

The Republic of the Union of Myanmar  
Ministry of Home Affairs  
Fire Services Department



**Myanmar Fire Safety Code  
2020**



## Contents

Sr.No	Descriptions	Page	
		From	To
<b>1</b>	<b>2</b>	<b>3(a)</b>	<b>3(b)</b>
1	Chapter (1) Terms and Definitions	1	57
2	Chapter (2) Objectives	58	58
3	Chapter (3) Means of Escape	59	118
4	Chapter (4) Structural Fire Precautions	119	229
5	Chapter (5) Fire Fighting Appliances Planning and External Extinguishing Proposals	230	252
6	Chapter (6) Electrical Power Supplies	253	255
7	Chapter (7) Fire Fighting Systems	256	282
8	Chapter(8) Mechanical Ventilation And Smoke Control Systems	283	308
9	Chapter (9) Other Systems	309	316
10	Chapter (10) Inspection on Fire Safety	317	321
11	Chapter (11) Penalties	322	322
12	Chapter (12) Miscellaneous	323	323

**The Republic of the Union of Myanmar**

**Ministry of Home Affairs**

**Fire Services Department**

**Notification No. 1999/2020**

**1<sup>st</sup> Waning of Nadaw, 1382 ME**

**(30 December 2020)**

Fire Services Department, Ministry of Home Affairs issues the following order relevant to the Myanmar Fire Safety Code, using its authority given by the Myanmar Fire Force Law – section (46), sub-section (B).

**Order relevant to the Myanmar Fire Safety Code (2020)**

**Chapter (1)**

**Terms and Definitions**

1. This order shall be called order relevant to the Myanmar Fire Safety Code (2020).
2. The terms involved in this order shall be affected in accordance with Myanmar Fire Force Law and Bye Laws. Moreover, the following terms shall have the definitions described as follows-
  - (a) **Code** means Myanmar Fire Safety Code (2020).
  - (b) **Area of refuge:** In the building under consideration, an area of refuge is an area adequately separated from the rest of the building by fire resisting construction and evacuees from the rest of the building enter the area of refuge using an external corridor that links this area to the rest of the building. An area of refuge may also be an area in an adjoining building which is separated from the building under consideration by fire resisting construction and evacuees similarly enter this area of refuge using an external corridor. An area of refuge shall always be accessible.
  - (c) **Corridor:** A passage providing means of access from rooms or spaces to an exit.
  - (d) **Separating wall:** A wall separating adjoining building.

- (e) **Dead-end:** A dead-end refers to a situation within a common area, normally or lift lobby spaces, where exit is only possible from one end, with no possible escape from the other end. The maximum length of such dead-end spaces shall not exceed 15 m or 20 m (sprinklered).
- (f) **Direct distance:** The shortest distance from a point in a room or space, measured within the external enclosure walls of the room or space to the relevant exits, ignoring internal walls, partitions and fittings other than the enclosure walls of exit passageways or exit staircases.
- (g) **Relevant boundary:** Boundary in relation to a side or external wall of a building or compartment, including a notional boundary.
- (h) **Exit:** A means of escape from the interior of the building to an exterior space which is provided by the use of the following either singly or in combination: exterior door openings, exit staircases, exit ramps or exit passageways. In the case of an exit leading to a separate building, exits also include linkways, walkways, bridges and balconies. Exit shall not include access stairs, aisles, corridor doors or corridors and access doors to rooms or spaces in occupancy areas.
- (i) **Exit passageway:** A horizontal extension of a vertical exit viz exit staircase or a passage leading from a courtyard to an open exterior space, complying with the requirements of Cl.22 for protected shafts in respect of fire resistance ratings for enclosure walls, floors, ceilings and doors, that serves as a required exit. Exit passageway shall be required to comply with the provisions of Cl.7(c).
- (j) **Exit door:** A door provided at the doorway of an exit for the passage of people, forming part of the integrity of the exit, including the exterior door opening.
  - (i) **Exit access:** That portion of a mean of escape that leads to an exit. It includes the room and building spaces that people occupy, the doors along the escape routes, lobbies, aisles, passageways,

corridors, access stairs and ramps that will be traversed in order to reach an exit.

- (ii) **Exit access door:** A door which provides access to a room or space (excluding toilet cubicle, bedroom, store room, utility room, pantry and the like) or installed across the escape path leading to an exit. Exit access door shall comply with all the requirements of an exit door and need not have fire resistance rating, unless it is specified.
- (k) **Exit staircase:** A staircase which has its enclosure constructed of noncombustible material having a fire resistance of not less than the minimum period required by Cl.17, for elements of structure for the part of the building in which it is situated.
- (l) **Vertical exit:** An exit staircase or exit ramp serving as required exit from one or more stories above or below ground level.
- (m) **Wall surface:** For the purpose of internal surfaces, includes

  - (i) The surface of glazing, and
  - (ii) Any part of ceiling which slopes at an angle of 70 degrees or more to the horizontal, but excluding:

    - (aa) door frames and unglazed parts of doors, and
    - (bb) window frames and frames in which glazing is fitted, and
    - (cc) architraves, cover moulds, picture rails, skirtings and similar narrow members, and
    - (dd) fitted furniture.
- (n) **Boundary:** The boundary of the land belonging to the building under consideration and including the imaginary extension of the boundary up to the centre of an abutting public street, canal or river.
- (o) **Habitable Height:** The habitable height is the height measured from the lowest level of fire engine accessway or access road (applicable to buildings

under Purpose Group II) to the finished floor level of the highest habitable floor.

- (p) **Habitable Floor:** A floor or part thereof, including roof level, regardless whether it is opened to sky or not, designated to be used for any purpose/activity other than housing lift motors, fire pumps, water supply pumps, cooling towers and water tanks. Such purpose/activity shall include terrace, garden and playground and other M&E plants.
- (q) **Occupant load:** The "occupant load" of a building or part thereof means the total number of persons that may occupy such building or part thereof at any one time. The "occupant load" shall be established;
  - (i) By applying to the floor areas available for occupation based on the appropriate areas per person as laid down in Table 1.5, or
  - (ii) By the number of fixed seating, if applicable, for Assembly Occupancies.
- (r) **Two-way escape (Remoteness of exits):** Where more than one exit is required from a building or portion thereof, such exits shall be remotely located from each other and shall be arranged and constructed to minimize the possibility that more than one can be rendered unusable by any one fire or other emergency condition.
  - (i) If two exits or exit access doors are required, they shall be placed at a distance from one another equal to or not less than half the length of the maximum overall diagonal dimension of the building or area to be served, measured in a straight line between the furthest edges of the exit doors or exit access doors (see diagram 1.1(a to e )) :

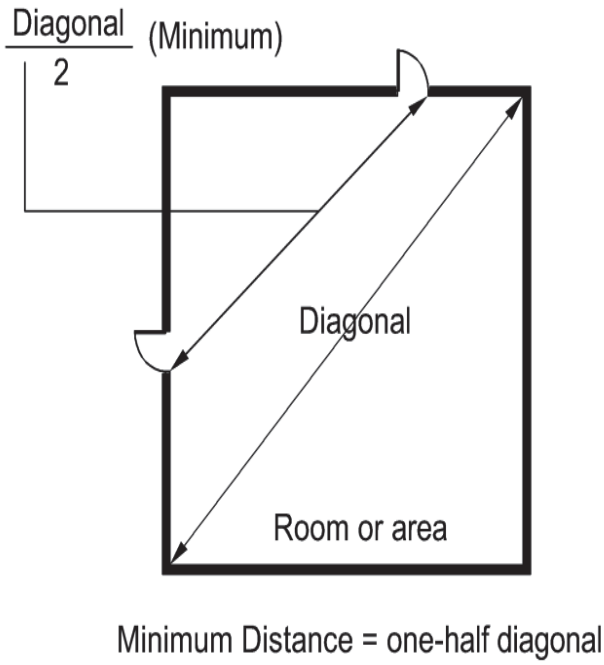


Diagram 1.1(a)

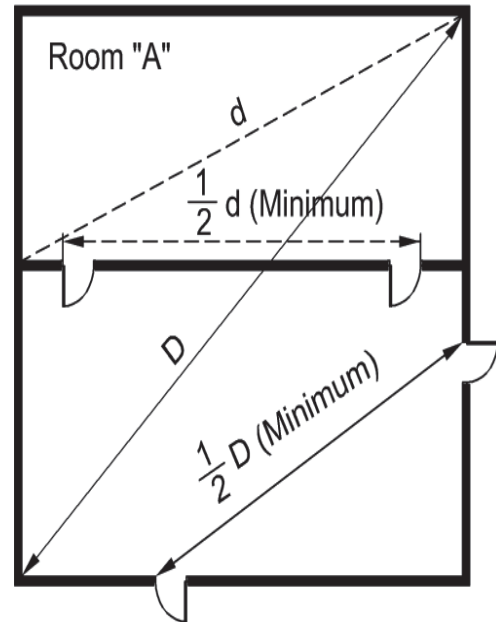


Diagram 1.1(b)

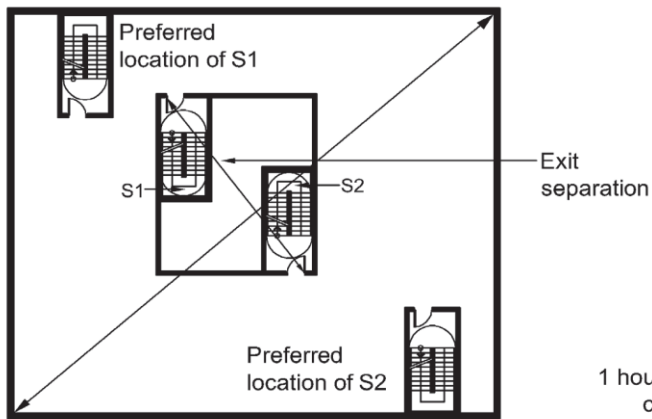


Diagram 1.1(c)

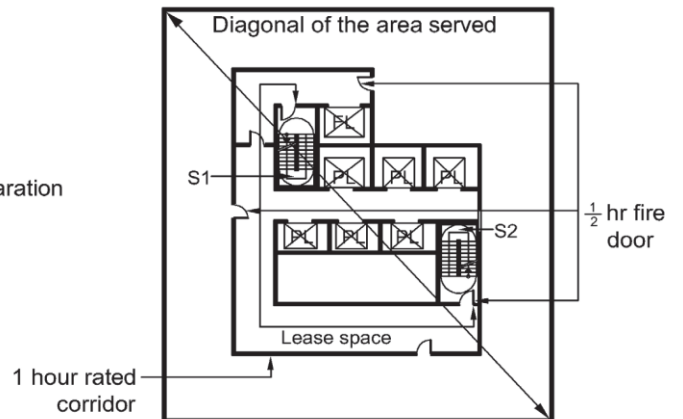
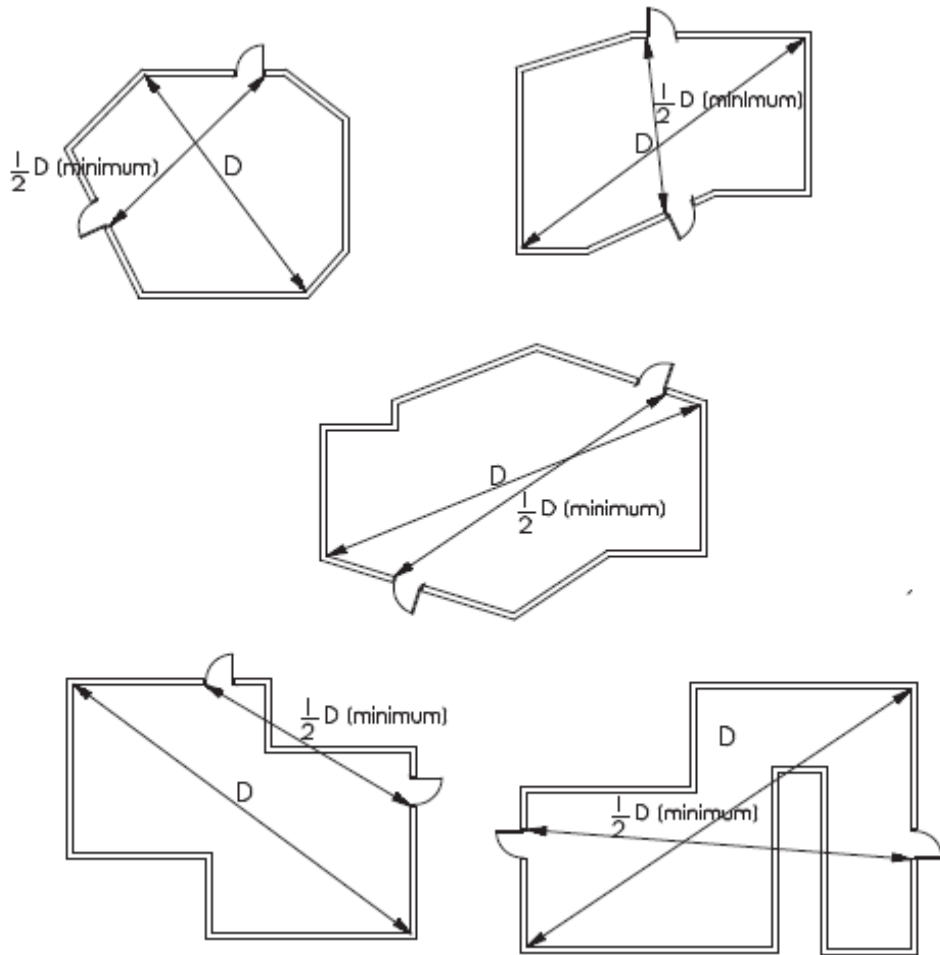


Diagram 1.1(d)



**Diagram 1.1(e)**

- (aa) If the distance between the two exits or exit access doors is less than half the length of the maximum overall diagonal dimension of the building or area to be served, it shall be considered as a one-way escape arrangement; and
- (bb) The separation distance measured in a straight line between the furthest edges of the doors of the two exits (exit staircases, exit passageways or exit ramps) shall not be less than 7 m.
- (ii) **Reduction in exit separation:** In buildings protected throughout by an approved automatic sprinkler system which complies with the requirements of chapter 7, the minimum separation distance between two exits or exit access doors measured in accordance with sub clause 2(p)(i) shall be not less than one third the length of the maximum overall diagonal dimension of the building or area to



be served. The separation distance measured in a straight line between the furthest edges of the doors of the two exits (exit staircases, exit passageways or exit ramps) shall not be less than 7 m.

- (iii) **Exit separation measured along exit access corridor:** Where two exit staircases, exit passageways or exit ramps are inter-connected by a corridor, exit separation shall be permitted to be measured along the line of travel within the exit access corridor. The exit access corridor connecting the exit staircases, exit passageways or exit ramps shall be protected by minimum one hour fire rated enclosures. Doors opening into this corridor shall have minimum half hour fire resistance rating. The separation distance measured along the line of travel within the exit access corridor between the furthest edges of the doors of the two exits (exit staircases, exit passageways or exit ramps) shall not be less than 7m.
- (iv) (aa) A one-way travel or “common path” exists if a floor space is arranged or provided with partitioning works such that occupants within that space are able to travel in only one direction to reach any of the exits or to reach the splitting point where they have the choice of two or more routes of travel to remote exits.
- (bb) The travel distance from the most remote point to the splitting point shall not exceed the permissible one-way travel distance allowed in Table 3.5. At the splitting point, the angle of divergence between any two alternative routes shall not be less than 90 degrees in order that the routes originating from the splitting point can be considered as two-way travel.
- (cc) The aggregate travel distances of the one-way travel from the most remote point to the splitting point and the continuous two-way travel from the splitting point to the nearest exit shall

not exceed the permissible two-way travel distance allowed in Table 3.5.

- (s) **Travel distance:** The distance required to be traversed from the most remote point in any room or space to the edge of a door opening directly to an exit staircase, or an exit passageway, or an open exterior space, unless otherwise permitted under this Code as in the case of hotel bedrooms (Cl.11(c)) residential apartments or maisonettes (Cl.8(g)) and exit to Area of Refuge (Cl.6(f)(6)).
- (t) **High hazard occupancy:** Any occupancy in which the contents or activities include one or more of the following
  - (i) Materials that will flame up by themselves without the presence of any fire source below the ignition temperature of 200°C,
  - (ii) Materials that would produce poisonous, noxious fumes, or flammable vapour,
  - (iii) Materials that would cause explosions,
  - (iv) Extra high hazard occupancies classified under SS CP 52, and
  - (v) Highly combustible substances and flammable liquids.
- (u) **Smoke-stop lobby:** A lobby located at the entrance to an exit staircase to help to prevent or minimize the entry of smoke into the staircase. The size of the lobby shall not be smaller than 3 m<sup>2</sup>.
  - (i) **Storey:** A storey means any floor or part thereof including platform, mezzanine, attic level and M&E floor.
- (v) **Smoke check door:** A door or set of doors placed in an internal corridor to restrict the spread of smoke by reducing draft.
- (w) **Fire-fighting lobby:** A smoke-stop lobby which is adjacent to a fire lift and exit staircase designated for use by the fire-fighting team during an emergency. The lobby shall not be used for any other purposes and the size of the lobby shall not be smaller than 6 m<sup>2</sup> and with no dimension smaller than 2 m.

- (x) **Fire stop:** A seal provided to close an imperfection of fit or any joint between elements, components or construction in a building so as to prevent and restrict penetration of smoke and flame through that imperfection or joint.
- (y) **Fire resistance:** The minimum period of time during which an element of structure or building element may be expected to function satisfactorily while subjected to a standard fire test.
- (z) **Code:** Code is the standard of practice acceptable to the Relevant Authority (MFSD). The Relevant Authority may adopt requirements stipulated in the stated year of publication of any referred Code of Practice or at its discretion adopt those specified in a later version.
- (1 a) **Non-combustible material:** Non-combustible material means any material which neither burns nor gives off flammable vapour in sufficient quantity to ignite when subjected to the test for combustibility prescribed in BS 476 Part 4, and includes materials of limited combustibility, such as:
  - (i) Any material of density  $300 \text{ kg/m}^3$  or more, which when tested to BS 476: Part 11, does not flame and the rise in temperature on the furnace thermocouple is not more than  $20^\circ\text{C}$ ;
  - (ii) Any material with a non-combustible core at least 8 mm thick having combustible facings (on one or both sides) not more than 0.5 mm thick; and
  - (iii) Any material of density less than  $300 \text{ kg/m}^3$ , which when tested to BS 476: Part 11, does not flame for more than 10 seconds and the rise in temperature on the centre (specimen) thermocouple is not more than  $35^\circ\text{C}$  and on the furnace thermocouple is not more than  $25^\circ\text{C}$ .
- (2 a) **Fire engine access road:** An access road to allow a fire fighting appliance to move from one location to another within a development for fire-fighting purpose/ operation. It shall comply with clause 34.
- (3 a) **Fire engine access-way:** An access road to allow a fire fighting appliance to carry out fire-fighting operation and shall be located along the

perimeter of the building in such a way and, in such extent as required in clause 34.

- (4 a) **Permitted limit of unprotected area:** The maximum aggregate area of unprotected areas in any side or external wall of a building or compartment as referred to in Cl.19(c).
- (5 a) **Basement:** The portions of buildings that are partly below grade plane. A basement must be considered as a story above grade plane where the finished surface of the floor above the basement is more than 6 feet above grade plane or more than 12 feet above the finished ground level at any point. A basement is a story that is not a story above the grade plane.
- (6 a) **Air-well:** An air-well is a space(s) enclosed substantially by building(s) and directly opens to the sky. Minimum air-well sizes are described in Table 1.1.
- (7 a) **Electromagnetic or electromechanical device susceptible to smoke:** A device which will allow a door held open by it to close automatically in the event of each or anyone of the following:
- (i) Detection of smoke by automatic apparatus suitable in nature, quality and location, and
  - (ii) Operation of a hand operated switch fitted in a suitable position,
  - (iii) Failure of electricity supply to the device, apparatus or switch, and
  - (iv) Operation of the fire alarm system if any.
- (8 a) **Load-bearing wall:** Load-bearing wall means a wall which supports any load in addition its own weight.
- (9 a) **Non load-bearing wall:** Non load-bearing wall means a wall which supports no load other than its own weight.
- (1 b) **Separated part (of a building):** A form of compartmentation that is a part which is separated from another part of the same building by a compartment wall which runs full height of the part and is in one continuous plane.

- (2 b) **Private lift:** Private lifts are passenger lifts which are meant for the exclusive use of occupants in the building, and are located to open its door directly into private enclosed spaces. Private lifts shall exclude vehicle lifts, home lifts and stair lifts.
- (3 b) **Relevant authority:** Relevant Authority means the Commissioner of Myanmar Fire Services Department and includes officers authorized by him generally or specifically to exercise the powers, functions and duties conferred by the Fire Safety Act.
- (4 b) **Protected shaft:** An exit staircase, exit passageway, lift, chute, duct or other shaft which enables persons or things or air to pass from one compartment to another.
- (5 b) **Unprotected area:** In relation to a side or external wall of a building means
- (i) A window, door or other opening, and
  - (ii) Any part of the external wall which has less than the relevant fire resistance required in Cl.19, and
  - (iii) Any part of the external wall which has combustible material more than 1mm thick attached or applied to its external face whether for cladding or any other purpose.
- (6 b) **Protecting structure:** Wall, floor or other part of the building which encloses a protected shaft, but not:
- (i) A wall which also forms part of an external wall, separating wall or compartment wall, or
  - (ii) A floor which is also a compartment floor or a floor laid directly on the ground, or
  - (iii) A roof.
- (7 b) **Compartment:** A part of a building separated from all other parts of the same building by compartment walls and/or compartment floors. A roof space above the top storey of a compartment is included in that compartment.

- (8 b) **Compartment wall & compartment Floor:** A wall or a floor which is provided for the purpose of dividing a building into compartments for the purposes of Cl.16 and complies with Cl.21.
- (9 b) **Room:** An enclosed space in a building that is not an enclosed circulation space or a protected shaft or an enclosed space not exceeding 750mm in depth.
- (1 c) **Cavity barrier:**To seal a cavity (concealed space) against the penetration of smoke and flame, or within a cavity (concealed space) to stop the movement of smoke and flame within the cavity.
- (2 c) **Flexible joints and flexible connections:** For air conditioning and mechanical ventilation systems: Flexible joints means connections between ducts and equipment normally provided to isolate vibration and to allow thermal movement. Flexible connections means flexible sections of ducts provided to connect the extremity of ventilation ductwork to terminal units, extract units and grilles.
- (3 c) **Cubical extent of building or compartment:** The cubical extent of a building or compartment shall be ascertained by measuring the volume of space contained within the building or compartment.
- (4 c) **Circulation space:** A space mainly used as means of access between a room or protected shaft and an exit from the building or compartment. It shall not contain any commercial activity such as information and reception counter, exhibition and the like.
- (5 c) **Area of Building:** The area of any storey of a building or compartment shall be taken to be the total area of that storey bounded by the inner finished surfaces of the enclosing walls or, on any side where there is no enclosing wall, by the outermost edge of the floor on that side. The area of any room or space shall be taken to be the total area of its floor bounded by the inner finished surfaces of the walls forming the room or space. The area of any

part of a roof shall be taken to be the actual visible area of such part measured on a plane parallel to the pitch of the roof.

- (6 c) **Element of Structure:** The full separated parts from the continuous floor to the highest floor in the building.
- (7 c) **Approved:** "Approved" means approved by the Relevant Authority.
- (i) **Ancillary office:** Any office which supports the activities of another Purpose Groups III, V, VI, VII and VIII and is located within the same building or compartment as the purpose group it serves is termed as ancillary office.
- (ii) **Ancillary usage:** Ancillary usage means;
- (aa) The ancillary office - sick room/ first aid room, reception lobby/ area, waiting area, staff lounge/ staff recreation room, staff rest room/ pantry, staff changing/ locker room, meeting room, staff training room etc are considered as ancillary use and part of the same purpose group.
- (bb) In addition, workshop, laboratories (no open flame), store room, material/ product holding area and packing/ distribution area housed within factory or warehouse buildings are also considered as ancillary use.
- (8 c) **External exit passageway:** An exit passageway opens to the outdoor air that serves as a required exit. External exit passageway shall comply with the provisions of Cl.7 (c) (3).
- (9 c) **External exit staircase:** An exit staircase which serves as a required exit shall be located outside the building and open to the outdoor air, and enclosed by parapet walls or railing only. An external staircase shall qualify as an external exit staircase if it is located within or abutting an air-well (which is open to sky and is required to provide lighting and ventilation to the occupancy areas) having the minimum size in relation to the habitable height of the building as given in the Table 1.1.

- (1 d) **External wall (or side of a building):** An outer wall or vertical enclosure, including a part of the roof pitched at an angle of 70 degrees or more to the horizontal if that part of the roof adjoins a space within the building to which persons have access.
- (2 d) **External cladding:** Material fixed to the outside face of an external wall for weather protection or decorative purpose.
- (3 d) **Rooflight:** Includes any domelight, lantern light, skylight or other element intended to admit daylight.
- (4 d) **Public building:** Public building means a building or part thereof used or constructed or adapted to be used as a shop, office, hospital or place of public resort, not being a church, chapel, mosque, temple or other place where public worship is or religious ceremonies are performed.
- (5 d) **Emergency generator:** Emergency power generating equipment that complies with the requirements stipulated in SS 535 Code of Practice for Installation, Operation, Maintenance, Performance and Constructional Requirements of Mains Failure Standby Generating Systems.
- (6 d) **Emergency lighting and exit lighting:** Emergency lighting means lighting provided with a secondary source of power supply. Exit lighting means that part of emergency lighting which is provided to illuminate the exits.
- (7 d) **Concealed space (cavity):** A space enclosed by elements of a building (including a suspended ceiling or raised floor or space between curtain walling and the floor slab or spandrel wall) or contained within an element but not a room, cupboard, circulation space, protected shaft or space within a flue, chute, duct, pipe or conduit.
- (8 d) **Purpose group:** For the purpose of this document, every building or compartment shall be regarded according to its use or intended use as falling within one of the purpose groups set out in Table 1.4 For designation of purpose group, where a building is divided into compartments used or intended to be used for different purposes, the purpose group of each



compartment shall be determined separately, provided that where the whole or part of a building or compartment (as the case may be) is used or intended to be used for more than one purpose, only the main purpose of use of that building or compartment shall be taken into account in determining into which purpose group it falls.

**Remarks:** Requirements for buildings not covered in Table 1.4, including but not limited to Power Stations, Telecommunication Exchanges, Incinerator Buildings, Wood Working Buildings, Rubber Factory Buildings, Matches and Fire Works Factories, Glass Factories, Chemical Plants, Petroleum Refineries and Buildings used for the manufacture and storage of Highly Combustible Substances and Flammable Liquids, etc. shall be consulted with the Relevant Authority.

- (9 d) **Atrium:** An atrium within a building is a large open space created by an opening, or a series of openings, in floor assemblies, thus connecting two or more stories. Atrium is covered at the top and is used for purposes other than those associated with small shafts, such as for stairs, elevators and various services. The sides of the atrium may be open to all floors, to some of the floors, or closed to all or some floors by unrated or rated fire-resistance construction.

**3. Provisions for Fire safety requirements are shown in below;**

- (a) **Chemical/ Hazmat Warehouses:** Chemicals or hazardous materials (hazmat) have a wide range of properties and hazards which must be identified and understood if the conditions of “safe warehousing” are to be achieved. A complete understanding of the hazards also requires an assessment of the container and packaging systems and storage arrangements. In addition, the provision of “Guidelines on Fire Safety Requirements for General Warehouses” shall be complied with. See Appendix (2).
- (b) **General Warehouses:** The scope of these guide lines in appendix (2) covers the fire safety requirements for general warehouses which include single-

storey single-user warehouses, single-storey multi-user warehouses, underground warehouses, multi-stories warehouses with or without basements and warehouse within other non-industrial buildings.

- (c) **Fully Automated Mechanized Car Park (FAMCP):** The fully automated mechanized car park buildings, which can be above and/or below ground, incorporate the concept of parking and retrieving a vehicle by mechanical means without the driver entering the parking area. The buildings are therefore unmanned and are totally different from the conventional car parks, such as, car park in a multi-stories building, multi stories car parks, etc. In view of the peculiar designs and operations of the fully automated mechanized car parks, a set of requirements is drawn up at Appendix (3) for ease of reference and compliance.
- (d) **Intumescent Paints For Protection To Structural Steel Members Of Buildings:** A new set of requirements is drawn up at Appendix (4) for ease of reference and compliance.
- (e) **Structural Loading Of Fire Engine On Accessway:** Technical data on fire appliance is drawn up at Appendix (5) for ease of reference and compliance.
- (f) **Water Supply Requirements For Wet Riser System:** Pumping and storage capacities can be reduced, on account that building having wet risers are likely to be sprinkler protected and the number of fire hose jets likely to be deployed at the fire site. The reduction in water supply requirements would result in less space requirements and thus impose smaller loads on the building structure. Water flow rate for wet riser system is mentioned in Table 1.2.
- (g) **Petroleum Service Station:** The requirements for storing and dispensing of liquid petroleum in Petroleum Service Station are drawn up at Appendix (6). Its purpose is not intended to preclude the use of alternative designs, materials and methods that provide equivalent standards of safety. Petroleum Service Stations are installations where petrol and diesel are

kept and dispensed as fuel for motor vehicles, on forecourt areas, which members of the public have access to. Measures and provisions must be made to prevent ignition sources coming into contact with liquid petroleum or its vapour. The control of ignition sources may become more difficult on sites where the public have access. This would cause the risk to life and property to be potentially high, especially where there are activities apart from dispensing petrol or where supervision is not constant.

- (h) **Reduced Water Storage Requirements For Sprinkler Systems In Buildings (For Ordinary Hazard Groups):** The primary purpose of these guidelines is to facilitate the installation of sprinkler systems in existing buildings that are not already protected by sprinkler system and that are in the Ordinary Hazard I, II & III classification. They are also applicable to new buildings having similar hazards. With the timely response by the MFSD, the designated water storage capacities in these guidelines should be adequate for the sprinkler system to control the fire spread till the arrival and the intervention by fire fighters. See following Table 1.3.
- (i) **High Containment Facility (BIO- Safety Level 3/4):** The purpose of these guidelines is to stipulate the fire safety requirements for high containment facility or laboratory that handles biological agents or toxins, designed to meet the WHO's requirements of Bio-Safety Level 3 [BSL-3] or higher level facility. These guidelines will assist the Qualified Persons in the design of fire safety provisions for the high containment facility. See Appendix (7).
- (j) **Liquefied Petroleum Gas (LPG) Cylinder Installations:** The scope of these guidelines covers both outdoor and indoor LPG cylinder installations. It is intended for commercial, industrial and residential premises with eating outlets, eating places, canteens, restaurants and other eateries which use LPG for cooking purposes. It is also intended for industrial applications involving hot works. See Appendix (8).

- (k) **Laboratories Handling Hazardous Chemicals:** For laboratory storing and using chemicals/hazmat shall be in compliance with NFPA 45 (with the Maximum Allowable Quantity, MAQ).
- (l) **Sprinkler and Wet Riser Systems In High-Rise Buildings:** These requirements serve to facilitate the installation of combined storage and pumping facilities for fire-fighting systems in high-rise buildings which would result in less space requirements, smaller loads imposed on the building structure and less cost in maintaining the system. The wet riser storage tank is able to cater to the effective operation of both sprinkler and wet riser systems, taking into consideration the response time of MFSD's fire-fighting crew to fire incidents and fire site.
- (m) **Temporary Workers' Quarters In Uncompleted Permanent Buildings On Construction Sites:** The scope of this Fire Safety Requirements (FSR) comprises the design, construction, installation and maintenance of temporary workers' quarters in uncompleted buildings on construction sites. It includes fire safety plans submission for such workers' quarters. This FSR shall not be applicable if the aggregate number of workers housed in the temporary workers' quarters in the uncompleted permanent building(s) on the construction site is not more than 40. See Appendix (9).
- (n) **Ductless Jet Fans System in Car Parks:** This set of requirements is only applicable to conventional car parks where passenger cars/light weight vehicles are parked alongside each other with common driveways and is not intended for mechanized car park system or other forms of car parking systems. See Appendix (10).
- (o) **Lift Rescue:** This set of Fire Safety Requirements (FSR) stipulates the fire safety provisions for performing lift rescue operation in buildings with blind lift hoist ways exceeding 11m. The fire safety requirements stipulated herein shall be applicable to buildings of all purposes groups except purpose group I. See Appendix (11).

- (p) **Persons with Disabilities:** The scope of these requirements covers the provision of fire safety features to assist persons with disabilities (PWDs) during emergencies and the development of plans to manage the evacuation of PWDs. It shall be applicable to all buildings except Purpose Group I and II buildings (residential) and Health Care Occupancy (i.e. Hospital, Nursing Home, Ambulatory Health Care Centre, Custodian Care and Supervisory Care facility) as defined in the Fire Code. Non-residential standalone buildings such as car park buildings and clubhouses that are located within the residential development and intended as ancillary use are not required to comply with these requirements. See Appendix (12).
- (q) **Using Lifts for Evacuation of Building Occupants during Emergency:** The scope of these requirements covers the provision of lift design for evacuation of building occupants requiring assistance during emergencies. It shall be applicable to all buildings exceeding 24 m except Purpose Group I and II buildings (residential developments) as defined in the Fire Code. See Appendix (13).
- (r) **Exit and Directional Signs in Buildings:** Entrance to every exit on every floor shall be clearly indicated by an exit sign placed over the exit doors. In long corridors, open floor areas, and all situations where the location of the exits may not be readily visible, directional signs shall be provided to serve as guides from all portions of the corridors or floors. Room shall also be provided with exit sign. Appendix (14) provides the guidelines for rooms that require the provision of exit signs.

**Table 1.1 Minimum Air-well Size**

Max. Habitable Height of Building	Min. Clear width of Air-well
18 m	10 m
24 m	11 m
36 m	12 m
48 m	13 m
60 m and above	14 m

**Table 1.2 Water Flow Rate for Wet Riser System**

No: of stacks	Water flow rate For Non-residential buildings	Water flow rate For residential buildings
1	38 L/s	27 L/s
2	57 L/s	40.5 L/s
3	76 L/s	54 L/s
4 and above	95 L/s	67.5 L/s

**Table 1.3 Effective tank capacity for inflow**

Occupancy Group	System demand	Proposed minimum effective capacity of storage tank
OH 1 [72m <sup>2</sup> ]	540 l/min	16.2 m <sup>3</sup>
OH 2 [144m <sup>2</sup> ]	1000 l/min	30.0 m <sup>3</sup>
OH 3 [216m <sup>2</sup> ]	1350 l/min	40.5 m <sup>3</sup>

**Table 1.4 Occupancy Load Tables**

<b>Purpose Group</b>	<b>Descriptive Title</b>	<b>Purpose for which building or part of the building is used or intended to be used</b>
I	Small residential	Private dwelling house such as bungalows, semi-detached houses
II	Other residential	Accommodation for residential purposes other than any premises comprised in Group I to include flats, maisonettes, apartments etc.
III	Institutional	Establishments used for treatment , care or maintenance of persons suffering from disabilities, or educational purposes and accommodations, including hospitals , clinics, polyclinics, student hostels, dormitories, old folks homes, orphanages , children’s homes, day-care centres, infant care ,kindergartens, army camps, detention /correction centres, schools, colleges , commercial schools, vocational institutions, polytechnics and universities.
IV	Office	Office or premises used for office purposes meaning the purposes of administration , clerical work ( including book-keeping, accounting , drawing and editorial work etc) telephone and telegraph operating and banking or as premises occupied with an office for the purposes of the activities therein carried on.
V	Shop	Shop or shopping centre including departmental stores, shopping arcades, supermarkets , drugstores, showrooms for sale of goods, hairdressing and beauty salons, ticketing agencies, pawnshops, laundries and/ or any other similar trades or businesses.
VI	Factory	A factory refers to any industrial premises with manufacturing, processing, servicing or testing activities.
VII	Place of public resort	Premises used for social ,recreational or business purposes to include hotels , holidays resorts, boarding houses , service apartments, convention centres, private clubs, community centres, museums, public art galleries, exhibition centres, theatres , cinemas, concert halls, public libraries, religious buildings, public sports complex, stadium , public swimming complex, recreational

<b>Purpose Group</b>	<b>Descriptive Title</b>	<b>Purpose for which building or part of the building is used or intended to be used</b>
		buildings , amusement centres, eating houses, restaurants, coffee shops, hawker centres, fast food outlets , bus terminals, train stations, airport and ferry terminals .
VIII	Storage	Place of storage (including godowns, warehouses, stores etc), deposit or parking of goods, materials and / or vehicles.



**Table 1.5 Occupancy Load Tables**

Table 1.5.1	Purpose Group II	Residential
Table 1.5.2	Purpose Group III	Health-Care Occupancy (Hospital, Clinic & Polyclinic)
Table 1.5.3	Purpose Group III	Student Hostel, Dormitory , Old Folks Home, Orphanage, Children's Home, Day-care Centre, Kindergarten, Infant Care, Army Camp, Detention / Correction Centre.
Table 1.5.4	Purpose Group III	Schools, Colleges, Commercial Schools, Vocational Institution, Polytechnic, University.
Table 1.5.5	Purpose Group IV	Offices, Banks, Publishers, Stock Brokers.
Table 1.5.6	Purpose Group V	Shops, Shopping Centres & Arcades.
Table 1.5.7	Purpose Group VI	Factories, Industrial Plants.
Table 1.5.8	Purpose Group VII	Hotels, Holiday Resorts, Boarding Houses, Service Apartments, Convention Centres, Private Clubs.
Table 1.5.9	Purpose Group VII	Community Centres.
Table 1.5.10	Purpose Group VII	Museums, Public Art Galleries, Exhibition Centres.
Table 1.5.11	Purpose Group VII	Theatres, Cinemas, Concert Halls.
Table 1.5.12	Purpose Group VII	Public Libraries.
Table 1.5.13	Purpose Group VII	Religious Buildings.
Table 1.5.14	Purpose Group VII	Public Sports Complex, Stadium, Public Swimming Complex.
Table 1.5.15	Purpose Group VII	Recreational Buildings, Amusement Centres.
Table 1.5.16	Purpose Group VII	Eating Houses, Restaurants , Coffee Shops, Hawker Centres, Fast Food Outlets
Table 1.5.17	Purpose Group VII	Bus Terminals, Train Stations, Airport, Ferry Terminal.
Table 1.5.18	Purpose Group VIII	Warehouses, Godowns, Car Parks

Table 1.5.1

Purpose Group-II		Other Residential
Building Types -		Apartments, Maisonettes
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Gross Floor Area	15.0	Calculated on habitable areas
Private roof garden/ terrace of a residential unit	-	Non-simultaneous
Children playground (with playground equipment)	5.0	
Common roof garden/roof terrace accessible to residents and guest	1.5 (except areas covered in Table 1.6 )	

Table 1.5.2

Purpose Group-III		Institutional	
Building Types -		Health-Care Occupancy(Hospital, Clinic & Polyclinic)	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS	
Reception Area	3.0		
Lobby/Corridors	-	Non-simultaneous	
Waiting Area/ Visitors Lounge	3.0		
Out-patient Waiting Area	1.5		
Admin Offices	10.0		
Doctor's Offices	10.0		
Nursing Station	10.0		
Staff Lounge	3.0		
Consultant/Treatment/ Examination Room	5.0		
Therapy Centre	10.0		
Operation Theatre	7.5		
Surgical Viewing Gallery	3.0		
Patient Accommodation	20.0	Intensive Care	
	10.0	Room (max 2 beds)	
	10.0	Ward	
Laboratories	20.0		
Pharmacy	20.0		
Kitchen/Housekeeping	10.0		
Laundry*(1)	10.0		
Toilet/Locker/ Changing Room	-	Non-simultaneous	

Purpose Group-III		Institutional
Building Types -		Health-Care Occupancy(Hospital, Clinic & Polyclinic)
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Storage	30.0	
Canteen	1.5	
Restaurant	1.5	
Shop	5.0	
Roof access for maintenance only	-	
Roof garden/roof terrace accessible to staff or other members of public in the building	1.5(except areas covered in Table 1.6)	

Table 1.5.3

Purpose Group – III	Institutional	
Building Types-	Student Hostel, Dormitory, Old Folk's, Home, Orphanage, Children's Home, Day-Care Centre, Kindergarten, Infant Care, Army Camp, Detention/Correction Centre	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Reception Area	3.0	
Lobby/ Corridors	-	Non-simultaneous
Waiting Area/ Visitors Lounge	3.0	
Admin office	10.0	
Staff Office	10.0	
Library/Reading Room	10.0	Stack Area
	5.0	Reading Area
Common Room	1.5	
Multi-purpose Room	1.5	
Student Bedroom	15.0 (including other areas attached living area or toilet)	Min. 2 persons per room

Purpose Group – III	Institutional	
Building Types-	Student Hostel, Dormitory, Old Folk's, Home, Orphanage, Children's Home, Day-Care Centre, Kindergarten, Infant Care, Army Camp, Detention/Correction Centre	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Warden's Accommodation	15.0	
Sleeping Quarters/Dormitories	3.0	
Detention Room	3.0	
Sick Room	-	Non-simultaneous
Toilets/Bath/Changing Rooms	-	Non-simultaneous
Indoor Games/Hobby Room	1.5	
Classroom	1.5	
Kitchen/Housekeeping	10.0	
Laundry*(1)	10.0	
Service Area	10.0	
Storage Area	30.0	
Dining/Canteen	1.5	

Purpose Group – III	Institutional	
Building Types-	Student Hostel, Dormitory, Old Folk's, Home, Orphanage, Children's Home, Day-Care Centre, Kindergarten, Infant Care, Army Camp, Detention/Correction Centre	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Shop	5.0	
Mechanical Plant Room	30.0	
Roof access for maintenance only	-	
Roof access for maintenance only members of public in the building.	1.5(except are as covered in Table 1.6)	

\*To refer to (1) (2) or (3) of notes at the end of Table (1.5.18)

Table 1.5.4

Purpose Group III- Building Types -	Institutional Schools, Colleges, Commercial Schools, Vocational Institution, Polytechnic, University	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Reception Area	3.0	
Lobby/Corridors	-	Non-simultaneous
Waiting Area / Visitors Lounge	3.0	
Admin Office	10.0	
Staff Office	10.0	
Class Room		
Computer Classroom	1.5	Commercial School
	3.0	Others
Seminar Room	1.5	
Lecture Room	1.5	
Library	10.0	Stack Area
	5.0	Reading Area (School)
	5.0	Others
Multi-purpose Hall	1.0	School/Colleges
	1.5	Others
Stage Area	3.0	
Viewing Gallery	1.5	
Design Studio	5.0	
Laboratories	5.0	
Workshop	5.0	
Club/Society Room	1.5	
Stack room	-	Non-simultaneous
Storage Area	30.0	
Kitchen/Service Area	10.0	
Toilets/Changing Room	-	Non-simultaneous
Canteen	1.5	



Purpose Group III- Building Types -	Institutional Schools, Colleges, Commercial Schools, Vocational Institution, Polytechnic, University	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Mechanical Plant Room	30.0	
Roof access for maintenance only	-	
Roof garden/roof terrace accessible to staff or other members of public in the building.	1.5(except are as covered in Table 1.6)	

\*Where school are provided with both Multi-purpose Hall and Indoor Sport Hall (ISH), the occupancy load for ISH can be based on 3 m<sup>2</sup>/person instead of 1 m<sup>2</sup>/person

Table 1.5.5

Purpose Group Iv - Office		
Building Types - Offices, Banks, Publishers, Stock Brokers		
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Reception Area	3.0	
Lobby / Corridors	-	Non-simultaneous
Waiting Area / Visitors Lounge	3.0	
Admin Office	10.0	
Business Centre	10.0	
Meeting/Seminar Room	1.5	
Archive/Library	10.0	Stack Area
	5.0	Reading Area
Filing Room/Store	10.0	
Computer Room	5.0	
Design Studio	5.0	
Drafting Office	5.0	
Trading Floor	2.0	
Trading Gallery	1.5	
Banking Hall	3.0	
Deposit/Strong Room	30.0	
Machine/Printing Room*(2)	10.0	
Restaurant	1.5	
Canteen	1.5	
Staff Canteen	1.5	
Shop	5.0	
Toilets	-	Non-simultaneous
Storage Area	30.0	
Mechanical Plant Room	30.0	
Aboveground or underground pedestrian linkways with commercial activities	2.0	

Roof access for maintenance only	–	
Roof garden/roof terrace accessible to staff or other members of public in the building.	1.5 ((except areas covered in Table 1.6)	

\*To refer to (1) (2) or (3) of notes at the end of Table (1.5.18)

Table 1.5.6

Purpose Group V- Building Types -		Shops Shops, Shopping Centres & Arcades
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Reception Area	3.0	
Lobby	-	Non-simultaneous
Fixed Corridors	-	Non-simultaneous
Waiting Area/Visitors Lounge	3.0	
Atrium Floor/Concourse	3.0	
Exhibition/Promotion Area	1.5	
Shop Floor	5.0	
Showroom	5.0	
Supermarket/Bazaar	5.0	
Department Store	5.0	
Restaurant	1.5	
Canteen	1.5	
Cafeteria	1.5	
Fast Food Outlet	1.0	
Admin Office	10.0	
Toilets/Staff Rest Room	-	Non-simultaneous
Storage	30.0	
Mechanical Plant Room	30.0	
Aboveground or underground pedestrian linkways with commercial activities	2.0	
Roof access for maintenance only	-	
Roof garden/roof terrace accessible to staff or other members of public in the building.	1.5(except areas covered in Table 1.6)	

Table 1.5.7

Purpose Group VI- Building Types -		Factory Factories, Flatted Factories, Industrial Plants	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS	
Reception Area	3.0		
Lobby/Corridors	-	Non-simultaneous	
Waiting Area/Visitors Lounge	3.0		
Admin Office	10.0		
Meeting/Seminar Room	1.5		
Library	10	Stack Area	
	5.0	Reading Area	
Workshop	10.0		
Laboratories	5.0		
Exhibition	1.5		
Production Area*(2)	10.0		
Packing/Distribution Area	10.0		
Material/Product	30.0		
General Storage	-	Non-simultaneous	
Multi-purpose Area	1.5		
Staff Recreation Room	-	Non-simultaneous	
Staff Rest Room	-	Non-simultaneous	
Staff Canteen	1.5		
Toilets/Changing/ Room	Locker	-	Non-simultaneous
Sick Room	-	Non-simultaneous	
Mechanical Plant Room	30.0		
Roof access for maintenance only	-		

Purpose Group VI- Building Types -		Factory Factories, Flatted Factories, Industrial Plants
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Roof garden/roof terrace accessible to staff or other members of public in the building.	1.5 (except areas covered in Table 1.6)	

\*To refer to (1) (2) or (3) of notes at the end of Table (1.5.18)

Table 1.5.8

Purpose Group VII -		Place of Public Resort
Building Types -		Hotels, Holiday Resorts, Boarding Houses, Serviced Apartments, Convention Centres, Private Clubs
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Reception Area	3.0	
Lobby /corridors	-	Non-simultaneous
Waiting Area / Visitors Lounge	3.0	
Atrium Floor/ Concourse	3.0	
Guestroom/ Accommodation unit	15.0(including other areas such as living area, toilet,etc)	Gross floor area of each room Min.2 persons per room
Backpacker hotel	3.0 (including other areas such as living area, toilet , etc)	Per room .Subject to a maximum of 20 persons per room .Maximum area of a backpacker room shall not exceed 60 m <sup>2</sup>
Serviced Apartment	15.0	Per unit
Bar/ Pub	1.0	Gross area
Discotheque	1.0 (including dine & dance area)	Gross area
Night Club	1.5 (including dine & dance area)	Gross area
Restaurant	1.5	
Exhibition/Multi-purpose area	1.5	
Function/Ball Room	1.5	
Pre-function Room	-	Non-simultaneous
Business Centre	10.0	
Admin Office	10.0	

Purpose Group VII -	Place of Public Resort	
Building Types -	Hotels, Holiday Resorts, Boarding Houses, Serviced Apartments, Convention Centres, Private Clubs	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Comference Room	1.5	
Meeting/ Seminar Room	1.5	
Library	10.0 5.0	Stack Area Reading Area
Shop	5.0	
Health Club/ Centre/SPA *(3)	5.0	
Swimming Pool Deck	10.0	
Swimming Pool	-	
Squash Court		2 per court
Staff Rest Room	-	Non-simultaneous
Staff Canteen	1.5	
Toilet / Changing / Locker Room	-	Non-simultaneous
Kitchen/ Service Area	10.0	
Laundry *(1)	10.0	
Mechanical Plant Room	30.0	
Above ground or underground pedestrian linkways with commercial activities	2.0	
Roof access for maintenance only	-	
Roof garden/roof terrace accessible to staff or other members of public in the building.	1.5 (except areas covered in Table 1.6)	

\*To refers to (1),(2) or (3) of notes at the end of Table (1.5.18)



Table 1.5.9

Purpose Group VII -		Place of Public Resort
Building Types -		Community Centres
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Reception Area	3.0	
Lobby/Corridors	-	Non-simultaneous
Waiting Area / Visitors Lounge	3.0	
Concourse	3.0	
Admin Office	10.0	
Multi-purpose Hall	1.5	
Meeting Room	1.5	
Library	10.0	Stack Area
	5.0	Reading Area
Health / Fitness Room/ SPA * (3)	5.0	
Games Room	1.5	
Canteen/ Cafeteria	1.5	
Kitchen	10.0	
Toilet /Changing Room	-	Non-simultaneous
Storage Area	30.0	
Mechanical Plant Room	30.0	
Roof access for maintenance only	-	
Roof garden /roof terrace accessible to staff or other members of public in the building.	1.5(except areas covered in Table 1.6)	

\*To refer to (1)(2) or (3) of notes at the end of Table (1.5.18)

Table 1.5.10

Purpose Group VII- Building Types -		Place of Public Resort Museums,Public Art Galleries ,Exhibition Centres	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS	
Reception Area	3.0	Reading Area	
Lobby/ Corridors	-	Non-simultaneous	
Waiting Area/ Visitors Lounge	3.0		
Concourse	3.0		
Admin office	10.0		
Archive/ Library	10.0	Stack Area	
	5.0	Reading Area	
Exhibition Area	1.5		
Auditorium/Theatre	1.5 (For Assembly occupancy,it can be based on fixed seating for purpose of computing occupant load)		
Storage Area	30.0		
Shop	5.0		
Restaurant	1.5		
Canteen/Cafeteria	1.5		
Kitchen	10.0		
Staff Rest Room	-	Non-simultaneous	
Toilet /Changing Room	-	Non-simultaneous	
Mechanical Plant room	30.0		
Roof access for maintenance only	-		
Roof garden / roof terrace accessible to staff or other Members of public in the building.	1.5 (except areas covered in Table 1.6)		

Table 1.5.11

Purpose Group VII - Building Types -		Place of Public Resort Theatres, Cinemas, Concert Halls	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS	
Reception Area	3.0		
Lobby / Foyer	3.0		
Corridors	-	Non-simultaneous	
Waiting Area / Visitors Lounge	3.0		
Admin Office	10.0		
Ticketing Office	10.0		
Seating Gallery	1.5	by numbers of	
Stage	-	Non-simultaneous	
Back stage	3.0		
Orchestral Room	1.5		
Changing Room	3.0		
Lighting/AVA Room	5.0		
Projection Room	5.0		
General Storage	30.0		
Restaurant	1.5		
Canteen/Snack Bar	1.5		
Kitchen	10.0		
Toilets	-	Non-simultaneous	
Mechanical Plant Room	30.0		
Roof access for maintenance only	-		

Purpose Group VII -		Place of Public Resort
Building Types -		Theatres, Cinemas, Concert Halls
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Roof garden / roof terrace accessible to staff or other members of public in the building	1.5(except areas covered in Table 1.6)	

Table 1.5.12

Purpose Group VII- Building Types -		Place of Public Resort Public Libraries	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS	
Reception Area	3.0		
Foyer	3.0	Loan Counter Area	
Lobby / Corridors	-	Non-simultaneous	
Waiting Area / Visitors Lounge	3.0		
Admin Office	10.0		
Library Area	10.0	Stack Area	
	5.0	Reading Area	
Audio Visual Area	3.0		
Auditorium / Theatre	1.5 (For Assembly occupancy ,it can be based on fixed seating for purpose of computing occupant load)		
Multi-purpose Room	1.5		
Book/ General Storage	30.0		
Cafeteria/Snack Bar	1.5		
Kitchenette	10.0		
Toilets	-	Non-simultaneous	
Mechanical Plant Room	30.0		

Purpose Group VII- Building Types -		Place of Public Resort Public Libraries	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS	
Roof access for maintenance only	-		
Roof garden/roof terrace accessible to staff or other members of public in the building.	1.5 (except areas covered in Table 1.6)		

Table 1.5.13

Purpose Group VII- Building Types -		Place of Public Resort Religious Buildings	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS	
Reception Area	3.0		
Foyer	3.0		
Lobby/ Corridors	-	Non-simultaneous	
Waiting Area/ Visitors Lounge	3.0		
Meeting /Seminar Room	10.0		
Class Room	1.5		
Prayer Hall / Gallery	1.5		
Choir Gallery	1.5		
Crematoria	1.5		
Mortuary	30.0		
Refreshment Area	1.5		
Kitchenette	10.0		
Staff Quarter	15.0		
General Storage	30.0		
Toilets/Changing Room	-	Non-simultaneous	
Mechanical Plant Room	30.0		
Roof access for maintenance only	-		
Roof garden/roof terrace accessible to staff or other members of public in the building.	1.5 (except areas covered in Table 1.6)		

Table 1.5.14

Purpose Group VII- Place of Public Resort		
Building Types - Public Sports Complex, Stadium,Public Swimming Complex		
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Reception Area	3.0	
Lobby/ Corridors	-	Non-simultaneous
Concourse/Foyer	3.0	
Waiting Area/ Visitors Lounge	3.0	
Admin Office	10.0	
Meeting /Seminar Room	1.5	
Multi-Purpose Sports Hall	3.0	
Gymnasium	3.5	
Training Area	3.0	
Grandstand /Seating Area	1.5	
Squash Court		2 per court
Swimming Pool Deck	5.0	
Swimming Pool	2.5	
Restaurant	1.5	
Cafeteria	1.5	
Fast Food Outlet	1.0	
Kitchen	10.0	
General Storage	30.0	
Toilet/Changing Room	-	Non-simultaneous
Mechanical Plant Room	30.0	



Purpose Group VII- Place of Public Resort		
Building Types - Public Sports Complex, Stadium, Public Swimming Complex		
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Roof access for maintenance only	-	
Roof garden/roof terrace accessible to staff or other members of public in the building.	1.5 (except areas covered in Table 1.6)	

Table 1.5.15

Purpose Group VII- Building Types -		Place of Public Resort Recreational Buildings, Amusement Centres	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS	
Reception Area	3.0		
Lobby/ Corridors	-	Non-simultaneous	
Waiting Area/ Visitors Lounge	3.0		
Admin Office	10.0		
Meeting /Seminar Room	1.5		
Bowling Alley	1.0	Excluding bowling lanes	
Amusement Park	1.0	Excluding machine areas	
Billiards Room	5.0		
Skating Rink	3.0	Rink Area	
Spectator Area	1.5		
Discotheque	1.0 (including dine & dance area)	Gross Area	
Pub/Bar	1.0	Gross Area	
Karaoke Lounge	1.5(including dine & dance area)	Gross Area	
Night Club	1.5(including dine & dance area)	Gross Area	
Health Club/Centre*(3)	5.0		
Restaurant	1.5		
Cafeteria/ Snack Bar	1.5		
Fast Food Outlet	1.0		

Purpose Group VII- Building Types -		Place of Public Resort Recreational Buildings, Amusement Centres	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS	
Kitchen/Service Area	10.0		
Toilet / Changing Room	-	Non-simultaneous	
General Storage	30.0		
Mechanical Plant Room	30.0		
Roof access for maintenance only	-		
Roof garden/roof terrace accessible to staff or other members of public in the building.	1.5 (except areas covered in Table 1.6)		

Table 1.5.16

Purpose Group VII- Place of Public Resort		
Building Types - Eating Houses, Restaurants, Cooking Shops, Hawker Centres, Fast Food Outlets		
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Reception Area	3.0	
Lobby/ Corridors	-	Non-simultaneous
Waiting Area	3.0	
Admin Office	10.0	
Meeting /Seminar Room	1.5	
Dining Area	1.5	Hawker Centres
	1.0	Fast Food Outlets
	1.5	Others
Bar/ Pub	1.0	Gross Area
Lounge	2.5	
Kitchen/Service Area	10.0	
Storage Area	30.0	
Toilet / Changing Room	-	Non-simultaneous
Staff Rest Room	-	Non-simultaneous
Mechanical Plant Room	30.0	
Aboveground or underground pedestrian linkways with commercial activities	2.0	
Roof access for maintenance only	-	

Purpose Group VII- Place of Public Resort		
Building Types - Eating Houses, Restaurants, Cooking Shops, Hawker Centres, Fast Food Outlets		
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Roof garden/roof terrace accessible to staff or other members of public in the building.	1.5 (except areas covered in Table 1.6)	

Table 1.5.17

Purpose Group VII- Building Types -		Place of Public Resort Bus Terminal, Train Station, Airport, Ferry Terminal	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS	
Reception Area	3.0	Non-simultaneous	
Lobby/ Corridors	-		
Waiting Area/ Visitors Lounge	3.0		
Concourse	3.0		
Admin Office	10.0		
Meeting /Seminar Room	1.5		
Ticketing Office	10.0		
Business Centre	10.0		
Passenger Arrival	1.5	Bus Terminal	
Departure Areas/Foyers	3.0	Others	
Restaurant	1.5		
Cafeteria	1.5		
Fast Food Outlet	1.0		
Kitchen/Service Area	10.0		
Shop	5.0	Non-simultaneous	
Staff Rest Room	-		
Storage Area	30.0	Non-simultaneous	
Toilets/Changing Room	-		
Mechanical Plant Room	30.0		
Aboveground or underground pedestrian linkways with commercial activities	2.0		

Purpose Group VII-	Place of Public Resort	
Building Types -	Bus Terminal, Train Station, Airport, Ferry Terminal	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Roof access for maintenance only	-	
Roof garden/roof terrace accessible to staff or other members of public in the building.	1.5 (except areas covered in Table 1.6)	

Table 1.5.18

Purpose Group VIII-	Warehouse, Godowns, Public Car Park	
Building Types -	Warehouse, Godowns, Car Park	
FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Reception Area	3.0	
Lobby/ Corridors	-	Non-simultaneous
Waiting Area/ Visitors Lounge	3.0	
Admin Office	10.0	
Meeting /Seminar Room	1.5	
Packaging Area	10.0	
Goods Storage	30.0	
General Storage	30.0	
Loading / Unloading Area	4 per Bay	
Staff Rest Room	-	Non-simultaneous
Toilets/Changing Room	-	Non-simultaneous
Staff Canteen	1.5	
Kitchen/Service Area	10.0	
Mechanical Plant Room	30.0	
Roof access for maintenance only	-	
Roof garden/roof terrace accessible to staff or other members of public in the building.	1.5 (except areas covered in Table 1.6)	

- (a) Car Parking Areas-occupancy calculated on the basis of 30 m<sup>2</sup> per person.
- (b) For building types not included in the above tables, occupancy load calculation shall be based on the figures established for buildings within the same purpose group, or as otherwise determined by the Relevant Authority.



- \* (1) Laundry Areas equipped with machine operation, occupancy may be calculated at 15.0 m<sup>2</sup> per person.
- \* (2) Production Area whether automated or not, shall be calculated on the basis of 10.0 m<sup>2</sup> per person.
- \* (3) Health/Fitness Centre /SPA include areas for weight training, aerobics, massage, sauna/ steam bath and whirlpools.

Table 1.6 Occupancy Load Factors for Roof Garden / Roof Terrace /  
Sky Garden / Sky Terrace

FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Sunken planting areas	3.0	
Planter boxes less than 300 mm in height (regardless of whether the planter box is covered with trees / shrubs)	1.5	
Height of planter box from 300 mm to 500 mm and covered fully with trees / shrubs	-	
Height of planter box from 300 mm to 500 mm and not covered with trees / shrubs	1.5	
Height of planter box exceeds 500 mm (without access by steps/ ramp)	-	
Depth / height of sunken/ elevated water feature (permanent / fixed structure ) less than 300 mm	3.0	
Depth / height of sunken/ elevated water feature (permanent / fixed structure ) less than 300 mm or more	-	
Jogging track / designated foot path not exceeding 3 m in width	3.0	
Children playground (with playground equipment)	3.0	

FUNCTIONAL SPACES	OCCUPANCY LOAD (m <sup>2</sup> /person)	REMARKS
Roof without public or occupant access (i.e. for maintenance only)	-	

Note-When works are carried out at an existing roof garden , roof terrace,sky garden ,sky terrace , regardless whether the works increase the occupant load, QP shall submit plans to MFSD for approval.

## **Chapter (2)**

### **Objectives**

4. According to modernization, Myanmar Fire Safety Code 2020 which is based on the International Code of Fire Safety and Means of Egress has been published with the following purposes-

- (a) To comply with the minimum requirements which is provided for fire safety and means of escape facilities based on the occupancy type
- (b) To realize and calculate the provisions which shall be complied in the case of construction and designs of fire safety and means of escape applying and managing, or maintaining.
- (c) To put fire fighting appliances in the premises of the building in order to perform effectively fire fighting and rescues activity.

## **Chapter (3)**

### **Means of Escape**

5. Exit Facilities - The provisions of this chapter of the Code shall serve to express the intentions for determining the design, construction, protection, location, arrangement and maintenance of exit facilities to provide safe means of escape for occupants from all buildings here after erected, altered or changed in occupancy. Areas which are designated as means of escape, such as exit staircase, fire-fighting lobby, smoke-stop lobby, exit passageway, escape corridors shall not be turned into other usage.
6. Determination of Exit Requirements for a building shall be based upon the following:
  - (a) The determination of exit requirements for a building shall be based upon the type of use or occupancy of the building, the occupant load, the floor area, the travel distance to an exit and the capacity of exits as provided in Table 3.5 and herein. Every storey of a building shall be provided with exit facilities for its occupant load. Vertical exits provided from any storey above ground level may serve simultaneously all storeys above the ground level and vertical exits provided from any storey below ground level may serve all storeys below ground level, subject to the provisions of Cl.7(f) which prohibit basement staircases being continuous with exit staircases serving the upper storeys, unless otherwise allowed by the Myanmar Fire Services Department.
  - (b) Where different parts of a building or storey of a building are designed for different types of occupancies or used for different purposes at the same time, the exit requirements of the entire building or storey of the building shall be determined on the basis of that type of occupancy or usage having the strictest exit requirements or the exit requirements for each building section shall be determined separately.

- (c) Where a building or storey of a building or a part of a building is used for multiple purposes involving different activities at different times, that purpose or use involving the greatest number of occupants shall form the basis for determining the exit requirements.
- (d) The floor areas of toilets, locker rooms, storage rooms, lobbies, corridors and similar rooms and spaces that serve other rooms and spaces on the same storey but are not occupied at the same time as such other rooms or spaces, may be omitted from the occupant load calculations of that storey of the building on which they are located.
- (e) The capacity of exits, exit staircases, exit passage ways, corridors, exit doors and other exit facilities shall be complied with the exit requirements in this chapter. Where a room or space is required to be provided with two exits, each exit shall be of sufficient width to accommodate not less than half the total occupant load.
- (f) The maximum travel distance for the respective types of occupancies shall be not greater than as laid down in Table 3.5 read in conjunction with the following:
  - (i) In the case of a floor area designed with minimum two exits, the maximum travel distance as given in Table 3.5 shall be applicable. The maximum travel distance starting from the most remote point in any occupied space to the nearest exit, shall not exceed the limits specified in Table 3.5,
  - (ii) In a large floor area sub divided into rooms, corridors and so forth, the travel distance requirements of the foregoing paragraphs of this clause

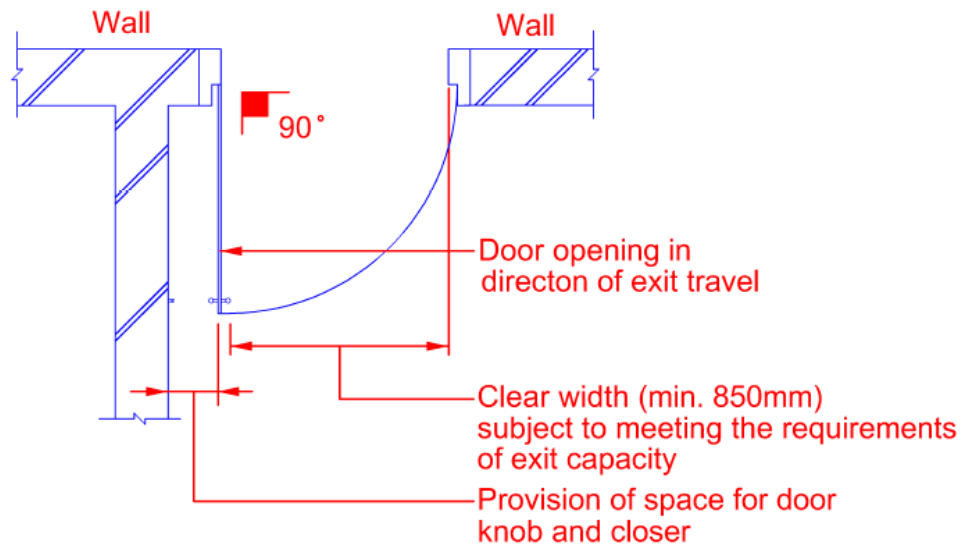
shall be deemed to be satisfied if the 'direct distance' does not exceed two third of the maximum travel distance permitted under Table 3.5,

- (iii) The most remote point from which the travel distance is measured shall be taken as being 400mm from the enclosure walls of the room or space,
- (iv) In the case of a hotel bedroom, travel distance shall be determined based on the provisions under Cl. 11(c) for Exit Requirements for Hotels,
- (v) In the case of a residential apartment or maisonette, the travel distance shall be determined based on the provisions under Cl. 8(g) for Exit Requirements for Residential Occupancy,
- (vi) Where Area of Refuge is provided in lieu of required exits, travel distance shall be measured to the exit door at the corridor leading to the Area of Refuge,
- (vii) Where permitted under Cl. 7(d) for exit staircases to be entered without the provision of an exit door, the travel distance shall be measured to a position where the exit door would be installed if otherwise required,
- (viii) Where an ancillary office is housed within a space belong to other Purpose Groups, the travel distance requirement for the ancillary office is allowed to be based on Purpose Group IV, provided:
  - (aa) the ancillary office is fire compartmented from spaces belonging to the other Purpose Groups,
  - (bb) the ancillary office occupants shall have access to exit(s) within the ancillary office compartment leading to direct discharge at ground level into a safe exterior open space, into a protected exit staircase or internal/external exit passageway.

- (g) Minimum width shall be required to comply with the following:
- (i) No exit, exit staircase or other exit facilities shall be narrower than the minimum width requirement as specified under Table 3.5. The minimum clear width of an exit door opening shall be not less than 850mm.
  - (ii) Exit access doors serving a room with an occupant load of not more than 2 persons shall not be less than 610mm in clear width.
  - (iii) A single leaf swing door along the means of egress shall not exceed 1250mm in clear width.
- (h) The maximum width of exit staircases shall be not more than 2000mm. Where staircases exceed 2000 mm in width, handrails shall be used to divide the staircase into sections of not less than 1000 mm of width or more than 2000mm of width. For the purpose of determining the exit capacity of a staircase that is wider than 2000mm that forms part of the required means of escape from any storey of the building, that part of its width in excess of 2000mm shall not be taken into account.
- (i) In the case of an exit staircase, the measurement of width referred to under Cl. 6(g) and 6(h) shall be the clear width, the inner sides of the balustrades if the staircase has balustrades on both sides, and the projection of handrail into the clear width of a staircase shall not exceed 80mm on each side of the staircase. If the projection exceeds 80mm, the clear width of the staircase shall be measured from the inner sides of the handrails.
- (i) Clear width of exit doors shall be measured as follows:
    - (aa) In the case of an exit door having a single leaf door, the opening shall be measured between the edge of the door jamb and the



surface of the door when opened at an angle of 90 degrees, (See Figure 3.1)



### Plan - Single Leaf Door

Figure (3.1)

- (bb) In the case of an exit door having 2 leaf and fitted with an approved automatic flush bolt, the clear openings shall be measured between the surface of one leaf to the other door leaf when opened at an angle of 90 degrees,
- (cc) If one of the door leaves is bolted to the door frame and/or floor by a manually operated bolt, this door leaf shall not be considered for the purpose of determining the exit capacity of the door. The opening of the other door leaf shall have a clear width of not less than 850mm, measured between the edge of the bolted door leaf and the surface of the other door leaf, when opened at an angle of 90 degrees,

- (dd) Door hardware and handrails which do not protrude more than 80mm into the clear width of exit opening can be ignored.
  
- (j) There shall be at least two door openings remote from each other and leading to exits from every room or enclosed space in which the total occupant load exceeds the maximum permissible occupant load for one door as listed in the Table 3.1. Rooms and spaces with occupancy of more than 50 persons shall comply with the requirements for 'Number and Width of Exits' under Cl. 12(b) for Assembly Occupancy.  
  
Note:
  - (i) For residential occupancy, see Cl. 8.
  - (ii) For health care occupancy, see Cl. 9.
  - (iii) For office/shop/factory/warehouse occupancy, see Cl. 10.
  - (iv) For hotels, see Cl. 11.
  - (v) For assembly occupancy, see Cl. 12.
  
- (k) There shall be at least two independent exit staircases or other exits from every storey of a building, unless otherwise permitted under other subsequent provisions of the code.
  
- (l) All exits and access facilities shall be required to comply with the following:
  - (i) Exits and access facilities shall be clearly visible or their locations shall be clearly indicated and shall be kept readily accessible and unobstructed at all times,

- (ii) Every occupant or tenant within a building or storey of a building shall have direct access to the required exit or exits without the need to pass through the spaces or rooms occupied by other occupants or tenants.
  - (iii) When more than one exit is required from any room or space or a storey of a building, each exit shall be placed as remote as possible from the other as permitted under Cl. 2(l).
- (m) Entry at every storey level (including Ground floor) to an exit staircase of any building of more than 6 storeys above ground level or more than habitable height of 24m shall be through:
- (i) an external exit passageway or external corridor. The openings for natural lighting and ventilation to the corridor shall be so located that they face and open to:
    - (aa) the external space,
    - (bb) a street, service road (at least 5m) or other public space which is open to the sky,
    - (cc) an air-well which opens vertically to the sky and having a minimum width of 6m and a superficial plan area of not less than 93m<sup>2</sup>, except that for residential occupancy, the external corridors for smoke free approach shall comply with the requirements of Cl. 8(h and i), and in the case of workers' dormitories and hotel bedrooms being served by external corridors, such corridors shall comply with Cl. 13(d) and Cl. 11(b) respectively.

- (ii) a lobby that is separated from the adjoining areas of the building by a wall having a fire resistance of 1 hour. The floor area of a smoke-stop lobby shall be not less than 3m<sup>2</sup> and the exit access door shall have fire resistance of half an hour fitted with automatic self-closing device conforming to the requirements of Cl. 23(b). The design of a smoke-stop lobby must be such as not to impede movement of occupants through the escape route. If a smoke-stop lobby also serves as a fire-fighting lobby, the floor area shall be not smaller than 6m<sup>2</sup> and with no dimension smaller than 2m. The floor shall be graded from the lift door towards the lobby door with a fall not exceeding 1 in 200. A smoke-stop lobby, including fire-fighting lobby, which acts as buffer space for entry into the protected staircase and use by fire fighters during emergency, shall be maintained as common property. A smoke-stop lobby shall be ventilated by:
- (aa) permanent fixed ventilation openings in the external wall of the lobby; such ventilation openings shall have an area of not less than 15 % of the floor area of the lobby and located not more than 9m from an air-well or external recessed space of minimum clear area 93m<sup>2</sup> and minimum width of 6m. The air-well or external recessed space shall have no obstruction vertically throughout the air space for ventilation,
  - (bb) mechanical ventilation, except for Purpose Group II, complying with the requirements in Chapter 8,
  - (cc) permanently fixed ventilation openings of area not less than 15 % of the floor area of the lobby and located not more than 9m from any part of the lobby, opening to an open air well which is

open vertically to the sky for its full height. The air-well size shall be in accordance with Cl. 6(m)(i)(cc) except for building not more than four storey, in which the air-well shall have a horizontal plan area of not less than  $10\text{m}^2$  or  $0.1\text{m}^2$  for each 300mm of height of the building, whichever is the greater. The minimum width of such air-well space shall not be less than 3000mm. The enclosure walls to the air well shall have a minimum fire resistance of 1 hour and have no openings other than ventilation openings for the smoke-stop lobby, exit staircase and toilets,

- (dd) cross-ventilated corridor having fixed ventilation openings in at least two external walls. The openings to each part of the external walls shall not be less than 50% of the superficial area of the opposing external walls. No part of the floor area of the corridor shall be at a distance of more than 13m from any ventilation openings.
- (iii) Exception for smoke-stop lobby shall be assigned as follows:
  - (aa) The omission of smoke-stop lobby required under Cl. 6(m)(ii) to exit staircase of any building exceeding 6 storeys is allowed under the following situations, provided the door opening into the exit staircases shall be at least 1 hour fire resistance and fitted with automatic self-closing device to comply with the requirements of Cl. 23(b):

- (1) where the internal exit staircase is provided with pressurization up to a habitable height of 24m in compliance with the requirements of Chapter 8,
  - (2) where an external exit staircase is constructed to comply with Cl. 2(9c),
  - (3) where an external exit staircase of a building is located along its perimeter wall and provided with uninterrupted external ventilation openings having not less than 50% of the planal area of the staircase at each storey level,
  - (4) in an open-sided car park floor where cross-ventilation is provided. Under this situation, the fire door to the exit staircase can be half an hour fire rated.
- (bb) The omission of smoke-stop lobby to exit staircases shall not be allowed under the following situations:
- (1) where the building exceeds 6 storeys and belongs to Purpose Group III and VII,
  - (2) where the internal exit staircase, which is provided with pressurization, exceeds the habitable height of 24m,
  - (3) where the exit staircase is designated as fire-fighting staircase adjacent to a fire lift as required in Chapter 7.

- (n) Smoke free approach in basement shall be required to comply with the following:
- (i) In a building comprising more than 4 basement storeys, entry to exit staircases serving the basement storeys at every basement storey level shall be through smoke-stop lobbies or connected with air well for smoke free approach, one of which shall be designated as firefighting lobby. The exit staircase connecting to the fire-fighting lobby shall be pressurized to comply with the requirements in Chapter 8,
  - (ii) In a building comprising 2, 3 or 4 basement storeys, entry at every basement storey level to at least one of the exit staircases serving the basement storeys shall be through a smoke-stop lobby or connected with air well for smoke free approach and where only one smoke-stop lobby is provided, it shall be required to serve as a fire-fighting lobby,
  - (iii) Smoke-stop lobbies in basement occupancies shall be required to comply with the relevant provisions under Cl. 6(m)(ii) and shall be mechanically ventilated to comply with the requirements in Chapter 8.
- (o) When a floor area has access to Area of Refuge in compliance with following requirements in this Clause, the occupant load for which vertical exits are to be accounted for the floor area may be reduced to half when one Area of Refuge is provided and to one third when two or more Areas of Refuge are provided.
- (i) Area of Refuge shall be required to comply with the following:
    - (aa) Adequate in size to hold the occupant load it receives from the floor area it serves as provision for required exit, in addition to its own occupant load calculated on the basis of 0.3 m<sup>2</sup> per

person except for Health Care Occupancies when the occupant load shall comply with the provisions under Cl. 9(c),

- (bb) Provided with at least one staircase for use by the occupants to gain access to other exit staircases or the ground level directly to an exterior open space,
- (ii) An Area of Refuge shall be entered through an external corridor and the room or space or Area of Refuge shall be separated from the corridor by a wall with minimum 1 hour fire resistance,
- (iii) External corridors when used as entry into an Area of Refuge shall conform to the requirements of exit passageway,
- (iv) Exit doors between the room or space or Area of Refuge and the external corridor shall have fire resistance of at least half an hour and fitted with automatic self-closing device to comply with the requirements of Cl. 23(b),
- (v) Every fire compartment in which exit reduction is permitted in connection with Area of Refuge shall have in addition to exit through the Area(s) of Refuge at least one staircase complying with Cl. 7(d).

7. Means of Escape General Requirements shall be assigned as follows:

- (a) Means of escape shall be provided for all buildings by one or more of the facilities listed herein. Access and exit facilities not specifically covered in this Code shall not be used without the approval of Myanmar Fire Services Department. Required exits shall be kept readily accessible, and doors shall be open able and unobstructed at all times during the occupancy of the building.



- (b) Staircases serving all buildings (except Purpose Group I) shall be provided with a signage not smaller than 300 x 300mm and within the stairwell at each storey landing. The signage shall contain the following information in the order as follows:
- (i) The storey number, at least 125mm in height.
  - (ii) An identification of the staircase in alphabetical and/or numeric, at least 25mm in height,
  - (iii) The signage shall be located such that it is visible when the door is in the open position and also visible to any person moving up or down the staircase,
  - (iv) The letters and numbers on the sign can be of any colour that shall contrast with the background colour.
- (c) Exit passageways shall be required to comply with the following:
- (i) Exit passageways that serve as a means of escape or required exits from any building or storey of a building shall have the requisite fire resistance as specified under Cl. 17.
  - (ii) Internal exit passageway shall be required to comply with the following:
    - (aa) an internal exit passageway which serves as required exit of the building shall be enclosed with construction complying with the provisions of Cl. 17,
    - (bb) the enclosure walls of an exit passageway shall have not more than two exit doors opening into the exit passageway,

- (cc) exit doors opening into an exit passageway shall have fire resistance rating as required for exit doors opening into exit staircases, fitted with automatic self-closing device and complying with the requirements of Cl. 23(b) for fire resisting doors,
  - (dd) the minimum width and capacity of exit passageway shall comply with the requirements as provided in Table 3.5,
  - (ee) changes in level along an exit passageway requiring less than two risers shall not be steeper than 1 in 10,
  - (ff) if the exit staircase which connects to the internal exit passageway is pressurized, the internal exit passageway shall not be naturally ventilated but shall be mechanically ventilated, and it shall be pressurized to comply with the requirements in Chapter 8.
- (iii) External exit passageway shall be required to comply with the following:
- (aa) an external exit passageway can be used as a required exit in lieu of an internal exit passageway. The external wall between the exit passageway and the rest of the floor space can have ventilation openings of non-combustible construction, fixed at or above a level 1.8m, measured from the finished floor level of the passageway to the sill level of the openings and such ventilation openings shall be located not less than 3m from any opening of an exit staircase,

- (bb) an external exit passageway may not be subjected to the limitations of a maximum of two exit doors opening into the exit passageway,
  - (cc) an external exit passageway may be roofed over provided the depth of the roofed over portion shall not exceed 3m to avoid smoke logging,
  - (dd) an external exit passageway may be enclosed on the open side by only a parapet wall of not less than 1m or more than 1.1m in height and the vertical height of the unobstructed ventilation opening measured from the parapet wall up to the top edge of the opening or eaves of overhang shall not be less than 1.2m,
  - (ee) exit doors opening into an external exit passageway shall have fire resistance for at least half an hour and fitted with automatic self-closing device.
- (iv) Ventilation system for exit passageways shall be required to comply with the following:
- (aa) all internal exit passageways shall be naturally ventilated by fixed ventilation openings in an external wall, such ventilation openings being not less than 15 % of the floor area of the exit passageway,
  - (bb) internal exit passageways that cannot be naturally ventilated shall be mechanically ventilated to comply with the requirements in Chapter 8.

- (d) Exit Staircase shall be required to construct as follows:
- (i) Internal Exit Staircase shall be required to comply with the following:
    - (aa) an internal exit staircase which serves as the required exit of the building shall be enclosed with construction complying with the provisions of Cl. 22,
    - (bb) where an internal exit staircase is directly approached from an external exit passageway or external corridor, it shall not be necessary to provide such enclosure between the staircase and the external exit passageway or external corridor,
    - (cc) there shall be no unprotected openings of occupancy area within 1.5m horizontally or within 3m vertically below any openings including final discharge openings located in the external wall of the internal exit staircase.
    - (dd) Exception for internal exit staircases is as follow:
      - (1) Exit staircases serving single storey basement car park are not required to be protected with fire rated enclosures, provided the travel distances in the car park are measured to the exit doors at ground level and comply with Table 3.5 of the Code.
      - (2) Doors to exit staircases of standalone car park buildings that are without any commercial activities or non-ancillary usage can be omitted, provided that the following conditions are fully complied with:

- (- -) The car park building shall not exceed 5 storeys above ground. It shall not consist of any basement storey, and shall not be connected to other building, except by open-sided covered link-way;
- (- -) At least two exit staircases shall be provided to serve every upper storey. The two staircases shall be located as remotely from one another as practicable. The exit openings to the staircases at each storey shall have a clear width of not wider than 1000mm or less than 850mm and a clear height of not more than 2200mm. The staircases shall be ventilated by fixed openings in the external walls, such openings being of area not less than 15 % of the floor area per floor of the staircase. Exit staircase and occupancy area shall not share the same air-well or void for lighting and ventilation,
- (- -) Every storey shall be provided with cross ventilation. The building shall be open sided having not less than 50% of the sides (front, rear and sides elevations) permanently open, and such openings being evenly distributed around the perimeter walls, excluding perimeter walls to air-well, so as to provide effective cross ventilation to all parts of the car parking decks,
- (- -) No part of the floor space shall be more than 12m from the openings on the perimeter walls of the

building or air-well. Air-well where provided for this purpose shall have a superficial plan area of not less than 10m<sup>2</sup>, and have a minimum dimension on plan of 2000mm, open vertically to the sky for its full height,

(- -) Travel distance within each car parking deck shall comply with Table 3.5. For upper storeys, the travel distance requirement shall be measured to a position where the exit door to the staircase would be installed if otherwise required,

(- -) The separation distance between the nearest edge of exit opening to exit staircase and the nearest edge of any vehicle parking lot shall not be less than 3m.

(ii) External Exit Staircase shall be required to comply with the following:

(aa) external exit staircase may be used as required exit in lieu of internal exit staircase provided it complies with the requirements of exit staircase, except for enclosure of an internal staircase,

(bb) there shall be no unprotected openings within 3m horizontally or within 3m vertically below, or adjacent or facing any part of the external exit staircase,

Exception: In building designed with external corridor access, the access to the external exit staircase shall be permitted, subject to the following:

- (1) the external corridor shall be served by at least 2 exit staircases,
  - (2) that unobstructed ventilation openings shall be provided along the long side of the external corridor above the parapet or balustrade,
  - (3) the external exit staircase shall be located so as to lead directly to a street or open space with direct access to street,
  - (4) Doors to the external exit staircases can be omitted, if the conditions given in CL. 7(d)(i)(dd) are fully complied with.
- (iii) Discharge shall be required to comply with the following:
- (aa) All exit staircases shall discharge at ground level directly into a safe exterior space opened to the sky. Open-sided external corridor which does not have any commercial activity and not more than 5m measured to the building eave line shall be considered as safe exterior open space. In a sprinkler protected building, maximum 50% of the total number of exit staircase is allowed to be discharged directly to the ground level covered circulation space subject to the following:
    - (1) The discharge point of the exit staircase into the ground level circulation space shall be within sight of and with direct access to a safe exterior open space,

- (2) The maximum distance between the discharge point of an exit staircase and the exterior open space opened to the sky shall not exceed 10m,
  - (3) Where there are commercial activities e.g. shops or kiosks/ carts located along one side or both sides of the designated escape passageway leading to the safe exterior open space, a minimum separation distance of 10m shall be maintained between the commercial activities and the designated escape passageway. The circulation space shall also be installed with engineered smoke control system. Alternatively, the commercial activities shall be fire compartmented with walls and doors of minimum 1 hour fire resistance rating,
  - (4) The clear width of the exit doors leading to the safe exterior open space shall be adequate to receive the occupant load in the ground floor circulation space and the total number of people discharging from the internal exit staircases,
- (bb) In the case of a Purpose Group II residential building not fitted with an automatic sprinkler system, at least 50% of the total number of exit staircases shall discharge to the safe exterior space opened to the sky and the remaining exit staircase is allowed to be discharged onto the ground level covered circulation space subject to the following:



- (1) The ground level covered circulation space shall be free of any commercial activity,
  - (2) The discharge point into the ground level circulation space shall be within sight of and provided with at least two alternative routes to the safe exterior space opened to the sky,
  - (3) The maximum distance between the discharge point of an exit staircase and the safe exterior space opened to the sky shall not exceed 10m,
  - (4) There shall not be more than 4 residential units opening into the designated escape passageway at grade level into which the exit staircase discharges,
  - (5) The discharge point of an exit staircase shall be effectively cross-ventilated such that:
    - (- -) each end has at least 50% permanent openings,
    - (- -) no part of the circulation space shall be more than 10m from the openings on the perimeter walls of the building or air-well.
- (cc) There shall be no unprotected openings of occupancy area within 3m from discharge point of the exit staircase (both internal and external). This distance can be reduced to 1.5m if the unprotected openings are along the same plane of the staircase exit.

- (iv) The minimum width and capacity of exit staircases shall be as specified in Table 3.5, and such staircases shall be required to comply with the following:
  - (aa) Winders shall not be permitted in any building other than for access staircases in a residential unit and in such cases, there shall be not more than 1 winder per 90 degree turn.
  - (bb) Where circular staircase is used as exit staircases or access staircase in Purpose Group I & II, the width of treads measured at the narrower end shall be not less than 100mm in residential buildings and 125mm in other buildings and at a distance of half meter from the narrower end shall be not less than 225mm in residential buildings and 250mm in other buildings. Such staircase shall not be more than 10m in height.
- (v) Handrails shall be required to comply with the following:
  - (aa) every exit staircase shall have walls, grilles or handrails on both sides, except that staircases that are 1250mm or less in width, can have a handrail one side only,
  - (bb) Where the width of the exit staircase exceeds 2000mm, handrails shall be provided in accordance with the requirements of Cl. 6(h).
- (vi) All exit staircases shall be ventilated by fixed openings in the external walls, such openings being of area not less than 15% of the floor area

per floor of the staircase, or mechanically ventilated to comply with the requirements in Chapter 8. Ventilation openings fronting an air-well, external recessed space or external shall be in accordance with Table 3.1. Exit staircase and occupancy area shall not share the same air-well or void for lighting and ventilation.

- (vii) In any building of which the habitable height exceeds 24m, any internal exit staircases without provision for natural ventilation shall be pressurized to comply with the requirements in Chapter 8. In a building comprising more than 4 basement storeys, the exit staircase connecting to the fire-fighting lobby shall be pressurized.
  - (viii) Different modes of ventilation within a single staircase shaft for buildings exceeding 24m in habitable height, the internal exit staircase can be naturally ventilated at its upper part and mechanically ventilated at its lower part provided this lower part does not exceed 24m in habitable height and there shall not be any intermediate staircase landing door separating the 2 modes of ventilation. If the lower part exceeds 24m in habitable height, this lower part shall be pressurized instead.
- (e) Scissor Exit Staircase shall be required to comply with the following:
- (i) Where two separate internal exit staircases are contained within the same enclosure, each exit staircase shall be separated from the other by non-combustible construction having fire resistance for a minimum period equal to that required for the enclosure,
  - (ii) Such scissor exit staircases shall comply with all applicable provisions for exit staircase,

- (iii) Door opening into scissor exit staircases shall be at least 7m measured as travel distance between the two closer edges of the staircase doors,
  - (iv) Where there is only one pair of scissor exit staircases, the door opening into scissor exit staircases shall be spaced at least  $\frac{1}{3}$  the diagonal dimension of the area to be served in a sprinkler protected building and  $\frac{1}{2}$  the diagonal dimension in a non-sprinkler protected building in accordance with Cl. 2(j),
  - (v) The ventilation openings of each staircase shall be located on alternate storeys if such openings or windows are serving both staircases on the same wall.
- (f) Basement Exit Staircase shall be required to comply with the following:
- (i) Any exit staircase which serves a basement storey of a building shall comply with all the applicable provisions for exit staircase,
  - (ii) Such exit staircase shall not be made continuous with any other exit staircase which serves a non-basement storey of the building,
  - (iii) Basement exit staircases which are vertically aligned with the exit staircases of non-basement storeys shall be separated from such other exit staircases by construction having fire resistance for a minimum period equal to that required for the enclosure.
  - (iv) Where upper storey staircase is allowed by Myanmar Fire Services Department to be continuous with that serving the basement which is naturally ventilated, the following shall be complied with:

- (aa) the entry into the basement staircase shall be through a protected lobby, or directly from the basement occupancy area provided the door to the basement staircase is minimum 1 hour fire rated,
  - (bb) to prevent occupants exiting continuously from upper storeys into the basement storey during an emergency, a physical barrier in the form of a door or gate (self-closing type) could be provided across the staircase landing at ground level to separate the discharge route of upper storeys from the basement staircase,
  - (cc) Smoke-stop lobby shall be provided for entry into the staircase at all storeys, including basement if the staircase serves more than 4 storeys, including basement,
  - (dd) appropriate signages shall be provided inside the staircase enclosure to direct occupants out of the building at ground level.
- (g) Hardwood staircase shall be allowed to be used as internal access staircase in building. Where timber staircases are used in units under Purpose Groups I and II buildings, the structural elements such as the stringer supporting the treads and risers shall be constructed of non-combustible materials.
- (h) Spiral Staircase shall be constructed as follows:
- (i) Spiral staircases shall not serve as required exits except that external unenclosed spiral staircases when built of non-combustible materials and having a tread length of at least 750mm may serve as required exits

from mezzanine floors and balconies or any storey having an occupant load not exceeding 25 persons,

- (ii) Such spiral staircases shall be not more than 10m high,
  - (iii) Spiral staircase shall not be designed as the sole means of escape for buildings under Purpose Group I and maisonettes and penthouses for buildings under Purpose Group II.
- (i) Exit ramps may be used as exits in lieu of exit staircases subject to compliance to the applicable requirements of Cl. 7(d). and to the following:
- (i) The slope of such exit ramps shall not be steeper than 1 in 10,
  - (ii) Exit ramps shall be straight with changes in direction being made at level platforms or landings only, except that exit ramps having a slope not greater than 1 in 12 at any place may be curved,
  - (iii) Platform
    - (aa) level platforms or landings shall be provided at the bottom, at intermediate levels where required and at the top of all exit ramps,
    - (bb) level platforms shall be provided at each door opening into or from an exit ramp,
    - (cc) the minimum width of a platform or landing and length shall be not less than the width of the ramp, except that on a straight run ramp, the length of the level platform or landing need not be more than 1m,

- (iv) Exit ramps shall have walls, guards or handrails and shall comply with the applicable requirements of Cl. 7 (d) (iv) for exit staircases,
  - (v) All exit ramps shall be provided with non-slip surface finishes,
  - (vi) Exit ramps shall be ventilated to comply with the requirements for ventilation of exit staircases,
  - (vii) Exit ramps serving as means of escape to only one basement storey need not be protected by enclosure walls.
- (j) Exit doors and exit access doors shall be required to comply with the following:
- (i) Exit doors shall be capable of being opened manually, without the use of a key, tool, effort for operation from the inside of the building. (not applicable to buildings under Purpose Group I & II),
  - (ii) Exit doors which are required to have fire resistance rating shall comply with the relevant provisions for fire resisting doors under Cl. 23(b),
  - (iii) Exit doors and exit access doors shall open in the direction of exit travel:
    - (aa) when leading to an area of refuge, exit and exit passageway,
    - (bb) when used in exit enclosure, including smoke-stop and fire-fighting lobbies in a building. It shall not apply to doors of individual residential units that open directly into an exit enclosure,
    - (cc) when serving a high hazard area,
    - (dd) when serving a room or space with more than 50 persons.

- (iv) Exit doors opening into exit staircases and exit passageways shall be complied with the following:
  - (aa) Exit doors opening into exit staircases and exit passageways shall not impede the egress of occupants when such doors are swung open,
  - (bb) All doors which open into the corridor shall not hinder movement of occupants. The corridor's clear width shall at least remain to be half of the required clear width as stipulated under Table 3.5 when such door(s) is swung open.
- (v) Fire door to protected staircase and smoke-stop/fire lift lobby shall be constructed to incorporate a vision panel. The vision panel shall have a clear view size of 100mm width by 600mm height. The vision panel shall have the requisite fire resistance rating and shall not turn opaque when subject to heat. The vision panel shall be located with the bottom edge not higher than 900mm and the top edge lower than 1500mm measured from the finished floor level. The provision of vision panel shall not apply to exit doors of residential apartment or maisonette units.
- (vi) Revolving doors shall not be used as exit doors for required exits.
- (vii) Any door located in a path of travel shall be of the side-hinged or pivoted swing type. The door shall be designed and installed so that when swung open, it does not prevent full use of the opening. The minimum clear width of the door opening shall not be less than the required door clear width.



- (aa) Sliding door or roller shutter is allowed within rooms or spaces that serve more than 50 persons provided it shall remain in the full open position during the period of occupation. A readily discernible sign with the lettering “THIS DOOR TO REMAIN OPEN WHEN THE BUILDING IS OCCUPIED” shall be permanently pasted on both sides of such sliding door or roller shutter,
- (bb) Wicket door shall be permitted to be incorporated within a roller shutter or sliding door. The wicket door shall be of the swing type having a minimum head height of 2m and a clear width of not less than the required door clear width,
- (cc) Power operated automatic sliding doors/ roller shutters, shall be linked to the building fire alarm system. The sliding door/ roller shutter shall automatically open to the required width/height (of door opening) upon the activation of the fire alarm. The automatic sliding door/ roller shutter shall also comply with the following:
  - (1) The automatic sliding doors/ roller shutters shall be of the fail-safe type. Should there be any fault in the electrical or sensor device, or any power failure, these doors shall automatically open and remain in an open position until power is restored.
  - (2) A manual override mechanism (a device to trigger the immediate opening of sliding doors/ roller shutters) shall be provided. The doors shall open and remain open upon activation of this device.

- (viii) Locking of staircase and smoke-stop/fire lift lobby doors. One way locking device is allowed to be provided in the following situations:
- (aa) exit door between staircase shaft and occupancy area,
  - (bb) exit access door between smoke-stop/fire-fighting lobby and occupancy area,
  - (cc) exit door between staircase shaft and smoke-stop lobby,
  - (dd) exit door between staircase shaft and circulation area,
  - (ee) exit access door between smoke-stop/fire-fighting lobby and circulation area. For selected floors under CL. 7 (j) (x), the doors of the fire-fighting/exit staircase and smoke-stop/fire-fighting lobby shall not be fitted with any locking device to allow for re-entry from the staircase to the interior of the building.
- (ix) Where access-control is provided to exit door using smart card locking device, magnetic bar and electro-mechanical locking device:
- (aa) The activation of the building fire alarm or sprinkler system shall automatically unlock the door. It shall remain unlocked until the building fire alarm system has been manually reset,
  - (bb) The door shall be arranged to unlock from a manual release device located within the occupancy space, 1.2m above the floor and within 1.5m of the exit door jamb. The manual override device shall be readily accessible and clearly identified by a sign that reads “**Emergency Door Release**”. The mechanism to unlock the door shall be fail-safe type.

- (cc) Where doors opening into passenger lift lobby are to be provided with access-control and would be locked after normal operation hours, the lobby shall be designed to have direct access to at least one exit staircase to prevent any occupant from being trapped in the lobby when the lifts are recalled at ground floor or other designated floor during fire emergency or building's power failure. Alternatively, a two-way communication system shall be available inside the lift lobby for use by trapped occupants to call for help. The two-way communication system shall be linked to the fire command center and/or building control room which shall be manned 24 hours.
- (x) Staircase re-entry shall be required to comply with the following:
  - (aa) Every exit staircase enclosure serving more than 7 storeys of non-residential building, excluding buildings of detention and correctional occupancies, shall allow re-entry from the staircase enclosure to the interior of the building. There shall be at least 1 level where it is possible to re-enter into the interior of the building from the staircase enclosure.
  - (bb) The re-entry points shall be located not more than 6 storeys apart. There shall not be more than 3 storeys above the highest re-entry door in the building.
  - (cc) Where re-entry is provided from the staircase enclosure, it shall enter into a common corridor that is connected directly to at least one other exit staircase.

- (dd) Staircase doors permitting re-entry into the building, shall be identified with a signage “Re-entry door” of the staircase door.

8. Means of Escape for Residential Occupancy shall be required to comply with the following:

- (a) Means of escape for a building or a separate part of a building of single occupancy of Purpose Group I can be provided via access staircases, and exit staircase under the provision of Cl. 7 is not required.
- (b) Means of escape for a building or a separated part of a building of Purpose Group II shall comply with the provision of Cl. 7.
- (c) In a block of residential apartments or maisonettes, at least two independent exit staircases or other exits from every storey shall be provided in compliance with the requirements of Cl. 6(k) unless otherwise permitted.
- (d) In a block of residential apartments or maisonettes not exceeding 24m in habitable height, one exit staircase only may be allowed to serve every upper storey, subject to:
  - (i) The exit staircase shall comply with the requirements of Cl. 7(d).
  - (ii) If the building consists of more than 4 storeys, approach to the exit staircase on all storeys shall comply with the requirements of smoke free approach to exit staircase under Cl. 6(m).
  - (iii) Access to the building for fire-fighting appliances being provided for in compliance with the requirements in Chapter 5. (or)
  - (iv) Shall be complied with the provisions directed by Myanmar Fire Services Department occasionally.

(e) Exits from Residential Unit shall be required to comply with the following:

- (i) In each residential apartment or maisonette unit, the exit access door or doors shall be provided such that the travel distances measured from any point within the unit to the entrance door or doors of the unit shall not exceed 20m (see Figure 3.2),

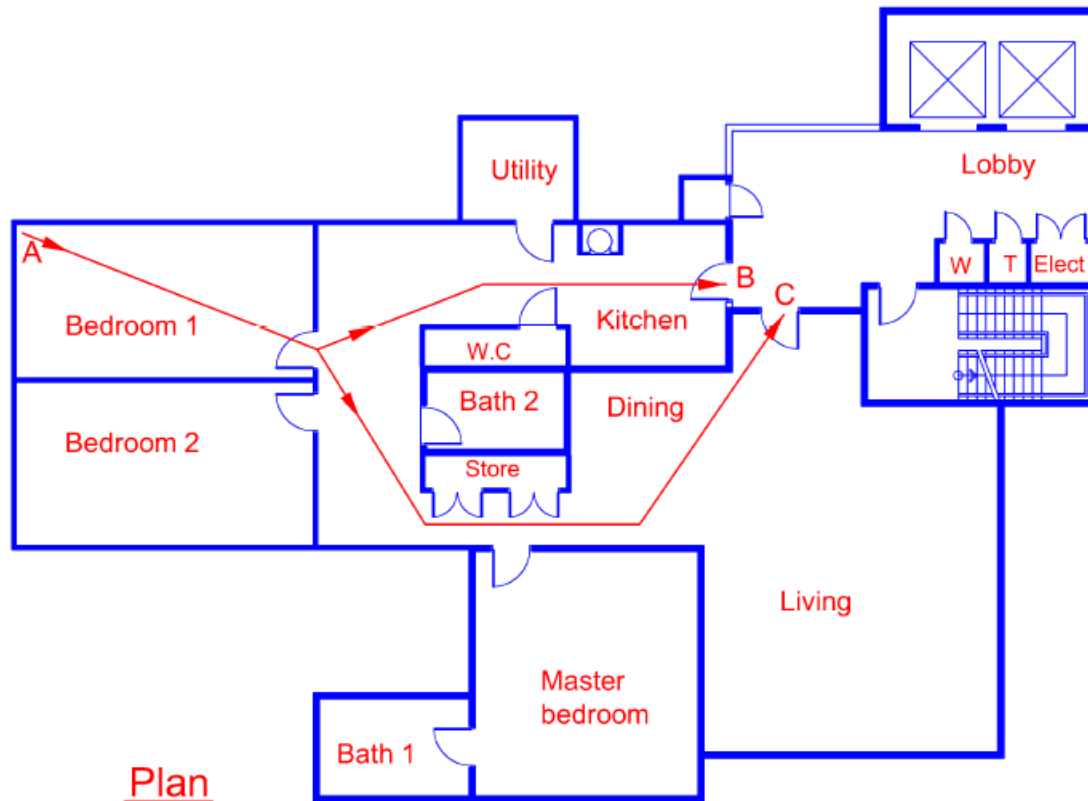


Figure (3.2)

- (ii) In addition, in the case of a maisonette unit comprising not more than 2 storeys, where a single door is provided,
- (aa) the door shall not be located on the upper storey of the unit,
- (bb) the floor area of the upper storey shall not exceed 60m<sup>2</sup>, unless a separate exit is provided on this upper storey.

- (iii) All exits from residential or maisonette units shall have direct access to exit staircase, exit passageway or exterior open space.
- (g) Travel distance shall be measured from the door or doors of the residential apartment or maisonette unit. Where a residential apartment is required to be provided with two doors at the same storey level, and if only one-way escape or one exit staircase only is provided, the travel distance shall be measured from the most remote door. If two-way escape is achieved, the travel distance shall be measured from each of the doors.
- (h) In a block of residential apartments or maisonettes, smoke free approach to an exit staircase is permitted by means of an external corridor subject to compliance with the following:
  - (i) Such external corridors conform to the requirements of external exit passageways for minimum width (4'), headroom clearance (6' 8"), changes in floor level. The provision of parapet wall or balustrade which shall not exceed 1.1m or lower than 1m in height along the outer side of the corridor. The corridor may be roofed over, provided the depth of the roofed over portion shall not exceed 3m. The vertical height of the unobstructed ventilation opening measured from the parapet wall or balustrade up to the top edge of the opening or eaves of overhang shall not be less than 1.2m
  - (ii) The residential apartment or maisonette shall be separated from the external corridor by an external wall with fire resistance rating of at least 1 hour, except that ventilation openings of non-combustible construction may be fixed at or above a level of 1.1m, measured from the finished floor level of the external corridor to the sill level of the opening.

- (i) Travel Distance
  - (i) In a block of residential apartment or maisonette where the means of escape is through an external corridor, the one way travel distance shall be measured as follow:
    - (aa) from the door of the apartment or maisonette to exit staircase shall not exceed 20m,
    - (bb) if the aggregate one-way travel distance within the unit and along the external corridor does not exceed 40m, the door of the apartment or maisonette to exit staircase can be permitted up to 24m,
  - (ii) In a block of residential apartments or maisonettes, the two way travel distance may be extended to 45m if the means of escape is through an external corridor as in Cl. 8 (h).
- (j) The provisions of Cl. 7 (d) (i)(bb) and (ii)(bb) that there shall be no unprotected openings within 3m horizontally or vertically below ventilation openings of exit staircases may not be applicable in the case of exit staircases for residential apartments or maisonettes provided:
  - (i) the exit staircases are cross ventilated and maintained under smoke free condition at all times,
  - (ii) unprotected openings of the apartment or maisonette units are not facing or ventilating into the exit staircase enclosures as shown in Figure 3.3.

Exemption from 3m clearance of  
unprotected openings from exit staircase

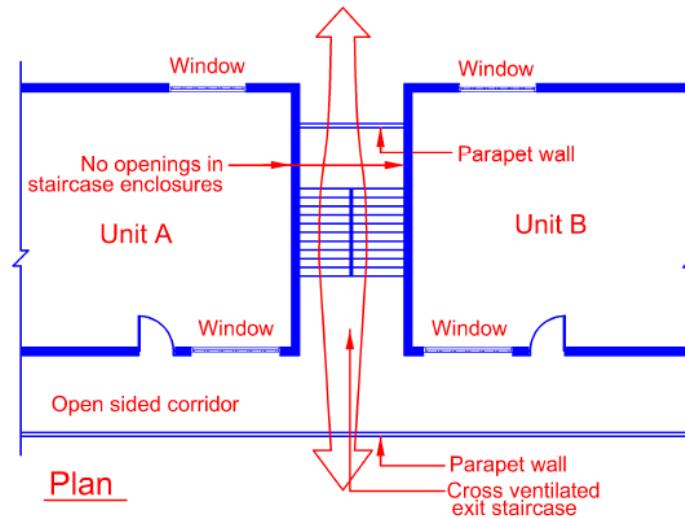


Figure (3.3)

- (k) Doors of residential apartments or maisonettes opening into external corridors need not have fire resistance rating.
- (l) An attic in buildings under Purpose Group I and II can be constructed of timber boarding on timber joists, provided it is protected to achieve the fire resistance rating required of the elements of structure of the building or compartment.
- (m) The common internal corridor not forming part of smoke free approach to exit staircase shall have ventilation openings of not less than 15 % of the floor area and located not more than 9m from any part of the common internal corridor. If the common internal corridor is cross-ventilated, the fixed ventilation openings at each end of the wall shall not be less than 50 % of the superficial area of the end walls. No part of the floor area of the common internal corridor shall be at a distance of more than 13m from any ventilation openings.



9. Means of Escape for Health Care Occupancy shall be required to comply with the following:

- (a) The provisions stated herein shall apply to Health Care Occupancies which may be identified under the following categories:
  - (i) Hospital is a building used for medical and surgical care and shall include general hospitals, hospitals for psychiatric care, children's hospitals, with 24 hours or in patient service.
    - (aa) Patient accommodation area containing beds shall not be located in the basement storey.
    - (bb) Each patient accommodation ward area shall be provided with at least 2 exits, which shall be remotely located from each other, if the occupant load exceeds 50 persons.
    - (cc) Every upper storey used for the accommodation of patients shall be provided with at least an area of refuge for horizontal evacuation purposes. The size of the area of refuge and the routes leading to it shall comply with CL. 2(a) and 9 (c).
    - (dd) Size and compartmentation of patient accommodation area shall be required to comply with the following:
      - (1) Each patient accommodation ward shall not exceed a floor area of 750m<sup>2</sup> and an occupant load of 75 persons, calculated on the basis of gross floor area of 10m<sup>2</sup> per person.
      - (2) Each patient accommodation ward area shall be constructed as a compartment having fire resistance

rating of at least 1 hour for walls/ceilings and half an hour fire door for protection of door openings. For walls and doors between ward and main exit access corridor (either internal or external corridor), the requirements given in CL. 9 (a) (i)(ff) and 9(a) (i)(gg) respectively shall be complied with. This requirement shall not be applicable to patient accommodation floor which is sprinkler protected.

- (ee) Provision of Escape Bed-lifts shall be required to comply with the following:
- (1) An escape bed-lift shall be provided adjacent to a protected exit staircase to serve every storey and/or every area of refuge above the 1st storey containing Operating Theatre Department, Coronary Care Unit, Intensive Care Units, Intensive Therapy Units, Neo Natal Units and patient accommodation areas where patients could not be able to be evacuated.
  - (2) A protected shaft containing an escape bed-lift shall be constructed to comply with the relevant requirements under CL 22.
  - (3) The entry into the escape bed-lift and the protected exit staircase shall be through a common protected lobby. The protected lobby shall have a floor area of not less than 9m<sup>2</sup>, having a depth of minimum. 2.5m perpendicular to the lift landing door, and shall be large enough to hold a

minimum of two beds, attendant staff and additional equipment. In the situation where the protected lobby is also acting as a smoke-stop lobby or fire-fighting lobby, the floor area of the lobby shall be of sufficient size to allow the evacuation of the required number of beds and the movements of other occupants into the protected staircase.

- (4) Escape bed-lift is to be used for the evacuation of patients in beds including those confined to wheel-chairs or physically disabled, in a fire emergency, although it can be used as a normal passenger lift during normal times in the day to day running of the hospital. A signage shall be posted outside the bed-lift stating "FIRE ESCAPE BED-LIFT"
- (5) The escape route for the escape bed-lift at the ground floor level shall be made protected from other occupancy areas by minimum 1 hour fire resistance separation and shall discharge directly into a safe exterior space.
- (6) An escape bed-lift that opens directly into an external corridor and is sited adjacent to a protected exit staircase does not require a protected lobby, provided there is no unprotected opening within 3m horizontally from the escape bed-lift door opening. The escape bed-lift provided under the above situation may be treated as common bed-lift that can serve multiple compartments located on the same floor.

- (7) An escape bed-lift shall be provided with the following features:
- (-- ) a duplicate power supply from an emergency generating plant.
  - (- -) a switch labeled “Evacuation Bed-Lift” situated next to the lift landing door at the final exit storey, which enables an authorized person nominated by the building management to take control of the lift car during an emergency. Operation of the switch should isolate the lift landing call controls and return the lift immediately to the final exit storey, where upon the lift can only operate in response to the lift car control panel. Such a switch is not needed in 2 store buildings.
  - (- -) a communications system (except in 2 storey building) should be installed to allow communication between occupants at each lift landing and the operator in the lift car.
- (8) The installation of escape bed-lifts shall be in accordance with SS 550 Code Of Practice For Installation, Operation And Maintenance Of Electric Passenger And Good Lifts.
- (ff) Patient accommodation ward with access through an internal access corridor shall comply with the requirements as follows:
- (1) Each ward shall be separated from the internal access corridor by a wall having fire resistance of at least 1 hour,

- (2) Doors opening into internal access corridor shall have fire resistance of at least half an hour and fitted with automatic self-closing device to comply with the requirements of Cl. 23(b); or held open by electro-magnetic or electromechanical device,
- (3) Requirements on fire compartmentation will not be applicable if the patient accommodation floor is sprinkler protected,
- (4) Internal access corridors shall be naturally ventilated with fixed openings in an external wall, such ventilation openings being not less than 15 % of the floor area of the internal access corridor,
- (5) The ventilation opening in the external walls shall not be less than 3.5m<sup>2</sup> and shall be unobstructed from parapet wall or balustrade level upwards and be positioned on opposite sides of the internal access corridor such that they provide effective cross-ventilation throughout the entire space of the corridor,
- (6) The ventilation openings in the external walls shall not be more than 12m from any part of the internal access corridor,
- (7) Internal access corridor may be provided with mechanical ventilation and pressurization in lieu of natural ventilation,

- (8) Other non-patient accommodation areas or spaces which open into or form part of the internal access corridor and which may prejudice the means of escape provision shall be compartmentalized by minimum 1 hour fire rated enclosures and minimum half an hour fire doors,
- (gg) Patient accommodation ward with access through an external access corridor shall be required to comply with the following:
  - (1) Patient accommodation ward shall be separated from the external access corridor by a wall having fire resistance of at least 1 hour, except that ventilation openings of non-combustible construction may be fixed at or above 1.1m, measured from the finished floor level of the external exit access corridor to the sill height of the opening,
  - (2) Doors opening into the external access corridor shall not be required to have fire resistance rating,
  - (3) External access corridor shall conform to the requirements of external exit passageway for minimum width, changes in floor level, roof protection and provision of parapet wall or solid balustrade which shall not exceed 1m height along the outer side of the corridor.
- (hh) Smoke free approach to exit staircase shall be required to comply with the following:
  - (1) Entry into an exit staircase from any part of a building of more than 4 storeys above ground level shall comply with

Cl. 6(m) – requirements of smoke free approach to an exit staircase. Pressurization of staircase in lieu of the provision of smoke-stop lobby is not permitted.

- (2) Any exit staircase which serves a basement storey shall comply with Cl. 6 (n) and Cl.7 (f).
  - (3) Where a smoke- stop lobby is provided to exit staircase to serve a patient accommodation floor, or any area where patients may need to be evacuated on mattresses or stretchers, the lobby shall have a minimum clear space (unobstructed by door swings) of 6m<sup>2</sup>.
- (ii) Exit staircases that serve patient accommodation floor and are to be used by patients in an emergency fire situation shall be designed to allow evacuation of patients on mattresses or stretchers. The width of stair, landing width and depth shall comply with the Table3.2:
- (ii) A building or part thereof, used for the housing and nursing care of persons, who because of mental or physical in capacity, may be unable to care for their own needs and safety without the assistance of other persons. Such buildings shall include nursing and convalescent homes, homes for the aged and hospices. Fire safety requirements under Cl. 9 (a) (i) – Hospital shall be fully complied with.
- (iii) Custodian Care Facility is a building or part thereof, used for the housing of persons who, because of age, or physical or mental disabilities, are unable to care for their self-preservation and safety. Such buildings shall

include nurseries for children under six years of age and institutions for the mentally disabled.

- (aa) Nurseries, including Childcare Centers, Kindergarten, infant care, if located within a building of mixed use, shall be compartmentalized from other spaces and occupancies by walls and doors having at least 1 hour fire resistance rating. Where such facilities are located on the ground floor, they shall be provided with direct access to the exterior of the building, and if located on the upper storey shall be sited adjacent to an exit staircase with direct dedicated access through smoke-stop lobby to the staircase (minimum one exit staircase) or direct access without passing through the common areas to the exit staircase.
- (bb) The requirement on the provision of fire compartmentation will not apply to any nursery, including Childcare Centres, Kindergarten, Infant Care that is located within a building protected by an automatic sprinkler system.
- (cc) Institutions for the mentally disabled shall be designed with each storey having an area of refuge in accordance with Cl. 2(a) and Cl. 9 (c). Fire safety requirements under Cl. 9 (a) (i)- Hospital, shall be fully complied with, except on Provision of escape bed-lift and on staircase landing width/depth.
- (iv) A building or part thereof, used for the housing, on a 24 hour basis, of mental health patients who may be capable of self-preservation but require supervision and are receiving therapy, training or other health related care and for whom there may be security measures not under



their control. Fire safety requirements under Cl. 9 (a) (i) – Hospital, shall be fully complied with, except Cl. 9 (a) (i) (ee) on Provision of escape bed-lift and Cl. 9 (a) (i) (ii) on staircase landing width/ depth.

- (v) Ambulatory Health Care Centre is a building or part thereof, used for providing services on an out patient basis for:
  - (aa) treatment for patients which would render them incapable of taking action for self preservation or safety under emergency conditions without assistance from others, such as hemodialysis units,
  - (bb) surgical treatment requiring general anaesthesia.
  - (cc) Ambulatory Health Care Centre, if located within a building of mixed use, shall be compartmentalized from other tenants and occupancies by walls and doors having at least 1 hour fire resistance rating. The Ambulatory Health Care Centre shall be provided with its own means of escape to at least one exit staircase.
  - (dd) Fire Safety requirements under (a) – Hospital, shall be fully complied with except Cl. 9 (a) (i) (cc) on Provision of area of refuge for horizontal evacuation, on Provision of escape bed-lift and on staircase landing/depth.
- (vi) Outpatient clinics that do not fall under categories described above. Fire safety requirements under Cl. 9 (a) (i) are not applicable, except on the provision of separate compartment, which shall comply with Cl. 16 (s) (ii).

- (b) In compliance with the provisions of Cl. 6 (j) for number of doors from rooms and spaces, two openings for doors located remote from each other shall be provided for any patient's sleeping room or suite of patients' sleeping room having an occupancy load exceeding 50 persons. Rooms and spaces with occupancy of 50 persons or more shall comply with the requirements of Cl. 12 (b) for Assembly Occupancy.
- (c) Where Area of Refuge serves as required exit, the calculation of area for refuge occupants shall be based on the following:
  - (i) Hospitals – 2.8 m<sup>2</sup> per person.
  - (ii) Nursing Homes – 2.8 m<sup>2</sup> per person.
  - (iii) Custodian Care Facility – 1.4 m<sup>2</sup> per person.
  - (iv) Supervisory Care Facility – 0.56 m<sup>2</sup> per person.
  - (v) Ambulatory Health Care Centre – 1.4 m<sup>2</sup> per person.

On storey of hospitals or nursing homes where patient accommodation is not provided, at least 0.56 m<sup>2</sup> per occupant shall be taken for the calculation of the area for refuge of occupants.

10. Means of Escape for Office/Shop/Factory/Warehouse Occupancy shall be complied with the following:

- (a) In an office, shop, factory and warehouse building, at least two independent exit staircases or other exits shall be provided in compliance with the requirements of Cl. 6(k), except that one exit staircase is permitted to serve the upper storeys, if the building is of non-combustible construction and not exceeding 4 storeys subject to:
  - (i) The maximum travel distance on any storey complying with column (ii) of Table 3.5,

- (ii) Exit staircase conforming to the requirements of Cl. 7(d),
  - (iii) The area of each upper storey of shop, factory and warehouse building not exceeding 200m<sup>2</sup>, including service ducts, lift shafts, toilets, staircase etc,
  - (iv) The habitable height of the shop, factory or warehouse building not exceeding 15m,
  - (v) Access to the building for firefighting appliances being provided for in compliance with the requirements in Chapter 5.
- (b) In factory unit with mezzanine floor, one open stair is allowed to serve the mezzanine floor, provided:
- (i) there is only one mezzanine floor above the main factory floor per factory unit,
  - (ii) the mezzanine floor and open stair shall be of fire resistant construction, the stair shall have a minimum width of 3' 6",
  - (iii) the maximum travel distance measuring from remote point on the mezzanine floor to the exit access door of the factory unit on the main factory floor shall comply with column (ii) of Table 3.5,
  - (iv) the area of the mezzanine floor shall not exceed 60m<sup>2</sup>, including service ducts, toilets, staircase and etc,
  - (v) the habitable height of mezzanine floor shall not exceed 24m,
  - (vi) mezzanine floor shall only be used for factory, store and/or ancillary office.

11. Means of Escape for Hotels, Boarding Houses, Serviced Apartments, Hostels, Backpackers Hotel shall be required to comply with the following:

- (a) Guestroom or accommodation unit with access through an internal corridor shall comply with the requirements as follows:
  - (i) Guestroom or accommodation unit shall be separated from the internal corridor by a wall having fire resistance of at least 1 hour,
  - (ii) Doors opening into internal corridors shall have fire resistance of at least half an hour and fitted with automatic self-closing device to comply with the requirements of Cl. 23 (b),
  - (iii) Internal corridors shall be naturally ventilated with fixed openings in an external wall, such ventilation openings shall comply with Cl. 6 (m) (ii) (aa) & (dd), and internal corridors which cannot be naturally ventilated shall be pressurized to comply with the requirements in Chapter 8.
  - (iv) Other rooms or spaces which open into or form part of the guestroom or accommodation unit corridor which may prejudice the means of escape provision shall be required to be compartmented to the same extent as the guestroom or accommodation unit.
  
- (b) Guestroom or accommodation unit with access through an external corridor shall comply with the requirements as follows:
  - (i) Guestroom or accommodation unit shall be separated from the external corridor by a wall having fire resistance of at least 1 hour, except that ventilation openings of non-combustible construction may be fixed at or

above a level of 1.1m, measured from the finished floor level of the external corridor to the sill height of the opening,

- (ii) Doors opening into the external corridor shall not be required to have fire resistance rating,
  - (iii) External corridors conform to the requirements of external exit passageways for minimum width (4'), headroom clearance (6' 8"), changes in floor level. The provision of parapet wall or balustrade which shall not exceed 1.1m or lower than 1m in height along the outer side of the corridor. The corridor may be roofed over, provided the depth of the roofed over portion shall not exceed 3m. The vertical height of the unobstructed ventilation opening measured from the parapet wall or balustrade up to the top edge of the opening or eaves of overhang shall not be less than 1.2m.
- (c) The travel distance shall be measured from the most remote point of a guestroom or accommodation unit or suite to the exit door of an exit staircase, exit passageway or exterior open space.
- (d) Spacing of smoke barrier shall be required to comply with the following:
- (i) Internal corridors which are not naturally ventilated shall be subdivided by smoke barriers into the following lengths:  
  
Building protected by sprinkler system .. 45m  
  
Building not protected by sprinkler system .. 30m
  - (ii) The smoke barriers shall consist of non-combustible partitions containing smoke-check doors. The smoke barriers, including the enclosing walls to the corridor, shall be constructed to full height,

carried right up to form a close joint with the soffit of the floor slab above, or an imperforate non-combustible ceiling or the roof coverings,

- (iii) the smoke barriers shall be sited at suitable locations across the corridor to create multiple sections, with each having free and direct access to an exit or exit staircase, exit passageway or exit ramp.
- (iv) smoke-check doors excluding glass doors, shall be provided with clear glass vision panels having at least 25% of the surface area of each door leaf,
- (v) smoke-check doors shall be self-closing, swinging type and may be double-swing but shall close the opening completely with only such clearance as is reasonably necessary for proper operation. The doors shall be closely fitted around their edges and the bottom clearance gap between such doors and the floor shall not exceed 4mm,
- (vi) smoke-check doors shall normally be in the closed position. However, they may be left open if they are arranged to close automatically by an approved electro-magnetic or electro-mechanical device which can be activated by the presence of smoke and/or the building fire alarm system.

12. Means of Escape for Assembly Occupancy shall be required to comply with the following:

- (a) Assembly Occupancy include all buildings or portions of buildings used for gathering together of more than 50 persons for such purpose as deliberation, worship, entertainment, eating, drinking, amusement or awaiting transportation. Assembly Occupancies include but are not limited to: Performance Theatres,

Cinemas, Assembly Halls, Auditoriums, Exhibition Halls, Museums, Skating Rinks, Gymnasiums, Bowling Establishments, Pool Rooms, Armouries, Mortuary Chapels, Libraries, Restaurants, Nightclubs, Discotheques, Churches, Dance Halls, Club Rooms, Passenger Stations and Terminals of Public Transportation Facilities, Courtrooms, Conference Rooms and Drinking Establishments.

- (b) Number and minimum width of exits for assembly occupancies shall comply with the provisions tabulated as Table 3.3:
- (c) Assembly Occupancy with Fixed Seating: (Performance theatres, Cinemas, Auditoriums, Concert Halls etc) shall be required to comply with the following:
  - (i) clear aisles or gangways of not less than the minimum width of corridors shall be provided around the auditorium, stalls and balconies leading to doors or exit doors,
  - (ii) aisles or gangways shall be provided with intersecting rows of seating and the number of seats in a row shall be in accordance with the provisions tabulated as Table 3.4. The seat way shall be the minimum clear width between rows, which shall not be less than 300mm, measured as the clear horizontal distance from the back of the row ahead (including seats that tip up automatically) and the nearest projection of the row behind when the seats are in upright position. The seat way widths shall be constant throughout the length of the row. (See Figure 3.4)

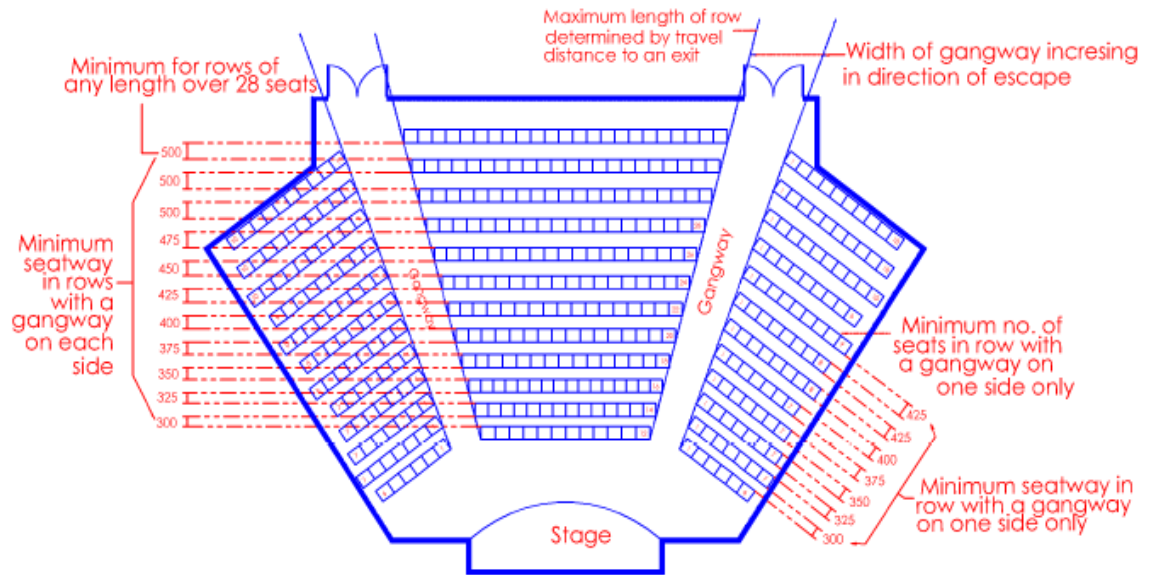


Figure (3.4)

- (iii) for changes of level, steps shall not be used to overcome differences in level in aisles or gangways unless the slope of such gangways exceeds 1 in 10,
- (iv) handrails shall be provided, where steps of a pitch exceeding 30 degrees or ramps of a slope exceeding 1 in 10 are provided in aisles or gangways flanking the seating,
- (v) flooring for the surface of steps and ramps forming the aisles or gangways shall be finished using non slip materials,
- (vi) illumination of steps shall be such that each step is clearly visible in the event of emergency.
- (vii) Seats for cinemas, theatre, auditorium shall be used non-combustible materials.



(d) Exits from a theatre, cinema or a concert hall shall be complied with the following:

- (i) The number and capacity of exits from an enclosed space in an assembly occupancy used or intended for use as cinema, concert hall, auditorium, performance theatre that is not normally provided with natural ventilation and lighting, shall be provided its own means of escape without having to take into account exits provided for its adjoining parts of the same building in which it is housed. Exception may be permitted where the occupancy load does not exceed 200 persons, in which case at least half the capacity of exits must be provided within the compartment.
- (ii) Where a building or part of a building is designed as a Cineplex to house multiple mini-cinemas, the means of escape to be provided may be shared by all the mini-cinemas. Each cineplex shall be treated as a single big cinema for the purpose of determining the exit requirements under CL. 12 (d).

13. Means of Escape for Workers' Dormitories shall be required to comply with the following:

- (a) Dormitories include buildings or spaces in buildings where group sleeping accommodation is provided for workers under joint occupancy and single management, with or without meals, but without individual cooking facilities. The phrase "without individual cooking facilities" refers to the absence of cooking equipment in any room or unit of a dormitory.
- (b) Workers' Dormitories shall be required to comply with the following:

- (i) Each dormitory bedroom shall not exceed 120m<sup>2</sup> and occupant load of 40 persons.
  - (ii) The occupant load shall be based on gross floor area on the basis of 3m<sup>2</sup> per person.
  - (iii) There shall be at least two independent exit staircases or other exits from every storey of a building.
  - (iv) The travel distance, measured from the most remote point of the dormitory bedroom to the nearest exit staircase or other storey exit, shall not exceed the maximum travel distance permitted under Table 3.5.
- (c) Dormitory bedrooms with access through an internal corridor shall comply with the requirements as follows:
- (i) Dormitory bedrooms shall be separated from the internal corridor by a wall having fire resistance of at least 1 hour,
  - (ii) Doors opening into internal corridors shall have fire resistance of at least half an hour and fitted with automatic self-closing device to comply with the requirements of Cl. 23 (b),
  - (iii) Internal corridors shall be naturally ventilated with fixed openings in an external wall, such ventilation openings being not less than 15 % of the floor area of the internal corridor,
  - (iv) The ventilation openings in the external walls shall not be more than 12m from any part of the corridor,
  - (v) Pressurization of internal corridors in lieu of natural ventilation is not permitted,

- (vi) Other rooms or spaces which open into or form part of the bedroom corridor and which may prejudice the means of escape provision shall be required to be compartmented by 1-hour fire rated enclosures and half an hour fire doors.
- (d) Dormitory bedrooms with access through an external corridor shall comply with the requirements as follows:
- (i) Dormitory bedrooms shall be separated from the external corridor by a wall having fire resistance of at least 1 hour, except that ventilation openings of non-combustible construction may be fixed at or above a level of 1.1m, measured from the finished floor level of the external corridor to the sill height of the opening,
  - (ii) Doors opening into the external corridor shall not be required to have fire resistance rating,
  - (iii) External corridors shall conform to the requirements of external exit passageway for minimum width, changes in floor level, roof protection and enclosure on the open side.
- (e) Entry into an exit staircase from any part of a building of more than six storey above ground level shall comply with requirements of Cl. 6(m) - requirements of smoke free approach to exit staircase. Pressurization of staircase in lieu of the provision of smoke-stop lobby is not permitted.
14. Exit Lighting and Directional Sign shall be required to comply with the following:
- (a) Exits of all buildings, except for those belonging to Purpose Group I, shall be provided with artificial lighting facilities to the satisfaction of the requirements in Chapter 9.

- (b) In all buildings or parts of building other than those belonging to Purpose Groups I and II (residential floors only), the location of every exit on every floor shall be clearly indicated by exit sign and directional signs to comply with the requirements in Chapter 8.
- (c) In all buildings, except Purpose Groups I & II, photo luminescent marking/tape to guide occupants along evacuation routes to appropriate exit shall be provided:
  - (i) along internal walls and/or floors of the exit staircase, smoke-stop lobby and fire-fighting lobby,
  - (ii) on the doors of smoke-stop lobby, fire-fighting lobby and exit staircase,
  - (iii) along corridor with exit directional signs,  
Omission of photo luminescent marking/tape is permitted on the following conditions:
    - (aa) the emergency power supply of the exit lightings, exit signs and directional signs in the above locations shall be self-contained battery pack (single point system) in compliance with SS 563 or central battery supply backed up by stand-by generator,
    - (bb) there shall be at least two emergency luminaires in the smoke-stop lobby, fire-fighting lobby and corridor with exit directional signs, such that no part of such spaces shall be left in total darkness should there be failure of anyone of the emergency luminaires,
    - (cc) there shall be at least one emergency luminaire at every exit staircase landing.
    - (d) The width of photo luminescent marking or tape shall be at least 50mm and be placed at low level. The bottom of the low level sign shall not be less than 150mm or more than 400mm above the floor level.

**Table 3.1 Number of Exits from Rooms and Spaces**

Type of Occupancy	Maximum Occupant Load with One Door
High Hazard	25
Patient accommodation area	50
Classrooms	50
Godowns, stores, and factories not being of high hazard type	50
Assembly	50

**Table 3.2 Landing Width and Depth**

Stair Width	Minimum Landing Width	Minimum Landing Depth	
1000	2800	1900 )))	Allows mattress or stretcher evacuation only (ie no pedestrian passing).
1250	2800	1900 )))	Allows mattress or stretcher evacuation and restricted ambulant passing.
1500	3200	1550	
1750	3600	* 1350 )))	Allows mattress or stretcher evacuation and ambulant passing.
2000	4000	* 1250	

\* For the purpose of calculating the exit capacity of the staircase, clear landing depth, instead of the clear stair width, should be taken.

**Table 3.3 Number and Width of Exit Facilities**

<b>No of Occupants</b>	<b>Min: No of Doors</b>	<b>Min: width of corridors</b>
51 - 200	2	1000 mm
201-500	2	1250 mm
501 - 1000	3	1250 mm
exceeding 1000	4	1250 mm

**Table 3.4 Number of Seats in a Row**

<b>Seat way width</b>	<b>Maximum number of seats in a row</b>	
	Gangway on one side	Gangway on one sides
mm		
300 to 324	7	14
350 to 374	8	16
325 to 349	9	18
375 to 399	10	20
400 to 424	11	22
425 to 449	)	24
450 to 474	) 12	26
475 to 499	)	28
500 or more	)	Limited by the travel distance

Table 3.5 Determination of Exit Requirement

(i) Type of Occupancy	(ii) Max Travel Distance (m) (One-way Travel)		(iii) Max Travel Distance (m) (Two-way Escape)		(iv) Capacity No of persons per unit of width (x)				(v) Min Width (m)		(vi) Max Dead End (m)	
	Un sprinklered	Sprinklered	Un sprinklered	Sprinklered	Door opening (c), (d) & (e)		(f) Stair- cases	(d) Ramps Corridors Exits Passageways	Stairs	Corridors	Corridors	
					To outdoors at ground level	Other exit & Corridor doors					Un sprinklered	Sprinklered
High hazard	10	20	20	35	50	40	30	50	1	1.2	15	20
Industrial buildings (factories, workshops, godown/ warehouse)	15	25	30	60	100	80	60	100	1	1.2	15	20
Shops	15	25	45	60	100	80	60	100	1	1.2	15	20
Offices	15	30	45	75	100	80	60	100	1	1.2	15	20
Places of public resort & car parks	15	25	45	60	100	80	60	100	1(h)	1.2(h)	15	20
Schools & educational buildings	15	25	45	60	100	80	60	100	1	1 <sup>1/2</sup> (a)	15	20
Hospitals	15	25	30	45	30	30	15	30	1	2(b)	15	20
Hotels, Boarding Houses, Serviced Apartments, Hostels, Backpackers Hotels, Dormitories	15	20	30	60	60	50	45	50	1	1.2	15	20
Blocks of flats/ maisonette (k)	15(g) 20(j)	30(g) 40(j)	30 45(j)	75	50	40	30	50	1(i)	1.2	15	20
Detached, semi-detached & terrace house, including townhouses	NR	NR	NR	NR	NR	NR	NR	NR	0.9	0.9	NR	NR

- NR = No requirements. Maximum direct distance =  $\frac{2}{3}$  x Maximum travel distance ....see Cl.2(6a).
- (x) Unit of width = 0.5 meters.
  - (a) Applies to corridors serving classrooms. Other corridors shall have a minimum width of 1.2 meter.
  - (b) Applies to corridors serving patients. Other corridors shall have a minimum of 1.2 meter.
  - (c) Exit doors and exit access doors.
  - (d) Exit ramp.
  - (e) Where a door opening is divided by mullions into two or more openings, each such opening shall be measured separately in computing the number of units of exit width.
  - (f) See Cl.6(e) regarding reduction of exit provision.
  - (g) For travel distance in single staircase flats ... see Cl.8.
  - (h) Refer to Cl.12(b).
  - (i) Staircase within maisonette serving as an internal access to be at least 0.9m width.
  - (j) Applies to external corridor ... see Cl.8(i).
  - (k) Measurement of travel distance is from the residential unit door to exit .... see Cl.8(g).



## Chapter (4)

### Structural Fire Precautions

15. The purpose of this chapter of the Code is to stipulate requirements to minimize the risk of spread of fire between adjoining buildings by separation, prevent the untimely collapse of buildings in the event of fire by the provision of a stable and durable form of construction and prevent the spread of fire between specified parts of the buildings by the division of such buildings into compartments.
16. The provision of compartment walls and compartment floors shall be in accordance with the following standards:

- (a) Compartment Size-Floor Area and Cubical Extent

Any building other than a building of Purpose Group I which has the following standards shall be complied with the provisions of the compartment size-floor area and cubical extent:

- (i) Any storey the floor area of which exceeds that specified as relevant to a building of that height in column (2) of Table (4.1), or a cubic capacity which exceeds that specified as relevant in column (3), shall be divided into compartments by means of compartment walls and compartment floors so that
- (ii) no such compartment has any storey the floor area of which exceeds the area specified as relevant to the building and no such compartment has a cubic capacity which exceeds that specified as relevant in Table (4.1).

- (b) Cubical extent for compartment exceeding 4m in height

- (i) In computing the cubical extent of compartments in single storey buildings such as factories, sport halls, markets, foodcourts, multi-

purposes halls, cinemas, concert halls, churches, temples and similar buildings, the height of 4m shall be used where the actual height exceeds that figure.

- (ii) If any compartment comprises more than one storey or contains mezzanine, galleries or lofts, the full height of the compartment shall be used in computing the cubical extent for each storey, mezzanine, galleries or lofts.
- (c) Where two buildings are connected by external open sided covered way or covered link-bridge, the buildings are considered as separate buildings, if the following conditions are complied with:
- (i) Within the covered way or link-bridge there is no commercial activities or other usage that would pose a fire risk:
  - (ii) The width of the covered way or covered link-bridge shall not exceed 5m measured from eave to eave.
- (d) Cl. 16(a) is not applicable if the building:
- (i) By fitting throughout with an automatic sprinkler system which complies with the requirements in Chapter 7, and
  - (ii) Complying with Cl.16 (e & g), Cl.87 and Appendix (2).
- (e) The compartmentation by Height shall comply with the following standards:
- (i) Compartmentation by Height-In any compartment except single household dwelling, up to a habitable height of 24m, no compartment shall comprise more than three storeys. This requirement can be relaxed for Atrium spaces provided the design of such spaces complies with the conditions stipulated under Cl 16(g).

- (ii) In any building which exceeds 24m in habitable height, no compartment shall comprise more than one storey for compartments at storey level exceeding 24m above average ground level.
  - (iii) Single household dwelling- Buildings under Purpose Group I may consist of more than 3 floors if they are occupied as a single household dwelling.
- (f) Other cases requiring compartment walls and compartment floors- The following situations shall require compartmentation by provision of compartment walls and/or compartment floors –
- (i) Purpose group II-Any wall and floor separating a residential apartment or maisonette from any other part of the same building, unless permitted (as in the case of an external wall adjoining an external corridor, for provision of window openings).
  - (ii) Separation of purpose groups- Any wall and floor separating part of a building from any other part of the same building which is used or intended to be used mainly for a purpose falling within a different purpose group, as identified under Table (1.5), except the following:
    - (aa) Ancillary offices located within a building or compartment of Purpose Group III, V, VI, VII and VIII.
    - (bb) Rooms or spaces for ancillary usage located within a building or compartment of Purpose Group III, IV, V, VI, VII and VIII as stipulated under Cl.2(6 c)(ii).

- (cc) Rooms or spaces located within a sprinkler protected building, unless otherwise stated in following Cl of 16(f) or other clauses in this Code.
- (iii) Floor over a Basement –
- (aa) Forms part of a building of Purpose Group I which has five or more storeys (including the basement storey) or a building or compartment of Purpose Group II to VIII. In the case of Purpose Group I building which has five or more storeys (including the basement storey), the basement level shall discharge directly to 1st storey grade level.
  - (bb) Where the floor area of the basement exceeds 100sq.m it shall be a compartment below ground level and shall not comprise more than one storey. Moreover, the automatic sprinkler system dry riser must be fitted in this basement. In the case of a building or compartment of Purpose Groups IV, V and VII and the building is also fitted with an automatic sprinkler system in compliance with the requirements in Chapter 7 and smoke control system in Chapter 8, the basement and upper storey may be allowed to be interconnected to form one compartment although the basement floor area is exceeding 100sq.m. The floor at first basement storey level is constructed as a compartment floor if the building comprises of more than one basement storey.
- (iv) Basement Floors-In any compartment below pavement level, no compartment shall comprise more than one storey, except in the case of Purpose Groups IV, V and VII as permitted under

Cl16(f)(iii)(bb) and in the case of basement used solely for car parking. No part of a basement storey shall be used for the bulk storage of highly inflammable liquids or substances of an explosive nature.

- (v) Fire Command Centre -The Fire Command Centre shall be separated from other parts of the same building by compartment walls and floors having fire resistance of at least 2 hours.
- (vi) Kitchen Separation - The compartmentation of commercial kitchen are as followed:
  - (aa) In an eating establishment where a kitchen is required for the preparation of food and where 'open flame' cooking appliances are used, the kitchen shall be separated from other parts of the same building by compartment wall and floor having fire resistance of at least 1 hour;
  - (bb) Openings in the compartment wall and floor shall comply with the relevant provisions of Cl.23 for protection of openings;
  - (cc) Doors shall have fire resistance of half an hour and fitted with automatic self-closing device;
  - (dd) Where the flue or duct passes through the compartment wall or floor, the flue or duct shall be encased by noncombustible construction to comply with the requirements of Cl.23(e) and no damper shall be permitted to be installed in such flue or duct; and
  - (ee) The separation requirement for kitchen could be exempted under the following conditions:-

- (1) when all the cooking facilities in the kitchen are fitted with extinguishing systems that are approved by Myanmar Fire Services Department; or
- (2) when there are at least 25% of the perimeter walls (excluding air-well and void) of an eating establishment open directly to the external of the building, and provided any part of the floor space is within 9m from the nearest opening; or
- (3) when there are at least 50% of the perimeter walls (excluding air-well and void) of an eating establishment open directly to the external of the building, and provided any part of the floor space is within 12m from the nearest opening; or
- (4) when an eating establishment is separated from other parts of the same building by walls and floors having fire resistance of at least 1 hour and doors having fire resistance of at least half an hour; and provided –

Note: For a sprinkler protected building, there is no restriction to the floor area of the compartment; or for a non-sprinkler protected building, the floor area of the compartment shall not exceed 150m<sup>2</sup>; LPG cylinders provided for the ‘open flame’ cooking activities are not allowed to be located at the basement and the installation of LPG cylinders at other areas shall comply with the provisions in the Fire Safety (Petroleum) Regulations that are recognized by Myanmar Fire Services Department and others. Notwithstanding all the above, the compartment where ‘open

flame' cooking activities is carried out shall not comprise more than one storey.

(vii) Separation of theatre, cinema or concert hall from other parts of the building- A theatre, cinema or concert hall shall be separated from other parts of the same building, which is of a different purpose group, by compartment walls and floors having a fire resistance of at least 2 hours. If the building is protected by an automatic sprinkler system, the fire resistance rating of the compartment walls or floors can be reduced to 1 hour. Where openings are provided for access between the theatre, cinema or concert hall and any other part of the same building of a different purpose group, the openings shall either be protected by fire doors having the necessary fire resistance rating as the enclosing walls or floors, or be provided with lobby which complies with the following requirements:

(aa) The lobby is enclosed by walls having fire resistance of at least 1 hour, is naturally ventilated complying with the requirements for ventilation of smoke stop lobbies, or mechanically ventilated to comply with the requirements in Chapter 8, and

(bb) All doors to the lobby shall each have fire resistance of not less than half an hour and fitted with automatic self-closing device.

(viii) Separation by Proscenium Wall in Theatres or Concert Halls

(aa) In a place of public resort, such as theatres, and concert halls, capable of seating more than 500 persons and in which

fly tower is used for stage scenery or when extensive stage scenery may normally be installed on the stage side, the stage shall be separated from the seating area by a proscenium wall of not less than 1 hour fire resistance in such a way that the stage and the audience seating area form separate compartments.

- (bb) The proscenium opening shall be protected by fire curtain with fire resistance of at least 1 hour, automatically operated by a fusible link or a smoke detector. In lieu of fire curtain, a smoke curtain is acceptable, if engineered smoke control and automatic sprinkler systems are to be provided to the stage area.
  - (cc) Not more than three other openings may be provided in the proscenium wall. Such openings shall not exceed 2m<sup>2</sup> in area and shall be fitted with doors having fire resistance of not less than half an hour and fitted with automatic self-closing device; and
  - (dd) The entire stage side of the proscenium wall shall be fitted with an automatic sprinkler system which complies with the requirements in Chapter 7.
- (xi) Hotel, Boarding Houses, Serviced Apartments, Hostels and Backpackers Hotel
- (aa) Guestroom or accommodation unit- Each guestroom or accommodation unit shall be compartmented from adjoining rooms and other parts of the same building by construction having fire resistance rating of at least 1 hour, that is



permitted by Cl.11(b) for the provision of window openings between the guestroom or accommodation unit and external corridor, and

- (bb) Guestroom or accommodation unit and other rooms or spaces which open into or form part of the guestroom or accommodation unit corridor shall be separated from the corridor to comply with Cl.11(a) and Cl.11(b).
- (x) Workers' dormitories
- (aa) Each dormitory bedroom shall be compartmented from adjoining rooms and other parts of the same building by construction having fire resistance rating of at least 1-hour, unless otherwise permitted under Cl.13(d) for the provision of window openings between the bedroom and external corridor;
  - (bb) Dormitory bedrooms and other rooms or spaces which open into or form part of the dormitory bedroom corridor shall be separated from the corridor to comply with cl.13(c &d); and
  - (cc) Kitchen shall be enclosed with minimum 1 hour fire rated compartment wall, including half an hour fire rated door. Kitchen can be located within each floor, but shall not be within the dormitory bedroom.
- (xi) Separation of Motor Vehicle Workshop -A motor vehicle workshop shall be separated from any other part of the same building by compartment walls and floors having fire resistance of not less than 2 hours, and if located in a basement storey of a building, shall be separated from any other part of the same building by

compartment walls and floors having fire resistance of not less than 4 hours.

(xii) Separation of Spray Painting Room

(aa) Areas in which spray painting or other allied processes are performed or carried out, shall be separated from other parts of the same building by compartment walls and floors having fire resistance of not less than 2 hours. Where spray painting booths that have built in vapour extraction system complying with NFPA 33, the fire resistance requirement is not applicable.

(bb) Where a spray painting room or booth is protected by an automatic sprinkler system but not complying with NFPA 33, the fire compartment to the room or booth can be reduced from 2 hours to 1 hour.

(xiii) Coldroom - A coldroom is a store room used for the storage of materials or chemical under cold temperature. The enclosures to the coldroom are constructed partly or wholly of highly combustible insulation materials. The floor area shall be the aggregate floor areas of all the coldrooms located in a compartment or a unit.

(aa) Where a coldroom has a floor area exceeding 10m<sup>2</sup>, a separate outer layer of non-combustible construction, including the door, having minimum 1 hour fire resistance rating, shall be provided to compartmentalize the coldroom enclosure from other areas

(bb) Provision of the fire resisting outer layer enclosure, including the fire door to the cold room would not be required if:

- (1) The coldroom has a floor area not exceeding 20m<sup>2</sup> and is sprinkler protected in a building under Purpose Groups III, IV, V, VI, VII or VIII, and the storage materials shall not include highly flammable chemicals.
  - (2) The coldroom is located in a building under Purpose Groups I or II.
  - (3) The coldroom is located in a kitchen compartment (with or without 'open flame' cooking appliances) in an eating establishment, provided the floor area of the coldroom does not exceed 20m<sup>2</sup>, and the kitchen is compartmentalised from other parts of the building by compartment walls and floor having minimum 1 hour fire resistance and door having minimum half an hour fire resistance, irrespective of the relaxation allowed under Cl 16(f)(vi).
- (cc) The insulation material for the coldroom shall pass Class B under BS EN 13501 or its equivalent.
- (xiv) Store Room - For non-sprinklered buildings, if the area of the store room exceeds 10m<sup>2</sup>, it shall be compartmented from the other parts of the same building by compartment walls and floors having fire resistance of not less than 1 hour. No fire compartmentation is required for a store room which is housed within a sprinklered protected building. However store room exceeding 700m<sup>2</sup> and 100m<sup>2</sup> for above-ground and below-ground respectively are subject to the compartment size requirements stipulated under Appendix (2).

(xv) Areas of Special Hazard

(aa) Areas of Special High Risk in a Building

Boiler rooms, transformer rooms, generator rooms, storage areas of materials that are highly combustible or flammable, and any other area of special high risk shall be separated from other parts of the building by compartment walls and floors having fire resistance of not less than 2 hours. If the building is protected by an automatic sprinkler system, the fire resistance rating of the compartment walls and floors can be reduced to 1 hour.

(bb) Rooms housing transformer containing flammable liquid and generator rooms shall be located against an external wall.

(xvi) Tenancy Unit- Fire compartmentation between individual tenancy units within a terraced or flatted factory or warehouse building shall be provided. The entire enclosure of each of these units shall be fire compartmented with walls and floors of minimum 1 hour fire resistance rating.

(xvii) Car Parking Area - Fire compartment between car parking area (Purpose Group VIII) and other areas shall be provided. The fire compartment walls and floors shall have minimum 1 hour fire rating.

(xviii) Warehouse- Warehouse compartment size exceeding 700m<sup>2</sup> for above ground level and 100m<sup>2</sup> for below ground level are subject to full compliance of Appendix(2).

- (g) Provision for Atrium Spaces - Myanmar Fire Services Department may consent to modify the requirements under Cl. 16(a) and 16(e) (i) of this Code for the design of 'Atrium spaces' in a building provided the following conditions are complied with:
- (i) The minimum plan area of the Atrium void shall be not less than 93m<sup>2</sup> and no horizontal dimension between opposite edges of the floor opening is less than 6m wide; and
  - (ii) Occupancy within the floor space of the Atrium meets with the specification for low or ordinary hazard content; and
  - (iii) The atrium is open and unobstructed in a manner such that it may be assumed that a fire in any part of the space will be readily obvious to the occupants before it becomes a hazard; and
  - (iv) The building is fitted throughout with an automatic sprinkler system to comply with the requirements in Chapter 7; and
  - (v) The building is fitted with an engineered smoke control system in accordance with Cl.88; and
  - (vi) Provision of openings and enclosures, and the planning of means of escape shall be subject to the approval of the Myanmar Fire Services Department.
- (h) Buildings of High Hazard Occupancy
- (i) The compartment of buildings of high hazard occupancy shall not exceed one half of the sizes given in Table (4.1) and each compartment shall comprise one storey only; and
  - (ii) No storey of a building, the habitable height of which is more than 24m, shall be used for the bulk storage of goods or substances of

highly combustible nature unless the building is provided with a sprinkler system to comply with Chapter 7; and

- (iii) The type of storage materials or substances shall not include the following:
  - (aa) Materials that will flame up by themselves without the presence of any fire source below the ignition temperature of 200°C; and
  - (bb) Combustible/highly flammable materials which include those highlighted in Cl. 2(z).
  
- (i) The requirements of Cl.16(a) may be exempted under the following circumstances:
  - (i) Buildings used solely for the sale, storage, processing and packaging of goods and substances of a non combustible nature, provided that any other parts of the buildings used otherwise as described shall be separated by compartment walls and compartment floors in compliance with the requirements of the relevant provisions for compartment walls and compartment floors, and
  - (ii) Single storey buildings of Purpose Group VI, provided that the buildings are used solely for the sale, storage, processing & packaging of goods & substances of a non-combustible nature, and
  - (iii) Open sided car parking decks having not less than 50% of the sides permanently open and unobstructed, and such openings being evenly distributed along each of the perimeter walls and on every individual floor/deck, excluding perimeter walls to air-well, so as to provide cross ventilation to all parts of the car parking decks; and

- (iv) No part of the floor space shall be more than 12m from the openings on the perimeter walls of the building or air-well. Air-well where provided for this purpose shall have a superficial plan area of not less than 10m<sup>2</sup>, or 0.1m<sup>2</sup> for every 300mm of height, whichever is greater, and have a minimum dimension on plan of 2000mm, open vertically to the sky for its full height.
- (j) For additions and alterations to existing buildings, the areas undergoing such works must be separated from other occupied areas of the building in accordance with Cl.29(o).

#### 17. FIRE RESISTANCE OF ELEMENTS OF STRUCTURE

- (a) Minimum Periods of Fire Resistance - Subject to any expressed provision to the contrary, any element of structure shall be constructed of non-combustible materials and to have fire resistance for not less than the relevant period specified in Table (4.2) having regard to the purpose group of the building of which it forms a part and the dimensions specified in that Table, provided that
  - (i) Any separating wall shall have fire resistance of not less than 1 hour, and
  - (ii) Any compartment walls or compartment floor which separates a part of a building falling within Purpose Group II or III from any other part of the building falling within a purpose group other than Purpose Group II or III shall have fire resistance of not less than 1 hour.
- (b) Requirement on fire resistance in Cl.17(a) shall not apply to:
  - (i) any part of any external wall which is non load bearing and can, in accordance with Cl.19 be an unprotected area.

- (ii) steel structures for standalone carpark if the following conditions are fulfilled:
- (aa) Each storey shall be provided with cross-ventilation by the provision of uninterrupted openings evenly distributed around the perimeter walls, excluding perimeter walls to air-well. The area of the openings shall not be less than 50% of all external walls or 15% of the footprint per storey, whichever is greater. This condition is not applicable if sprinkler system is installed throughout the carpark; and
  - (bb) No point on any storey shall be more than 12m from external air or air-well. Air-well where provided for this purpose shall have a superficial plan area of not less than 10m<sup>2</sup>, or 0.1m<sup>2</sup> for every 300mm of height, whichever is greater, and have a minimum dimension on plan of 2000mm, open vertically to the sky for its full height. This condition is not applicable if sprinkler system is installed throughout the carpark; and
  - (cc) All floor beams shall be designed as a composite structure with the floor slab; and
  - (dd) The building is not more than 24m in habitable height that shall not be any basement storey; and
  - (ee) No other usages, other than the electrical services that serve only the car park, are permitted; and
  - (ff) Steel structures shall meet the specifications of BS 5950 Pt 8; and
  - (gg) These requirements are for carpark for passenger vehicles.



- (c) In the case of a single storey building or a building consisting of a first storey and one or more basement storeys, requirement on fire resistance in Cl.17(a) shall not apply to any element of structure which forms part of the first storey and consists of :
- (i) A structural frame or a beam or column - A structural frame or a beam or column, provided that any beam or column (whether or not it forms part of a structural frame) which is within or forms part of a wall, and any column which gives support to a wall or gallery, shall have fire resistance of not less than the minimum period, if any, required by this Code for that wall or gallery, or
  - (ii) An internal loadbearing wall or a loadbearing part of a wall, unless that wall or part of it forms part of a compartment wall or a separating wall, or forms part of the structure enclosing a protected shaft or supports a gallery, or
  - (iii) Part of an external wall which does not support a gallery and which may, in accordance with Cl.19 be an unprotected area.
- (d) The interpretation and application of Cl.17 shall be as follows:
- (i) Subject to the provisions of cl.17(d)(ii) and any other expressed provision to the contrary, any reference to a building of which an element of structure forms a part means the building or (if the building is divided into compartments) any compartment of the building of which the element forms a part, and
  - (ii) Any reference to height means the height of a building, but if any part of the building is completely separated throughout its height both above and below ground from all other parts by a compartment wall or compartment walls in the same continuous

vertical plane, any reference to height in relation to that part means the height solely of that part, and

- (iii) If any element of structure forms part of more than one building or compartment and the requirements of fire resistance specified in Table (4.2) in respect of one building or compartment differ from those specified in respect of any other building or compartment of which the element forms a part, such element shall be so constructed as to comply with the greater or greatest of the requirements specified.
- (iv) If any element of structure is required to be of non-combustible construction, the measure of fire resistance rating shall be determined by the part which is constructed wholly of non-combustible materials. (With the exception of fire protecting suspended ceilings, surface materials for walls and ceilings and floor finishes may be combustible, if they are not relied on to contribute to the fire resistance of the wall or floor).
- (e) Wall Separation Residential Apartment or Maisonette - Any compartment wall separating a residential apartment or maisonette from any other part of the same building, shall not be required to have fire resistance exceeding 1 hour unless
  - (i) The wall is a wall forming part of a protected shaft and the minimum period of fire resistance required by the provisions of this Code for the protecting structure is more than 1 hour, or
  - (ii) The part of the building from which the wall separates the residential apartment or maisonette is of a different purpose group and the minimum period of fire resistance required by the

provisions of this code for any element of structure in that part is more than 1 hour.

- (f) Suspended Ceiling - In determining the fire resistance of floors, no account shall be taken of any fire resistance attributable to any suspended ceiling unless the ceiling is constructed specifically as a fire protecting suspended ceiling and the construction complies with the requirements under Table (4.3) for Limitations on Fire Protecting Suspended Ceilings.
- (g) Fire Rated Board - Fire rated boards are permitted to be used for protection to structural steel beams and columns in building if the following conditions are satisfactorily fulfilled:
  - (i) Material shall be non-combustible; and
  - (ii) It shall have fire resistance for not less than the relevant period specified in Table (4.2) having regard to the purpose group of the building of which it forms a part and the dimensions specified in that Table; and
  - (iii) It shall meet the criteria, in terms of water absorption and bending strength performance, when subject to test of BS EN 520 (for gypsum plaster board) or ISO 1896 (for calcium silicate or cement board); and
  - (iv) Dry wall shall meet the criteria, in term of impact & deflection performance, when subject to the test of BS 5588 Pt 5 Appendix A and BS 5234 Pt 2; and

Note : Fire rated boards should not be used to protect structural steel in areas which may be subject to explosion risks as the boards may be displaced by the force of the blast. In buildings under Purpose Groups VI &

VIII, where there may be presence of corrosive atmosphere that may affect the effectiveness of fire rated board for protection to structural steel members of buildings, such proposal shall be subjected to evaluation of Myanmar Fire Services Department.

#### 18. TESTS OF FIRE RESISTANCE

- (a) Performance for the fire resistance of elements of structure and other forms of construction shall be determined by reference to the methods specified in BS 476: Part 20 to 23, which specify tests for stability, integrity and insulation. Specific requirements for each element in terms of the three performance criteria of stability, integrity and insulation are given in Table (4.4).
- (b) An element of structure or other part of a building shall be deemed to have the requisite fire resistance if it is constructed to the same specification as that of a specimen exposed to test by fire in accordance with the method and procedure under BS 476: Part 20 to 23, and satisfied the requirements of that test for the three performance criteria of stability, integrity and insulation for not less than the specified period , or
- (c) Timber Floors - The use of timber floors shall not be allowed, except:
  - (i) Buildings under Purpose Groups I; and
  - (ii) Ancient heritage buildings that are constructed by using timber floors.

#### 19. EXTERNAL WALL

- (a) Requirements of External Walls shall be as follows:
  - (i) Any external wall of a building or a separated part of a building which constitutes or is situated within a distance of 1m from any

point on the relevant boundary, or is a wall of a building or a separated part of a building which exceeds 15m in height shall

- (aa) be constructed wholly of non combustible materials apart from any external cladding which complies with Cl.19(d) or any internal lining which complies with Cl.27(d), and
- (bb) be so constructed as to attain the fire resistance required by this chapter, and

- (ii) Any beam or column forming part of an external wall and any structure carrying an external wall which is required to be constructed of non combustible material, shall comply with the provisions of Cl. 19(a)(i).

(b) The exceptions of external wall are as follow:

- (i) The requirements of Cl.19(a)(i)(aa) for non combustibility of external walls shall not apply to the external wall of a building or separated part of a building

(aa) if that wall is:

- (1) situated 1m or more from the relevant boundary; and
- (2) not exceeding 15m in height; and
- (3) separated as described in Cl.17(d)(ii); or

(bb) if that wall is situated 1m or more from the relevant boundary:

- (1) of Purpose Group I and II of not more than three storeys, or

- (2) of single storey construction and not exceeding 15m in height and floor area not exceeding -
    - (- -) Purpose Group III, IV, VII 3000m<sup>2</sup>
    - (- -) Purpose Group V, VI 2000m<sup>2</sup>
    - (- -) Purpose Group VIII 500m<sup>2</sup>; or
  - (3) other than single storey buildings, but not exceeding 7.5m in height and floor area not exceeding -
    - (- -) Purpose Group IV, VI, VII 25m<sup>2</sup>;
    - (- -) Purpose Group V, VIII 150m<sup>2</sup>.
- (ii) The requirements of Cl.19(a)(i)(bb) for fire resistance of external walls shall not apply to the external wall of a building or separated part of a building –
- (aa) if that wall is situated 1m or more from the relevant boundary:
- (1) for single storey buildings not exceeding 15m in height and floor area not exceeding 2000m<sup>2</sup> or 500m<sup>2</sup> under Purpose Groups VI or VIII respectively; and
  - (2) such wall shall be provided with minimum period of 15 minutes insulation from inside the building under BS 476: Part 20 to 23.
- (c) Except where otherwise provided, unprotected areas in any side of a building shall comply with the following:
- (i) Any relevant requirements relating to the permitted limits of unprotected areas specified in Appendix B , Chapter 4,and

- (ii) The extent of unprotected openings in an external wall of a building or compartment in relation to its distance from the lot boundary can be doubled in the following situations-
  - (a) used solely for the sale, storage and processing involving goods and substances of a non combustible nature, or
  - (b) fitted throughout with an automatic sprinkler system in compliance with the requirements in Chapter 7.
- (iii) As an alternative to Cl.19(c)(ii) (bb) above, the distance between the external wall of a building and the relevant boundary can be half that specified in Appendix B, Chapter 4 if the building is fitted throughout with an automatic sprinkler system in compliance with the requirements in Chapter 7.
- (iv) The extent of unprotected openings in an external wall of a building or part of building used for carparking in relation to its distance from the lot boundary or relevant boundary can be based on the floor having the largest extent of unprotected openings for the purpose of complying with Table 1 of Appendix B, Chapter 4.
- (v) It must be constructed as follows:
  - (aa) The extent of unprotected openings in an external wall of a building under purpose group I in relation to its distance from the relevant boundary can be based on the internal room/space in the building that has the largest extent of unprotected openings for purpose of complying with Table 1 of Appendix “B”.

- (bb) Internal walls enclosing the room/space in the building are not required to be fire rated but shall be constructed of non-combustible materials, except glazing.
- (d) The cladding on External Walls shall comply with the following:
  - (i) If such cladding is situated less than 1 m from any point on the relevant boundary, it shall have surface complying with the requirements for Class '0', and
  - (ii) If such cladding is situated 1m or more from the relevant boundary it shall have, if the building is more than 15m in height, a surface complying with the requirements specified for Class '0', except that any part of such cladding below a height of 15m from the ground may consist of timber of not less than 9mm finished thickness or of a material having a surface which is provided for the building is of Purpose Group VI or VIII,
- (e) Any reference to Appendix B, Chapter 4 shall be construed as referring to the provisions of Part I and II of that Appendix.
- (f) Buildings on Land in Common Occupation - If two or more detached buildings are erected on land in common occupation, any external wall of any building so erected which faces an external wall of such other building, the relevant boundary shall be a notional boundary passing between those buildings and such boundary must be capable of being situated in such a position as to enable the external walls of those buildings to comply with the requirements of Cl.19(c).
- (g) Vertical Fire Spread- For high and low parts of different compartments of a building abutting each other, either one of the following requirements shall



be complied with to prevent spread of fire from the roof close to and lower than the external of the higher part:

- (i) the roof over the lower part of the building shall be fire rated in accordance with the element of structure for minimum 1 hour for a distance of 5m measured horizontally from the external wall of the higher part of building; or
- (ii) the external wall of the higher part of the building overlooking the roof below shall have the necessary fire resistance rating in accordance with the element of structures for minimum 1 hour for a vertical height of not less than 9 m measured from the roof of the lower part of the building.

## 20. SEPARATING WALLS

- (a) Every separating wall shall be as follow:
  - (i) Form a complete barrier in the same continuous vertical plane through the full height between the buildings it separates, including roofs and basements and shall be imperforate except for provisions of openings permitted under Cl.20(b), and
  - (ii) Have the appropriate fire resistance to comply with the requirements of Cl.17, and
  - (iii) Be constructed of non combustible materials, together with any beam and column which form part of the wall and any structure which it carries.
  - (iv) Not include glass fire resisting walls.

- (b) Openings in Separating Walls - A separating wall shall have no openings except for:
- (i) A door required to provide a means of escape in the event of a fire, having the same fire resistance as that required for the wall and complying with Cl.23(b), or
  - (ii) A door provided for the purpose of public circulation and permitted by Myanmar Fire Services Department, having the same fire resistance as that required for the wall and complying with Cl.23(b), or
  - (iii) Opening for the passage of a pipe complying with the relevant provisions of Cl.23(c).
- (c) Separating Wall-Roof Junction - A separating wall shall be either carried up to form a close joint with the underside of a pitched roof of non combustible covering or carried up above the level of such roof covering. The junction between such separating wall and roof shall be properly fire stopped so as not to render ineffective the resistance of such separating wall to the effects of the spread of fire.
- (d) Separating Wall-External Wall Junction -If any external wall is carried across the end of a separating wall, such external wall and separating wall shall be bonded together or the junction of such walls shall be fire stopped to comply with the requirements of Cl.26.
- (e) No combustible material shall be built into, carried through or carried across the ends of or carried over the top of separating walls in such a way as to render ineffective such separating walls to the effects of the spread of fire.

## 21. COMPARTMENT WALLS AND COMPARTMENT FLOORS

- (a) Requirements of Compartment Walls or Compartment Floors have every compartment wall or compartment floor shall be required to -
- (i) Form a complete barrier to fire between the compartments it separates, and
  - (ii) Have the appropriate fire resistance to comply with the requirements of Cl.17, and
  - (iii) Be constructed of non combustible materials (together with any beam or column which forms part of the wall or floor and any structure which it carries), and
  - (iv) Have no fire resisting glass forming part of it unless permitted under Cl.29(m).
- (b) Opening in Compartment Walls or Compartment Floors - A compartment wall or compartment floor shall have no openings in it, except for
- (i) A door which has the same fire resistance rating as the compartment wall and complies with the relevant requirements of Cl.18, unless permitted by other provisions of this Code, or
  - (ii) A protected shaft which complies with the requirements of Cl.22, or
  - (iii) The passage of a pipe or ventilation duct, such openings in the compartment wall or compartment floor shall be protected to comply with the relevant provisions of Cl.23.

- (c) Junction with Other Structures and Opening in Curtain Walling
- (i) Junction with Other Structures - Where a compartment wall or compartment floor forms a junction with any structure comprising any other compartment wall, or any external wall, separating wall or structure enclosing a protected shaft, such structures shall be bonded together at the junctions or the junctions shall be fire stopped to comply with the requirements of Cl.26.
  - (ii) Opening in Curtain Walling - The opening occurring at the junction between the edge of a structural floor and the curtain walling shall be sealed to prevent the spread of smoke and flame from the lower floor to the upper floor via the opening.
- (d) Compartment Wall-Roof Junctions - Where a compartment wall forms a junction with a roof, such compartment wall shall be carried up to form a close joint with the underside of the roof and shall be properly fire stopped or shall be carried up above the level of the roof covering and the junction between such compartment wall and roof shall be properly fire stopped so as not to render ineffective the resistance of such compartment wall to the effects of the spread of fire.
- (e) No combustible material shall be built into, carried through or carried across the ends of any compartment wall or compartment floor or carried over the top of any compartment wall in such a manner as to render ineffective the resistance of such wall or floor to the effects of the spread of fire.
- (f) Non combustibility of compartment walls or floors - Every compartment wall or compartment floor shall be constructed of non-combustible materials.

- (g) Use of Fire Shutter - Fire shutter is permitted to be used as compartment wall except for fire compartmentation of fire command centre and means of escape which include exit staircase, smoke-stop lobby/fire-fighting lobby, internal exit passageway, etc.
- (h) The fire shutters, which are used to protect openings in compartment wall/floor, shall have the necessary fire resistance including thermal insulation, not less than that of the compartment wall/floor. However, fire shutters, which are installed at the edge of atria, voids such as escalator void areas and between floors and door way, need not have thermal insulation.
- (i) The commonly used shutters such as vertical, horizontal and lateral fire shutters shall comply with SS 489 and the following:
  - (i) For vertical fire shutter operated by gravity during fire condition: activation Upon by fire alarm system or fusible link, the operating mechanism of curtains/leaves of vertical fire shutter shall be released. The curtain/leaves shall descend under gravity at a controlled rate.
  - (ii) For electrically operated vertical, lateral and horizontal fire shutter (no fusible link is required): Upon activation by fire alarm system, the electrical motor shall drive the curtains/leaves to descend and shall be backed up by emergency power supply. The power and signal cables shall be fire-rated.
- (j) The mode of activation for fire shutters at different locations shall be as follow:
  - (i) Fire shutters as separating wall between two buildings:
    - (aa) Two buildings separated by a common fire shutter: For vertical fire shutter operated by gravity and electrically

operated fire shutters, it shall be linked to fire alarm systems of both buildings and shall be activated by fire alarm system of either building. Mode of activation by fusible link only is not permitted.

- (bb) Two buildings separated by two separate fire shutters: For vertical fire shutter operated by gravity and electrically operated fire shutters, each fire shutter shall be activated by the fire alarm system of its own building. Mode of activation by fusible link only is not permitted.
- (ii) Fire shutters as compartment wall/floor for limiting compartment area and cubical extent, as compartment between different purpose groups, as compartment of special rooms such as kitchen, electrical room, store room, etc. and as compartment of basement passenger/goods lift lobby:
- (aa) For vertical fire shutter operated by gravity, mode of activation by fusible link is acceptable.
  - (bb) For electrically operated fire shutter, mode of activation shall be by local smoke detectors.
- (iii) Fire shutters as compartmentation at atrium/voids or between floors (being part of the engineered smoke control design):
- (aa) Only electrically operated fire shutter is permitted. Signal to operate the respective fire shutter shall be from dedicated smoke detector installed at the respective smoke zone.
  - (bb) Vertical fire shutter operated by gravity activated by fusible link is not permitted.

## 22. PROTECTED SHAFTS

- (a) A protected shaft shall not be used for any purpose additional to those given as defined under Cl.2(6 d). All services such as, pipe/duct installation should not be located inside protected staircase. Likewise, no washroom is allowed to be located inside protected staircase.
- (b) Every protected shaft shall be required to
  - (i) Form a complete barrier to fire between the different compartments which the shaft connects, and
  - (ii) Have the appropriate fire resistance to comply with the requirements of Cl.17, and
  - (iii) Be constructed of non combustible material (together with any beam or column which forms part of the enclosure and any structure which carries it).
- (c) Openings in Protected Shaft - A protected shaft shall have no openings in its enclosure, except -
  - (i) In the case of any part of the enclosure which is formed by a separating wall, any opening which complies with the requirements of Cl.20 for separating walls, or
  - (ii) In the case of any part of the enclosure which is formed by a compartment wall or a compartment floor, any opening which complies with the requirements of Cl.21 for compartment wall or compartment floor, or

- (iii) In the case of any part of the enclosure which is formed by the protecting structure-
  - (aa) a door which has the appropriate fire resistance to comply with the requirements of Cl.18 for test of fire resistance, or otherwise permitted by provision of Cl.22(f), or
  - (bb) the passage of a pipe, excluding protecting structure to exit staircase and exit passageway, or
  - (cc) inlets to and outlets from and opening for the duct, if the shaft contains or serves as a ventilation duct, such openings in the protected shaft shall be protected to comply with the relevant provisions of Cl.23 for protection of openings.
- (d) Every protecting structure shall be constructed wholly of non combustible materials except that floor, wall and ceiling finishes which do not contribute to the fire resistance of such protecting structure may not be required to comply with the requirements for non combustibility.
- (e) Ventilation of Protected Shaft - Ventilation of protected shaft shall comply with the following:
  - (i) A protected shaft used for the passage of people, such as exit staircases, shall be ventilated to comply with the relevant provisions of this Code.
  - (ii) A protected shaft containing a pipe conveying gas shall be adequately ventilated directly to the outside air or have other modes of ventilation allowed under SS CP 51.
- (f) Doors in Protecting Structures - Any door fitted to an opening in protecting structure shall have fire resistance for not less than half the period required



by other provisions of this Code for the protecting structure surrounding the opening.

Exception : Any door fitted to an opening in protecting structure of a shaft containing services such as electrical cables, pipes (including gas pipe in separate shaft), ducts would not need to have the fire resistance rating if the door is located along the wall facing the external corridor.

(g) Protected Shaft Containing Exit Staircase

(i) A protected shaft which contains an exit staircase shall not contain any services e.g. pipes, cables, ducts, etc., that are not solely serving the same exit staircase (even if the services are protected with fire rated dry construction), except for:

(aa) cut-off sprinkler and pipe for that staircase; and

(bb) UPVC or cast iron rain water downpipes serving the roof directly above the exit staircase, and not routed through anywhere outside the staircase.

(cc) rising mains.

(ii) The protecting structure shall be constructed of masonry, or drywall. If drywall construction is used, the following conditions shall be complied with:

(aa) Drywall shall be non-combustible; and

(bb) Drywall shall have fire resistance for not less than the relevant period specified in Table(4.2)having regard to the purpose group of the building of which it forms a part and the dimension specified in that Table; and

- (cc) Drywall shall meet the criteria, in terms of impact and deflection performance, when subject to the tests of BS 5588 Pt 5 Appendix A and BS 5234 Pt 2; and
  - (dd) Drywall shall meet the criteria, in terms of water absorption and bending strength performance, when subject to the test of BS EN 520 (for gypsum plaster board) or ISO 1896 (for calcium silicate or cement board); and
  - (ee) The building shall have at least two independent exit staircase shafts (scissors staircases are considered as single shaft).
- (h) Lift Shaft - A protected shaft which contains a lift shall comply with the following:
- (i) It shall not contain any pipe conveying gas or combustible liquid, other than those in the mechanism of a hydraulic lift.
  - (ii) The protecting structure shall be constructed of masonry, or drywall. If drywall construction is used, the following conditions shall be complied with:
    - (aa) Drywall shall be non-combustible; and
    - (bb) Drywall shall have fire resistance for not less than the relevant period specified in Table(4.2) having regard to the purpose group of the building of which it forms a part and the dimension specified in that Table; and
    - (cc) Drywall shall meet the criteria, in terms of impact and deflection performance, when subject to the tests of BS 5588 Pt 5 Appendix A and BS 5234 Pt 2.

- (dd) Drywall shall meet the criteria, in terms of water absorption and bending strength performance, when subject to the test of BS EN 520 (for gypsum plaster board) or ISO 1896 (for calcium silicate or cement board); and
  - (ee) Drywall shall meet the criteria of Cyclic Loading and Dynamic test as specified under International Specification.
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- (iii) Where a lift is either located at the edge of atrium floors or at the external wall and outside the building, the lift shall be considered as not enclosed within a protected shaft.
  - (iv) The protected shaft shall be vented in accordance with SS 550 Code of Practice for Installation, Operation and Maintenance of Electric Passenger and Goods Lifts. The vents shall be so arranged as to induce exhaust ventilation of the shaft. Where vents could not be provided because of the location of the lift shaft, ventilation duct protected by drywall complying with Cl.22(h)(ii) serving as ventilation of the shaft may be provided instead. If the duct is not to be fire rated, fire dampers shall be provided to the duct at the wall of the lift shaft, provided such relaxation shall not apply to shaft containing fire lift.
  - (v) Openings for the passage of lift cables into the lift motor room located above or at the bottom of the shaft shall be as small as practicable.
  - (vi) Transom panel above lift entrance shall be considered as part of the protecting structure and shall therefore conform to the fire resistance requirements of the protected structure.

- (vii) If it serves any basement storey it shall be protected by a smoke-stop lobby with walls having 1 hour fire resistance and fire door of half an hour fire resistance. The protected lobby shall be mechanically ventilated.

Exception: Where the lift landing area is adjoining an air-well or external space of minimum clear area 10m<sup>2</sup> and minimum width of 3m. The distance between the nearest edge of lift door opening to the air-well shall not exceed 3m.

- (vii) Private Lift - Private lifts that are provided for the exclusive use of occupants in residential units under Purpose Group II buildings shall comply with the following requirements:

- (aa) Smoke detectors shall be provided at the lift landing area. The activation of any of the smoke detectors at the lift landing area shall cause the lift to home to the designated floor; and
- (bb) Emergency power supply from a generating plant shall be provided to home the lift to the designated floor when there is a power failure in the building; and
- (cc) The designated floor can either be on ground level or one level below ground level. If it is the latter, the lift shall home to a protected lobby, with direct access to an exit; and
- (dd) The lift shall not be permitted to double-up as a fire lift; and
- (ee) Private lifts shall comply with SS 550.

- (i) Protecting Shaft Containing Other Services Installations - A protected shaft used for the enclosure of services shall comply with the following:

- (i) The protecting structure for protected shaft containing kitchen exhaust ducts and mechanical ventilation ducts serving areas specified in Cl.36(d) which pass through one or more floor slabs shall be of masonry or drywall. Such shaft shall be completely compartmented from the rest of the shaft space containing other ducts or any other services installations. Protected shaft containing ducts serving other areas which pass through two or more floor slabs shall be constructed of drywall. If the protecting structure for the protected shaft is constructed of drywall, the following conditions shall be complied with :
  - (aa) Drywall shall be non-combustible; and
  - (bb) Drywall shall have fire resistance for not less than the relevant period specified in Table(4.2) having regard to the Purpose Group of the building of which it forms a part and the dimension specified in that Table; and
  - (cc) Drywall shall meet the criteria, in terms of impact and deflection performance, when subject to the tests of BS 5588 Pt 5 Appendix A and BS 5234 Pt 2; and
  - (dd) Drywall shall meet the criteria, in terms of water absorption and bending strength; and performance, when subject to the test of BS EN 520 (for gypsum plaster board) or ISO 1896 (for calcium silicate or cement board).
  
- (ii) Protected shaft used for the enclosure of electrical power services shall be interrupted at every floor level with barriers with fire resistance of at least half an hour. Protected shaft used for the

enclosure of telecommunications cables shall be interrupted by barriers with fire resistance of at least half an hour at vertical intervals not exceeding 15m. Such cavity barriers shall comply with the relevant provisions of Cl.25.

- (iii) In the case of protected shafts which are interrupted by barriers with fire resistance of at least half an hour at every floor level or protected shafts containing sanitary pipes or water pipes, fire resisting doors opening into the protected shaft are not required to be installed with automatic self closing devices, provided such doors are kept closed and locked at all times.
- (iv) All protected shafts containing services shall not be located within an exit staircase except for the case of residential apartment/maisonette development under Purpose Group II not exceeding 6 storey where smoke-stop lobby is not required.

## 23. PROTECTION OF OPENINGS

- (a) The provisions of this Clause are made in connection with the protection of openings permitted in elements of structure or other forms of fire resisting construction required to act as a barrier to fire and smoke.
- (b) Fire doors for protection of openings shall comply with the following:
  - (i) Fire doors shall have the appropriate fire resistance as required by relevant parts of this Code, and two fire doors may be fitted in an opening if each door by itself is capable of closing the opening and the two doors together achieve the required level of fire resistance, and

- (ii) All fire doors shall be fitted with an automatic self closing device which is capable of closing the door from any angle and against any latch fitted to the door. The omission of the self-closing device to the bolted door leaf of a 2-leaf door is acceptable if the door is the entrance door to a residential unit under Purpose Group II.
- (iii) Where a self closing device would be considered a hindrance to the normal use of the building, fire doors may be held open as follows:
  - (aa) by a fusible link, or
  - (bb) if the doors can be opened manually, by electromagnetic or electro mechanical devices which can be activated by the presence of smoke and/or the building alarm system,
- (iv) Any hinge on which a fire door shall be of the type approved according to International standards, and
- (v) Any fire door fitted in an opening which is provided as a means of escape:
  - (aa) shall be capable of being opened manually, without the use of key, tool, special knowledge or effort for operation from the inside of the building; and
  - (bb) shall not be held open by any means other than by an electromagnetic or electro mechanical device which can be activated by the presence of smoke and/or the building alarm system, provided that this shall not apply in the case of fire doors opening into pressurized exit staircases.
  - (cc) shall open in the direction of exit travel in accordance with Cl.7(j).

- (vi) Fire doors where required to be provided shall be constructed and installed to comply with Specification for Fire Doors.
- (c) Pipes
  - (i) Pipes which pass through a separating wall, compartment wall or compartment floor shall be kept as small as possible and fire stopped around the pipe. The nominal internal diameter of the pipe shall be not more than the relevant dimension given in Table(4.5). Spacing between pipes shall be minimum 50mm or ½-diameter of the largest pipe, whichever is the larger.
  - (ii) Routing of gas pipes in basements
    - (aa) All gas pipes that are routed in basement shall be API pipes with welded joints. These joints shall be 100% radiography checked in accordance with the International Specification that are recognized by Myanmar Fire Services Department. The gas pipes are not required to be fire rated if they are running outside essential areas such as exit staircases, smoke stop or fire fighting lobby, fire pump room, generator room, fire command centre, etc. If they run into essential area, they are required to be encased in masonry.
    - (bb) For mechanically ventilated basement, the gas pipes shall be provided with pipe sleeves for the venting of gas pipes. One end of the sleeve shall be exposed to the external as specified in International Standards that are recognized by Myanmar Fire Services Department.



- (cc) For naturally ventilated basement that complies with sub-clause 57(d)(iii)(bb), the provision of pipe sleeve is not required.
- (d) Ventilation Ducts - Ventilation duct which passes directly through a compartment wall or compartment floor shall comply with the following:
  - (i) Where the ventilation duct does not form a protected shaft or is not contained within a protecting structure,
    - (aa) the duct shall be fitted with a fire damper where it passes through the compartment wall or compartment floor, and
    - (bb) the opening for the duct shall be kept as small as practicable and any gap around the fire damper shall be fire stopped.
  - (ii) Where the ventilation duct forms a protected shaft or is contained within a protecting structure, the duct shall be
    - (aa) fitted with fire dampers at the inlets to the shaft and outlets from it, and
    - (bb) constructed and lined with materials in accordance with the requirements in Chapter 8.
  - (iii) The installation of ventilation ducts and fire dampers shall comply with the requirements in Chapter 8.
- (e) Flues - Duct encasing one or more flue pipes which passes through a compartment wall or compartment floor shall be of non combustible construction having fire resistance of not less than half the minimum period of fire resistance required for the compartment wall or compartment floor through which it passes, except for kitchen flue pipes when the fire resistance shall be as required for the compartment wall or compartment floor.

- (f) The places that are not allowed Pipes Plumbing
- (i) Air ducts, sanitary pipes, gas pipes, electrical conduits/cable tray and other services that are likely to permit passage of flame or smoke in the event of a fire shall not be permitted to pass through the following spaces:
- (aa) Fire Command Centre;
  - (bb) Fire Pump Room;
  - (cc) Emergency Generator Room;
  - (dd) Smoke Control Fans Room.
- except where such services are required for the operation of these equipment.
- (ii) Air ducts, sanitary pipes, gas pipes, electrical conduits/cable tray, and other services, excluding lifts, that are likely to permit passage of flame or smoke in the event of a fire shall not be permitted to run inside and/or pass through:
- (aa) fire-fighting lobby;
  - (bb) smoke-stop lobby.
- (iii) all these services are protected with 1 hour fire resistance enclosure, or separated with 1 hour fire resistance ceiling from the said lobby. If these services are required for the operation of the above lobbies, they need not be separately protected.

#### 24. EXIT STAIRCASES

- (a) Every exit staircase, including the treads/risers and landing, shall be constructed of non-combustible materials. The exception is for buildings

under Purpose Group I, where only the stringer or structures supporting the treads/risers and landing shall be constructed of non-combustible materials.

- (b) Structure Separating Exit Staircase - The exit staircase shall be separated from other parts of the building by a masonry structure or drywall complying with Cl.22(g)(ii) which shall have fire resistance for not less than the period required by Cl.17 for Elements of Structure.
- (c) Exit Doors - Doors opening into the exit staircase shall have fire resistance of at least half an hour and fitted with automatic self-closing device.
- (d) Finishes - Finishes to the ceilings/walls and floors of exit staircase shall be of non-combustible materials.

## 25. CONCEALED SPACES

- (a) General Provision- Concealed spaces in a building shall be interrupted by construction of cavity barriers to restrict the spread of smoke and flames.
- (b) Closing The Edges Of Cavities - Cavity barriers shall be used to close the edges of cavities, edges around openings through a wall, floor and any other part of the construction which contains a cavity and to separate any cavity in a wall, floor or any other part of the construction from any other such cavity.
- (c) Interrupting Cavities - Cavities including roof spaces shall be interrupted by cavity barriers where a wall, floor, ceiling, roof or other part of the construction abut the cavity. Such cavity barriers shall be of fire resisting construction at least equal to the provision for that required for the fire resisting barrier.
- (d) Sub-Division of Extensive Cavities - Cavities, including roof spaces, unless otherwise permitted, shall be sub divided so that the maximum distance

between cavity barriers shall not exceed the relevant dimensions given under Table (4.6).

- (e) Cavity barriers shall be
  - (i) Constructed to provide at least half an hour fire resistance, and
  - (ii) Tightly fitted to rigid construction or the junctions shall be fire stopped to comply with the requirements of Cl.26.
  
- (f) Openings in Cavity Barrier - A cavity barrier shall have no opening in it except for:
  - (i) A door which has at least half an hour fire resistance and shall be kept closed all the time,
  - (ii) A pipe which complies with the provision under Cl.23(c),
  - (iii) A cable or conduit containing one or more cables,
  - (iv) An opening fitted with suitably mounted automatic fire damper, and
  - (v) A duct which is fitted with a suitably mounted fire damper where it passes through the cavity barrier.
  
- (g) Raised Floors for Fixed Stages and Display Platforms - The construction of raised floors for fixed stages and display platforms shall comply with the following requirements:
  - (i) The concealed space between the structural floor and raised floor shall not be used for storage purpose, and
  - (ii) No services or installation shall be permitted within the concealed space other than electrical wiring in conduit, and
  - (iii) All sides shall be properly sealed, and

- (iv) The concealed space shall be sub divided by cavity barriers in compliance with the requirements of Cl.25(d) and Table (4.6).
  
- (h) Raised Floors With or Without Accessible Panels - The construction of raised floors with or without accessible panels shall comply with the following requirements:
  - (i) The supporting structure shall be constructed of non combustible materials having a melting point of at least 800°C, and
  - (ii) The concealed space between the structural floor and raised floor shall not be used for storage purpose, and
  - (iii) No services or installation shall be permitted within the concealed space other than
    - (aa) electrical wiring in metal conduit and metal trunking in compliance with the requirements of specifications and standards;
    - (bb) communication cables for computer equipment
    - (cc) fire protection installations serving the area, and
  - (iv) Where the raised floor is used as a plenum, requirements in Cl.67(f) shall be satisfied, and
  - (v) Decking of the raised floor shall be constructed of non combustible material or where combustible material is used as core material, if allowed in the case of sprinkler protected buildings, the top, bottom, all sides and cut edges shall be covered with material with surface property complying with Class 0 (excluding materials for floor finishes), and

- (vi) In the case of raised floors with accessible panels, access sections or panels shall be provided such that all concealed spaces between the structural floor and raised floor are easily accessible, and
- (vii) Openings in the raised floor for entry of electrical cables shall be effectively closed to prevent entry of debris or other combustible material into the concealed spaces, and
- (viii) All sides shall be properly sealed, and
- (ix) The concealed space shall be sub-divided by cavity barriers such that the maximum unobstructed area within the concealed space does not exceed  $930\text{m}^2$ , and
- (x) Where the concealed space is fitted with an automatic sprinkler system which complies with the requirements in Chapter 7, cavity barriers are not required, and
- (xi) For a non-sprinklered protected building, if the height of the concealed space measured between the top of the structural floor and underside of the raised floor decking exceeds 150mm, it shall be fitted with automatic smoke detection system complying with Chapter 7. For a sprinkler protected building, the concealed space shall be fitted with automatic smoke detection system as above if its height is between 150mm to 400mm, and automatic sprinkler system if it exceeds 400mm.
- (xii) Where the height of concealed space measured between the top of the structural floor and the underside of the raised floor decking is less than 50mm, the requirements on provision of cavity barriers shall not be applicable.

- (i) Myanmar Fire Services Department may consent to exempt from provision of cavity barriers within the concealed spaces of suspended ceiling, provided the following requirements are complied with:
  - (i) The concealed space shall not be used for storage purpose, and
  - (ii) The supporting elements shall be constructed of non combustible material, and
  - (iii) The exposed surfaces within the concealed space is of Class 0 flame spread, (excluding surfaces of any pipe, cable, conduit or insulation of any pipe) and
  - (iv) In the case of a detector protected building, if the concealed space does not exceed 800mm in depth or if the concealed space is fitted with detectors which comply with the requirements of Chapter 7.
  - (v) In the case of a sprinkler protected building:
    - (aa) if the concealed space does not exceed 400mm in
    - (bb) if the concealed space exceeds 400mm and does not exceed 800 mm in depth and no combustible material is used within the concealed space, or
    - (cc) if the concealed space is fitted with an automatic sprinkler system which complies with the requirements of Chapter 7.
  - (vi) In the case of other buildings, if the concealed space does not exceed 800mm in depth.
- (j) Where the concealed space of suspended ceiling is fitted with an automatic sprinkler system which complies with the requirements in Chapter 7,

- (i) The concealed space may be exempted from provision of cavity barriers, and
  - (ii) Combustible materials and materials with other than Class 0 flame spread may be used for the supporting elements and exposed surfaces of materials within the concealed space, provided the ceiling is not situated over an exit passageway, smoke stop lobby or other designated means of escape facilities.
- (k) Suspended Ceiling over Protected Areas - The concealed spaces of suspended ceiling over an exit passageway, smoke-stop lobby, exit staircase or other designated means of escape facilities, shall comply with the following:
- (i) the ceiling supporting elements and the ceiling shall be constructed of non-combustible materials; and
  - (ii) the exposed surfaces within the concealed space shall be of Class 0 surface flame spread.
  - (iii) Where sprinkler system is installed within the concealed spaces at smoke-stop lobby/fire-fighting lobby, the ceiling supporting elements and its exposed surface may have a surface spread of flame not lower than Class 2.
- (l) Buildings under Purpose Group I are not required to comply with the requirements on the provision of cavity barrier in concealed spaces. Residential units in buildings under Purpose Group II need not comply with requirements on the provision of cavity barrier in concealed floor and ceiling spaces.



## 26. FIRE STOPPING

- (a) Openings for pipes, ducts, conduits or cables which pass through any part of an Element of Structure (except for a part which does not serve as a fire resisting barrier) or Cavity Barrier, shall be:
  - (i) Kept as few in number as possible, and
  - (ii) Kept as small as practicable, and
  - (iii) All gaps shall be filled with fire stopping materials.
- (b) Fire stopping - Fire stopping shall be of material having the necessary fire resistance when tested to other acceptable international standards.
- (c) Materials for Fire-Stopping - Suitable fire stopping materials include :
  - (i) Proprietary fire stopping and sealing systems which have been shown by test to maintain the fire resistance of the wall or other element, subject to approval by the international standards.
  - (ii) Other fire-stopping materials include:
    - (aa) cement mortar;
    - (bb) gypsum based plaster;
    - (cc) cement or gypsum based vermiculite/perlite mixes;
    - (dd) glass fibre, crushed rock, blast furnace slag or ceramic based products (with or without resin binders), and
    - (ee) intumescent mastics.

Noted : The method of fire stopping and choice of materials should be appropriate to the situation and its application.

## 27. RESTRICTION OF SPREAD OF FLAME OVER SURFACES OF WALLS AND CEILINGS

- (a) Any reference to a surface being Class 0 shall be construed as a requirement that
  - (i) The material of which the wall or ceiling is constructed shall be non combustible throughout; or
  - (ii) The surface material shall have a surface of Class 1 of flame spread.
- (b) Any reference to a surface being of a class other than Class 0 shall be construed as a requirement that the material which the wall or ceiling is constructed shall comply with the relevant test criteria as to surface spread of flame specified in relation to that class in BS 476: Part 7.
- (c) Class 0 shall be regarded as the highest class followed in descending order by Class 1, Class 2, Class 3 and Class 4, as set hereunder:
  - (i) Class 0 Surface of no Flame Spread. Those surfaces that conform to the requirements of Cl. 27(a).
  - (ii) Class 1 Surface of Very Low Flame Spread. Those surfaces on which not more than 150mm mean spread of flames occurs under the relevant test conditions.
  - (iii) Class 2 Surface of Low Flame Spread. Those surfaces on which during the first 1½ minutes of test, the mean spread of flame is not more than 375mm and the final spread does not exceed 450mm under the relevant test conditions.
  - (iv) Class 3 Surface of Medium Flame Spread. Those surfaces on which during the first 1½ minutes of test, the mean spread of flame is not

more than 375mm and during the first 10 minutes of test is not more than 825mm under the relevant test conditions.

- (v) Class 4 Surface of Rapid Flame Spread. Those surfaces on which during the first 1½ minutes of test the mean spread of flame is more than 375mm and during the first 10 minutes of test is more than 825mm under the relevant conditions.
- (d) The surface of a wall or ceiling in a room/space shall be of a class not lower than specified as relevant in the Table (4.7), provided that
  - (i) Where an automatic sprinkler system is fitted throughout in the building in compliance with the requirements in Chapter 7, there is no control on the surface of flame rating in room/space, except for the following occupancies/usage:
    - (aa) Health care facilities, including hospital, nursing home for handicapped, disabled, aged or persons with mental and/or mobility impairments.
    - (bb) Detention facilities.
    - (cc) Exit staircase, exit passageway and smoke-stop / firefighting lobbies.
  - (ii) Where a building is not protected by automatic sprinkler system, surfaces of the walls and ceilings may be of a surface class not lower than Class 3 to the extent permitted by Cl.27(e)(i) and Cl.27(e)(ii) respectively.
  - (iii) If timber is used as the surface material for the walls along the side gangways of the auditorium which is not sprinkler protected, the requirements of this regulation pertaining to the requisite class of

flame spread may be relaxed only in respect of those parts of such wall surfaces provided the aggregate area of such parts does not exceed 50 percent of the whole surface area of the side walls of the auditorium.

- (e) Area Limitations of Flame Spread on Wall and Ceiling in a Room or Compartment
- (i) Any part of the surface of a wall in a room or compartment may be of any class not lower than Class 3 if the area of that part (or if there are two or more such parts, the total area of those parts) does not exceed the following
- (aa) in the case of a building or compartment of Purpose Group III, 20m<sup>2</sup>, or
- (bb) in any other case, 60m<sup>2</sup>.
- (ii) Any part of the surface of a ceiling may be of any class not lower than Class 3 if that part of the surface is the face of a layer of material the other face of which is exposed to the external air (skylight included) and
- (aa) the ceiling is that of a room in a building or compartment of Purpose Group III, IV, V or VII or that of a circulation space excluding smoke stop lobby, exit staircase and exit passageway in a building or compartment of any purpose group, and
- (1) the area of that part does not exceed 2.5m<sup>2</sup>, and
- (2) the distance between that part and any other such part is not less than 3.5m, or

- (bb) the ceiling is that of a room in a building or compartment of Purpose Group VI or VIII, and
    - (1) the area of that part does not exceed 5.0m<sup>2</sup>, and
    - (2) the distance between that part and any other such part is not less than 1.8m, and
  - (cc) that part and all other such parts are evenly distributed over the whole area of the ceiling and together have an area which does not exceed 20% of the floor area of the room, or
  - (dd) the ceiling is that of a balcony, verandah, open carport, covered way or loading bay which (irrespective of its floor area) has at least one of its longer sides wholly and permanently open, or
  - (ee) the ceiling is that of a garage or outbuilding which (irrespective of whether it forms part of a building or is a building which is attached to another building or wholly detached ) has floor area not exceeding 40m<sup>2</sup>.
- (f) Wall and ceiling finishes in the form of thin sheet of not more than 1.0 mm thickness mounted on a non-combustible substrate will not be subject to the requirement of surface spread of flame provisions provided that this exception shall not apply to smoke-stop/firefighting lobbies, exit staircases and passageways.

## 28. ROOFS

- (a) Surface of materials for roof covering and roof construction shall have a surface spread of flame rating not lower than Class 1, except in the case of

Purpose Groups I and II, and in buildings that are protected throughout with automatic sprinkler system in compliance with Chapter 7.

- (b) Myanmar Fire Services Department may consent to the use of combustible material for roof construction for buildings of Purpose Groups III, IV, V and VII, which satisfy the following requirements :
  - (i) Building does not exceed four storeys, and
  - (ii) Roof space between the roof and the ceiling shall be sub divided by cavity barriers where required to comply with the relevant provisions of Cl.25, and openings in cavity barriers shall be fire stopped to comply with the requirements of Cl.26, and
  - (iii) If the underside of the roof serves as the ceiling to a room or space, the elements of the underside of the roof shall comply with the relevant provisions of Cl.27 for restriction of spread of flame.
- (c) At the junctions with separating wall or compartment wall, roof construction shall comply with the relevant requirements under Cl.20(c) and Cl.21(d) respectively.
- (d) Roof Terrace - Roof terrace shall not be roofed over. If it is either partially or fully roofed over, it shall be considered as a habitable floor.

## 29. MATERIALS FOR CONSTRUCTION

- (a) Materials for Construction shall comply with the following standards:
  - (i) Materials used in the construction of building elements shall comply with the provisions stated under this section in addition to the performance requirements such as for fire resistance and limit to spread of flame as stipulated in other relevant sections of this Code.

- (ii) Intumescent paints - Intumescent paints is allowed to be used for protection of structural steel members of all buildings provided:
- (aa) the paint shall be of a proprietary system that has been demonstrated to achieve the fire resistance performance as required in BS 476 Part 20/21 or its equivalent, together with the specified weathering tests as specified in the BS 8202: Part 2;
  - (bb) coating of intumescent paint onto structural steel, and subsequent maintenance shall conform to BS 8202: Part 2; and
  - (cc) all requirements stipulated in the Appendix to this clause: “Notes on the use of Intumescent Paints for Protection to Structural Steel Members of Buildings” shall be complied with. (Please see Appendix (4))

Note : In buildings under Purpose Groups VI & VIII, where there may be presence of corrosive atmosphere that may affect the effectiveness of intumescent paints for protection to structural steel members of buildings, such proposal shall be subjected to evaluation of Myanmar Fire Services Department.

- (iii) Flame retardant chemicals are permitted to be used for upgrading of fire resistance rating or surface spread of flame of timber or any combustible materials, subject to the following:
- (aa) The chemical treatment process is part and parcel of the manufacturing process to produce the finished product ;

- (bb) The chemical treatment is by means of pressure impregnation conforming to the International Standards that are recognized by Myanmar Fire Services Department. Use of Timber in Building Construction, or the manufacturer's specification in accordance to the prototype test, for timber and other combustible materials respectively.
  - (cc) The treated materials/products have been subjected to fire test as required under Cl 18(a) or Cl 27(a).
- 
- (b) All elements of structure shall be constructed of non-combustible materials in addition to the relevant provisions as follows: Cl.17 for fire resistance of elements of structure, Cl.19(a), 19(b)& 19(d) for External Walls, Cl.20(a)(iii)/(iv) & 20(e) for Separating Walls, Cl.21(a)(iii)/(iv), 21(e) & 21(f) for Compartment Walls and Compartment Floors, Cl.22(b)(iii), 22(d), 22(g)(ii), 22(h)(ii), 22(h)(v) & 22(i) for Protected Shafts.
  - (c) Materials used for the protection of openings shall comply with the relevant provisions of Cl.23 of this Code for protection of openings.
  - (d) Exit staircases shall be constructed of non-combustible materials to comply with the provisions of Cl.24(a).
  - (e) Materials used for the construction of raised floors shall comply with the provisions of Cl.25(h)(i) & Cl.25(h)(v).
  - (f) Materials used for construction of ceiling and its supports shall comply with Table (4.8), except for supports that are required to comply with Cl.25(i)(ii).
  - (g) Construction of ceilings and ceiling supports located within sprinkler protected building shall comply with the provision of Cl.25(j)(ii).



- (h) Materials used for fire stopping shall comply with the relevant provisions of Cl.26(b & c).
- (i) Materials used on the surfaces of walls and ceilings are required to meet the requirements for restriction of spread of flame and to comply with the performance requirements as stipulated under Cl.27.
- (j) Materials used for roof construction shall comply with the provisions of cl.28(a & b).
- (k) Internal non-load bearing walls in buildings shall comply with Table (4.8) and the materials for surface finishes of internal non-load bearing walls shall not be treated as part of the wall and shall comply with the relevant provisions of Cl.27.
- (l) It shall also comply with the following standards:
  - (i) Composite panels which consist of plastic core shall not be used either for the construction of internal non-load bearing walls, ceilings, external walls or as cladding to external walls of all buildings unless prior approval has been obtained from Myanmar Fire Services Department.
  - (ii) Materials with surface flame spread rating of not lower than Class 2 shall be permitted to be used for the construction of partition for toilet cubicles. If the material used is of Class 3 surface flame spread rating, total exposed surface area of the partitions within the toilet shall not be more than 60m<sup>2</sup>.
- (m) Fire rated glass wall/door to compartment walls, compartment floors, smoke-stop lobby and fire-fighting lobby, and protected shafts not containing exit staircase and fire lift. In buildings which are protected by an automatic

sprinkler system, fire rated glass can be used for the construction of compartment walls, compartment floors, enclosures to smoke-stop lobby and firefighting lobby, and protected shafts not containing exit staircase and fire lift, subject to the following:

- (i) The walls and doors shall have the necessary fire resistance, including insulation, when subject to test under BS 476: Part 20-23; and
  - (ii) The walls and doors shall meet the Class A of the Impact Performance requirements when subject to test under BS 6206 or AS 2208.
- (n) Walls, ceilings, roof covering and finishes shall not contain any plastic material.
- (o) For additions and alterations to existing buildings, non-combustible partitions shall be used for separation of areas undergoing A&A works from other occupied areas of the building.

Table (4.1)

## SIZE LIMITATION OF BUILDING AND COMPARTMENT

(1) Compartments	(2) Maximum Floor Area	(3) Maximum Cubical Extent
Compartment below ground level. No compartment to comprise more than one storey.	2000m <sup>2</sup>	7500m <sup>3</sup>
Compartments between average ground level and a height of 24m. No compartment to comprise more than 3 storeys.	4000m <sup>2</sup>	15000m <sup>3</sup>
Compartments above a height of 24m from average ground level. No compartment to comprise more than one storey.	2000m <sup>2</sup>	7500m <sup>3</sup>

Table (4.2)

(Minimum periods of fire resistance)

In this Table -

“cubical extent” means the cubical extent of the building or, if the building is divided into compartments, the compartment of which the elements of structure forms part;

“floor area” means the floor area of each storey in the building or, if the building is divided into compartments, of each storey in the compartment of which the element of structure forms part;

“height” has the meaning assigned to that expression by Cl.17(d)(2); “NL” means No limit applicable.

## PART I

## BUILDINGS OTHER THAN SINGLE STOREY BUILDINGS

Purpose group (1)	Maximum dimensions			Minimum period of fire resistance (in hours) for elements of structure (*) forming part of-	
	Height (in m) (2)	Floor area (in m <sup>2</sup> ) (3)	Cubical Extent (in m <sup>3</sup> ) (4)	Above ground storey (5)	Basemest storey (6)
I (Small residential)					
House having not more than 3-storeys	NL	NL	NL	½	1(a)
House having 4-storeys	NL	250	NL	1(b)	1
House having any number of storey	NL	NL	NL	1	1½
II (Other residential)					
Building or part (+) having not more than two Storeys	NL	500	NL	½	1
Building or part (+) having 3-storeys	NL	250	NL	1(b)	1
Building having any number of storeys	28	3,000	8,500	1	1½
Building having any number of storeys storeys	NL	2,000	5,500	1½	2
III (Institutional)	28 over 28	2,000 2,000	NL NL	1 1½	1½ 2
IV (Office)	7.5 7.5 15 28 NL	250 500 NL 5,000 NL	NL NL 3,500 14,000 NL	½ ½ 1(b) 1 1½	1(a) 1 1 1½ 2

**PART I - continued**  
**BUILDINGS OTHER THAN SINGLE STOREY BUILDINGS - continued**

Purpose group (1)	Maximum dimensions			Minimum period of fire resistance (in hours) for elements of structure (*) forming part of-	
	Height (in m) (2)	Floor area (in m <sup>2</sup> ) (3)	Cubical Extent (in m <sup>3</sup> ) (4)	Above ground storey (5)	Basement storey (6)
V (Shop)	7.5	150	NL	½	1(a)
	7.5	500	NL	½	1
	15	NL	3,500	1(b)	1
	28	1,000	7,000	1	2
	NL	2,000	7,000	2	4
VI (Factory)	7.5	250	NL	½	1(a)
	7.5	NL	1,700	½	1
	15	NL	4,250	1(b)	1
	28	NL	8,500	1	2
	28	NL	28,000	2	4
	Over28	2,000	5,500	2	4
VII (Place of public resort)	7.5	250	NL	½	1(a)
	7.5	500	NL	½	1
	15	NL	3,500	1(b)	1
	28	1,000	7,000	1	1½
	NL	NL	7,000	1½	2
VIII (Storage and general)	7.5	150	NL	½	1(a)
	7.5	300	NL	½	1
	15	NL	1,700	1(b)	1
	15	NL	3,500	1	2
	28	NL	7,000	2	4(d)
	28 over	NL	21,000	4(c)	4(d)
	28	1,000	NL	4(c)	4(d)

Notes to Part I

For the purpose of Cl 17(a) the period of fire resistance to be taken as being relevant to an element of structure is the period included in columns (5) or (6) in the line of entries which specifies the floor area with which there is conformity or, if there are two or more such lines, in the topmost of those lines.

(\*) A floor which is immediately over a basement storey shall be deemed to be an element of structure forming part of a basement storey.

(+) The expression “part” means a part which is separated as described in Cl 17(d)(2).

- (a) The period is half an hour for elements forming part of a basement storey which has an area not exceeding 50 m<sup>2</sup>
- (b) This period is reduced to half an hour in respect of a floor which is not a compartment floor, except as to the beams which support the floor or any part of the floor which contributes to the structural support of the building as a whole.
- (c) This period is reduced to 2-hours for:
  - (1) unsprinklered, open-sided standalone car park buildings
  - (2) sprinkler protected, above-ground car park floors in standalone car park building or mixed-use building.
- (d) Single basement carpark storey, which is sprinklered protected, the element of structure can be reduced to half the minimum period of fire resistance.

Table (4.2) - continued  
 (Minimum periods of fire resistance)  
 PART 2 - SINGLE STOREY BUILDINGS

Purpose group (1)	Maximum floor area (in m <sup>2</sup> ) (2)	Minimum period of fire resistance (in hours) for elements of structure (3)
I (Small residential)	NL	½
II (Other residential)	3,000	½
III (Institutional)	3,000	½
IV (Office)	3,000 NL	½ 1
V (Shop)	2,000	½
	3,000	1
	NL	2
VI (Factory)	2,000	½
	3,000	1
	NL	2
	3,000	½
VII (Place of public resort)	NL	1
	500	½
VIII (Storage and general)	1,000	1
	3,000	2
	NL	4(a)

#### Notes to Part 2

For the purpose of Cl 17(a) the period of fire resistance to be taken as being relevant to an element of structure is the period included in column (3) in the line of entries which specifies the floor area with which there is conformity or, if there are two or more such lines, in the topmost of those lines.

(a) This period is reduced to 2-hours for open-sided buildings which are used solely for carparking.

Table (4.3)  
(Suspended ceilings)

Height of building (1)	Type of floor (2)	Required fire resistance of floor (3)	Description of suspended ceiling (4)
Less than 15m	Non- Compartment	1 hour or less	Surface of ceiling exposed within the cavity not lower than
	Compartment	Less than 1 hour	Class I (as to surface spread of flame).
	Compartment	1 hour	Surface of ceiling exposed within the cavity not lower than Class O (as to surface spread of flame); supports and fixing for the ceiling non-combustible.
15m or more	Any	1 hour or less	Surface of ceiling exposed within the cavity not lower than Class O (as to surface spread of flame) and jointless; supports and fixing for the ceiling non-combustible.
Any	Any	More than 1 hour	Ceiling of non-combustible construction and jointless; supports and fixings for the ceiling non-combustible.

Notes: (1) References to classes in the above table are to classes as specified in Cl.27.

- (2) Where the space above a suspended ceiling is protected by an automatic sprinkler system it shall be exempted from the requirements for non-combustibility and surface spread of flame classification as specified in the above table provided the ceiling is not situated over an exit passageway, protected lobby or other required protected means of escape



Table (4.4)

## SPECIFIC PROVISIONS OF TEST FOR FIRE RESISTANCE OF ELEMENTS OF STRUCTURE ETC

Part of building	Minimum provisions when tested to BS 476: Part 20-23 (minutes)			Method of exposure
	Stability	Integrity	Insulation	
1 Structural frame, beam or column	*	no requirement	no requirement	exposed faces
2 Loadbearing wall which is not also an external wall, separating wall, compartment wall or protecting structure (See 4, 5, 6 or 7)	*	no requirement	no requirement	each side separately
3 Floors				
(a) floor in upper storey of a 2-storey dwelling house (but not over a garage)	30	15	15	from underside (Note 1)
(b) any other floor (including a compartment floor)	*	*	*	from underside (Note 1)
4 External walls				
(a) any part less than 1m from point on relevant boundary	*	*	*	Each side separately
(b) any part of the wall of a building used for Assembly purposes which is 1m or more from the relevant boundary and is described in Note 2	*	*	15	from inside
	(max. 60)	(max. 60)	(max. 60)	from outside
(c) any part 1 m. or more from the relevant boundary and is not a part described in (b) above	*	*	15	from inside
5 Separating wall	*	*	*	each side separately
	(min. 60)	(min.60)	(min. 60)	
6 Compartment wall	*	*	*	each side separately
7 Protecting structure any part	*	*	*	each side separately
8 Wall separating an attached or integral garage from a dwelling house	*	*	*	from garage side

Part of building	Minimum provisions when tested to BS 476: Part 20-23 (minutes)			Method of exposure
	Stability	Integrity	Insulation	
9 Doors (a) in a separating wall (b) in a compartment wall if it separates a flat or maisonette from a space in common use in a compartment wall or compartment floor not described in (b) above (c) in a protecting structure situated wholly or partly above the level of the adjoining ground in a building used for Flats, Other Residential, Assembly or Office purposes (d) in a protecting structure not described in (d) above any other door (including a door in a cavity barrier and a door between a dwelling house and garage)	no provision	+(min. 60)	no provision***	each side separately when fitted in its frame
	no provision	30	no provision***	each side separately when fitted in its frame
	no provision	+	no provision***	each side separately when fitted in its frame
	no provision	30	no provision***	each side separately when fitted in its frame
	no provision	** (min. 30)	no provision***	each side separately when fitted in its frame
	No provision	30	no provision***	each side separately when fitted in its frame
10 Casing around a drainage system	30	30	30++	from outside
11 Cavity Barriers (a) cavity barrier 1m x 1m or Larger (b) any other cavity barrier (c) ceiling	30	30	15	each side separately
	30	30	no provision	each side separately
	30	30	30	from underside

#### Modifications

++ No provision for insulation if the casing is more than 50mm from any pipe in the enclosure (except a pipe passing through the casing).

#### Notes

\* Period of fire resistance as specified.

+ Period of fire resistance for the wall or floor in which the door is situated.

\*\* Half the period of fire resistance for the wall or floor in which the door is situated.

- \*\*\* This exemption does not apply to fire-rated glass door.
- 1 A suspended ceiling should only be relied on to contribute to the fire resistance of the floor if the ceiling meets the appropriate provisions given in Table 4.3.
- 2 Any part of the wall which is 7.5m or less above the ground, or above a roof or any other part of the building to which people have access, if the building has 2 or more storeys.

Table (4.5)

## MAXIMUM NOMINAL INTERNAL DIAMETER OF PIPES

Situation	Pipe material and maximum nominal internal diameter [mm]		
	Non-combustible material <sup>1</sup>	Lead, aluminium or aluminium alloy, or uPVC <sup>2</sup>	Any other material
When the pipes penetrate the structure enclosing a protected shaft which is not an exit stairway or lift shaft	150	100	40
Any other situation	150	100 (stack pipe) <sup>3</sup> 75 (branch pipe) <sup>3</sup>	40

## Notes

- (1) A non-combustible material (such as cast iron or steel) which if exposed to a temperature of 800 degrees Celsius will not soften nor fracture to the extent that flame or gases will pass through the wall of the pipe.
- (2) uPVC pipes complying with BS 4514:1983.
- (3)
  - (i) Within toilets, wash rooms or external corridors, maximum diameter of uPVC pipes may be increased to double the size given in the above table.
  - (ii) Within areas of fire risk, such as kitchens, and adjacent to escape routes, uPVC pipes shall be enclosed by construction having fire resistance of at least one half hour.
  - (iii) Where the size of uPVC pipes exceeds that specified under this Clause, approved fire collar shall be fitted at all positions where such pipes pass through constructions required to act as a barrier to fire.

Table (4.6)

## Maximum Dimensions of Cavities

Location of cavity	Purpose Group of building or compartment	*Class of surface exposed in cavity	Max. dimension in any direction
Between roof and ceiling	I & II	any	no limit
	others	any	20m
Any other cavity	any	Class 0	20m
	any	any	8m
* excluding surface of any pipe, cable, conduit or insulation of any pipe.			

188  
Table (4.7)

Purpose group of building	Classification of finishes to walls and ceiling relating to flame spread							
	Non-sprinkler protected building				Sprinkler protected building			
	Room, compartment	Circulation space	Smoke-stop/ fire-fighting lobby	Exit staircase & exit passageway	Room, compartment	Circulation space	Smoke-stop/ fire-fighting lobby	Exit staircase & exit passageway
I (Small residential)	No control	N/A	N/A	N/A	No control	No control	2	0
II (Other residential)	No control	0	0	N	No control	No control	2	0
III (Institutional)	1	0	0	N	3*	3*	2	0
IV ( Office)	1	0	0	N	No control	No control	2	0
V (Shop)	1	0	0	N	No control	No control	2	0
VI (Factory)	1	0	0	N	No control	No control	2	0
VII (Place of public resort)	1	0	0	N	No control	No control	2	0
VIII (Storage)	1	0	0	N	No control	No control	2	0

N Non-combustible to comply with BS 476 Pt 4.

3\* Applies to Detention facilities and Health-care, including hospital, old-aged homes, nursing homes for mentally or physically disabled patients.

N/A Not Applicable

189  
Table (4.8)

Purpose group of building	Material construction (Homogenous)*					
	Non-sprinkler protected building			Sprinkler protected building		
	Internal non-load bearing wall and ceiling within room, compartment	Circulation spaces, e.g. common corridor passageway, etc	Roof covering, including supports	Internal non-load bearing wall and ceiling within room, compartment	Circulation spaces, e.g. common corridor, passageway, etc	Roof covering, including supports
I (Small residential)	No control	N/A	N/A***	No control	No control	No control
II (Other residential)	No control	N	N/A***	No control	No control	No control
III (Institutional)	0	N	1	3**	3**	3**
IV (Office)	0	N	1	No control	No control	No control
V (Shop)	0	N	1	No control	No control	No control
VI (Factory)	0	N	1	No control	No control	No control
VII (Place of public resort)	0	N	1	No control	No control	No control
VIII (Storage)	0	N	1	No control	No control	No control

\* Refer to the entire construction of the element.

0/1/3 The tests of BS 476 Pt 6 and/or Pt 7 shall be conducted with air gap

\*\* Applies to Detention facilities and health-care, including hospital, nursing homes for handicapped, disabled, aged or persons with mental and/or mobility impairment.

\*\*\* Roof support can be of timber construction but not of plastic material. Roof covering shall not be of plastic material

N/A Not Applicable

N Non-combustible, including limited combustibility.

## NOTIONAL PERIODS OF FIRE RESISTANCE

In this Appendix:

- (a) “Class 1 aggregate” means foamed slag, pumice, blast furnace slag, pelleted fly ash, crushed brick and burnt clay products (including expanded clay) well-burnt clinker and crushed limestone.  
“Class 2 aggregate” means flint gravel, granite, and all crushed natural stones other than limestones.
- (b) Any reference to plaster means:
- (i) in the case of an external wall 1m or more from the relevant boundary, plaster applied on the internal face only;
  - (ii) in the case of any other wall, plaster applied on both faces;
  - (iii) if to plaster of a given thickness on the external face of a wall, except in the case of a reference to vermiculite-gypsum plaster, rendering on the external face of the same thickness;
  - (iv) if to vermiculite-gypsum plaster, vermiculite-gypsum plaster of a mix within the range of 1 ½ to 2:1 by volume.
- (c) In the case of a cavity wall, the load is assumed to be on inner leaf only except for fire resistance period of four hours.
- (d) Any material or type of construction or method of mixing, preparing, using, applying or fixing the material as referred to in the table, shall conform with the relevant provisions of the Building Control Act and the relevant Singapore Standard or Singapore Standard Code of Practice in respect of the material or such matters. In the absence of a Singapore Standard or Singapore Code of Practice on the material or such matters, the relevant British Standard or British Code of Practice or other accepted Standard or Code of Practice shall be applicable.





## PART 1: WALLS - continued

## A. Masonry construction - continued

Construction and materials	Minimum thickness excluding plaster (in mm) for period of fire resistance of											
	Loadbearing						Non-loadbearing					
	4 hours	3 hours	2 hours	1 ½ hours	1 hour	½ hour	4 hours	3 hours	2 hours	1 ½ hours	1 hour	½ hour
3. Bricks of clay, concrete or sand - lime:												
(a) Unplastered .. .. .	200	200	100	100	100	100	170	170	100	100	75	75
(c) 13mm gypsum-sand plaster ..	200	200	100	100	100	100	170	170	100	100	75	75
(d) 13mm vermiculite-gypsum or perlite- gypsum* plaster.. ..	200 100	200 -	100 100	100 100	100 100	100 100	170 100	170 -	100 100	100 100	75 75	75 75
4. Concrete blocks of Class 1 aggregate:												
(a) Unplastered .. .. .	150	-	100	100	100	100	150	-	75	75	75	50
(b) 12.5mm cement-sand plaster.. ..	150	-	100	100	100	100	100	-	75	75	75	50
(c) 12.5mm gypsum-sand plaster .. ..	150	-	100	100	100	100	100	-	75	75	75	50
(d) 12.5mm vermiculite-gypsum plaster	100	-	100	100	100	100	75	-	75	62	50	50

## A. Masonry construction - continued

Construction and materials	Minimum thickness excluding plaster (in mm) for period of fire resistance of											
	Loadbearing						Non-loadbearing					
	4 hours	3 hours	2 hours	1 ½ hours	1 hour	½ hour	4 hours	3 hours	2 hours	1 ½ hours	1 hour	½ hour
5. Concrete blocks of Class 2 aggregate:												
(a) Unplastered .. .. .	-	-	100	100	100	100	150	-	100	100	75	50
(b) 12.5mm cement-sand plaster ..	-	-	100	100	100	100	150	-	100	100	75	50
(c) 12.5mm gypsum-sand plaster	-	-	100	100	100	100	150	-	100	100	75	50
(d) 12.5mm vermiculite-gypsum plaster	100	-	100	100	100	100	100	-	75	75	75	50
6. Autoclaved aerated concrete blocks, density 475 - 1200 kg/m <sup>3</sup> .. .. .	180	140	100	100	100	100	100	-	62	62	50	50
7. Hollow concrete blocks, one cell in wall thickness, of Class 1 aggregate:												
(a) Unplastered .. .. .	-	-	100	100	100	100	150	-	100	100	100	75
(b) 12.5mm cement-sand plaster	-	-	100	100	100	100	150	-	100	75	75	75
(c) 12.5mm gypsum-sand plaster	-	-	100	100	100	100	150	-	100	75	75	75
(d) 12.5mm vermiculite-gypsum plaster	-	-	100	100	100	100	100	-	75	75	62	62

- Perlite – gypsum plaster to clay bricks only.

## A. Masonry construction - continued

Construction and materials	Minimum thickness excluding plaster (in mm) for period of fire resistance of											
	Loadbearing						Non-loadbearing					
	4 hours	3 hours	2 hours	1½ hours	1 hour	½ hour	4 hours	3 hours	2 hours	1½ hours	1 hour	½ hour
8. Hollow concrete blocks, one cell in wall thickness, of Class 2 aggregate:												
(a) unplastered .. ..	-	-	-	-	-	-	150	-	150	125	125	125
(b) 12.5 mm cement-sand plaster ..	-	-	-	-	-	-	150	-	150	125	125	100
(c) 12.5 mm gypsum-sand plaster ..	-	-	-	-	-	-	150	-	150	125	125	100
(d) 12.5 mm vermiculite-gypsum plaster	-	-	-	-	-	-	125	-	100	100	100	75
9. Cellular clay blocks not less than 50% solid:												
(a) 12.5 mm cement-sand plaster ..	-	-	-	-	-	-	-	-	-	-	100	75
(b) 12.5 mm gypsum-sand plaster ..	-	-	-	-	-	-	-	-	-	-	100	75
(c) 12.5 mm vermiculite-gypsum plaster	-	-	-	-	-	-	200	-	100	100	100	62

A. Masonry construction - continued

Construction and materials	Minimum thickness excluding plaster (in mm) for period of fire resistance of											
	Loadbearing						Loadbearing					
	4 hours	3 hours	2 hours	1½ hours	1 hour	½ hour	4 hours	3 hours	2 hours	1½ hours	1 hour	½ hour
10. Cavity wall with outer leaf of bricks or blocks of clay, composition, concrete or sand-lime, not less than 100 mm thick and ;												
(a) inner leaf of bricks or blocks of clay, composition, concrete or sand lime	100	100	100	100	100	100	75	-	75	75	75	75
(b) inner leaf of solid or hollow concrete bricks or blocks of Class 1 aggregate	100	100	100	100	100	100	75	-	75	75	75	75
11. Cavity wall with outer leaf of cellular clay blocks as 9 above and inner leaf of autoclaved aerated concrete blocks, density 480-1200 kg/m <sup>3</sup>	150	140	100	100	100	100	75	75	75	75	75	75

## Appendix (A)-continued

## NOTIONAL PERIODS OF FIRE RESISTANCE

## PART 1 : WALLS – continued

## B Framed and composite construction (non-loadbearing).

	Construction and materials	Period of fire resistance (in hours)
1.	Steel frame with external cladding of 16 mm rendering on metal lathing and internal lining of autoclaved aerated concrete blocks, density 480-1120 Kg/m <sup>3</sup> of thickness of –	
	50mm ... ..	2
	62mm ... ..	3
	75mm ... ..	4
2.	Steel frame with external cladding of 100mm concrete blocks and internal lining of 16mm gypsum plaster on metal lathing ... ..	4
3.	Steel frame with external cladding of 16mm rendering on metal lathing and internal lining of 16mm gypsum plaster on metal lathing ... ..	1
4.	Steel or timber frame with facings on each side of -	
	(a) metal lathing with cement-sand or gypsum plaster of thickness of- 19mm ... ..	1
	12.5mm ... ..	½
	(b) metal lathing with vermiculite-gypsum or perlite-gypsum plaster of thickness of-	
	25mm ... ..	2
	19mm ... ..	1½
	12.5mm ... ..	1
	(c) 9.5mm plasterboard with gypsum plaster of thickness of 5mm ...	½
	(d) 9.5mm plasterboard with vermiculite-gypsum of thickness of-	
	25mm ... ..	2
	16mm ... ..	1 ½
	10mm ... ..	1
	5mm ... ..	½
	(e) 12.5mm plasterboard-	
	unplastered ... ..	½
	with gypsum plaster of thickness of 12.5mm ... ..	1

	Construction and materials	Period of fire resistance (in hours)
	(f) 12.5mm plasterboard with vermiculite-gypsum plaster of thickness of- 25mm ... .. 16mm ... .. 10mm ... ..	2 1 ½ 1
	(g) 19mm plasterboard (or two layers of 9.5mm fixed to break joint) without finish	1
	(h) 19mm plasterboard for two layers of 9.5mm with vermiculite-gypsum plaster of thickness of- 16mm ... .. 10mm ... ..	2 1 ½
	(i) 12.5mm fibre insulating board with gypsum plaster of thickness of 12.5mm ...	½
	(j) 25mm wood wool slabs with gypsum plaster of thickness of 12.5mm	1
5.	Compressed straw slabs in timber frames finished on both faces with gypsum plaster of thickness of 5mm ...	1
6.	Plasterboard 9.5mm cellular core partition-	
	(a) unplastered ..... (b) 12.5mm gypsum plaster ... .. (c) 22mm vermiculite-gypsum plaster ... ..	½ ½ 2
7.	Plasterboard 12.5mm cellular core partition-	
	(a) unplastered ..... (b) 12.5mm gypsum plaster ... .. (c) 16mm vermiculite-gypsum plaster ... ..	½ 1 2
8.	Plasterboard 19mm finished on both faces with 16mm gypsum plaster	1
9.	Plasterboard 12.5mm bonded with neat gypsum plaster to each side of 19mm plasterboard	1 ½
10.	Three layers of 19mm plasterboard bonded with neat gypsum plaster	2
11.	Wood wool slab with 12.5mm rendering or plaster of thickness of- 75mm ..... 50mm ..... .....	2 1
12.	Compressed straw slabs, with 75mm by 12.5mm wood cover strips to joints, of thickness of 50mm	½

## C. External walls (non-loadbearing) more than 1m from the relevant boundary.

## Construction and materials

1.	Steel frame with external cladding of non-combustible sheets and internal lining of-	
	(a) 12.5mm cement-sand or gypsum plaster on metal lathing ... ..	4
	(b) two layers of 9.5mm plasterboard ... ..	½
	(c) 9.5mm plasterboard finished with gypsum plaster of thickness of 12.5mm	½
	(d) 12.5mm plasterboard finished with 5mm gypsum plaster ... ..	½
	(e) 50mm compressed straw slabs ... ..	½
	(f) 50mm compressed straw slabs finished with 5mm gypsum plaster ...	2
*2.	Timber frame with external cladding of 10mm cement-sand or cement-lime rendering and internal lining of-	
	(a) 16mm gypsum plaster on metal lathing ... ..	1
	(b) 9.5mm plasterboard finished with 12.5 mm gypsum plaster ... ..	1
	(c) 12.5mm plasterboard finished with 5mm gypsum plaster ... ..	1
	(d) 50mm compressed straw slabs ... ..	1
	(e) aerated concrete blocks :	
	50mm ..... ..	3
	62mm ..... ..	4
	72mm ..... ..	4
	100mm ..... ..	4
3.	Timber frame with external cladding of 100mm clay, concrete or sand-lime bricks of blocks, finished internally with 16mm gypsum plaster on metal lathing	4
*4.	Timber frame with external cladding of weather boarding or 9.5mm plywood and internal lining of-	
	(a) 16mm gypsum plaster on metal lathing ... ..	½
	(b) 9.5mm plasterboard finished with 12.5 mm gypsum plaster ... ..	½
	(c) 12.5mm plasterboard finished with 5mm gypsum plaster ... ..	½
	(d) 50mm compressed straw slabs ... ..	½
	(e) aerated concrete blocks :	
	50mm ..... ..	3
	62mm ..... ..	4
	72mm ..... ..	4
	100mm ..... ..	4
* The presence of a combustible vapour barrier within the thickness of these constructions shall not be regarded as affecting these periods of fire resistance.		



## PART II: Reinforced concrete beams

Description	Minimum dimension of concrete to give a fire resistance in hours					
	4	3	2	1 ½	1	½
	mm	mm	mm	mm	mm	mm
1. Siliceous aggregate concrete:						
(a) average concrete cover to main reinforcement	65*	55*	45*	35	25	15
(b) beam width ... ..	280	240	180	140	110	80
2. As (1) with cement or gypsum plaster 15mm thick on light mesh reinforcement						
(a) average concrete cover to main reinforcement	50*	40	30	20	15	15
(b) beam width ... ..	250	210	170	110	85	70
3. As (1) with vermiculite/gypsum plaster <sup>+</sup> 15mm thick:						
(a) average concrete cover to main reinforcement	25	15	15	15	15	15
(b) beam width ... ..	170	145	125	85	60	60
4. Light weight aggregate concrete:						
(a) average concrete cover to main reinforcement	50	45	35	30	20	15
(b) beam width ... ..	250	200	160	130	100	80

\* Supplementary reinforcement, to hold the concrete cover in position, may be necessary.

+ Vermiculite/gypsum plaster should have a mix ratio in the range of 1½ - 2:1 by volume.

## PART III: Prestressed concrete beams

Description	Minimum dimension of concrete to give a fire resistance in hours					
	4	3	2	1 ½	1	½
1. Siliceous aggregate concrete	mm	mm	mm	mm	mm	mm
(a) average concrete cover to tendons ...	100*	85*	65*	50*	40	25
(b) beam width ... ..	280	240	180	140	110	80
2. As (1) with vermiculite concrete slabs 15mm thick , used as permanent shuttering :						
(a) average concrete cover to tendons ...	75*	60	45	35	25	15
(b) beam width ... ..	210	170	125	100	70	70
3. As (2) but with 25mm thick slabs:						
(a) average concrete cover to tendons ...	65	50	35	25	15	15
(b) beam width ... ..	180	140	100	70	60	60
4. As (1) with 15mm thick gypsum plaster with light mesh reinforcement:						
(a) average concrete cover to tendons ...	90*	75	50	40	30	15
(b) beam width ... ..	250	210	170	110	85	70
5. As (1) with vermiculite/gypsum plaster <sup>+</sup> 15m thick:						
(a) average concrete cover to tendons ... ..	75*	60	45	30	25	15
(b) beam width ... ..	170	145	125	85	60	60
6. As (5) but with 25mm thick coating:						
(a) average concrete cover to tendons ...	50	45	30	25	15	15
(b) beam width ... ..	140	125	85	70	60	60
7. Lightweight aggregate concrete:						
(a) average concrete cover to tendons ...	80	65	50	40	30	20

\* Supplementary reinforcement, to hold then concrete cover in position, may be necessary.

+ Vermiculite/gypsum plaster should have a mix ratio in the range of 1 ½ -2: 1 by volume.

## PART IV: Reinforced concrete columns (all faces exposed)

Type of construction	Minimum dimension of concrete to give a fire resistance in hours					
	4	3	2	1 ½	1	½
	mm	mm	mm	mm	mm	mm
1. Siliceous aggregate concrete						
(a) without additional protection... ..	450	400	300	250	200	150
(b) with cement or gypsum plaster 15mm thick on light mesh reinforcement ..... ..	300	275	225	150	150	150
(c) with vermiculite / gypsum plaster* ... ..	275	225	200	150	120	120
2. Limestone aggregate concrete or siliceous aggregate: concrete with supplementary ... .. reinforcement in concrete cover	300	275	225	200	190	150
3. Lightweight aggregate concrete ... ..	300	275	225	200	150	150

\* Vermiculite / gypsum plaster should have a mix ratio in the range of 1 ½ - 2:1 by volume.

## Reinforced concrete columns (one face exposed)

Type of construction	Minimum dimension of concrete to give a fire resistance in hours					
	4	3	2	1 ½	1	½
	mm	mm	mm	mm	mm	mm
1. Siliceous aggregate concrete						
(a) without additional protection... ..	180	150	100	100	75	75
(b) with vermiculite/ gypsum plaster* 15mm thick on exposed faces ... ..	125	100	75	75	65	65

\* Vermiculite / gypsum plaster should have a mix ratio in the range of 1 ½ - 2:1 by volume.

## PART V: STRUCTURAL STEEL

## A Encased steel stanchions (Mass per metre not less than 45 kg)

Construction and materials	Minimum thickness (in mm) of protection for a fire resistance of -					
	4 hours	3 hours	2 hours	1 ½ hours	1 hours	½ hours
<b>A. SOLID PROTECTION*</b> (unplastered)						
1. Concrete not leaner than 1:2:4 mix with natural aggregates-						
(a) concrete not assumed to be load-bearing reinforced+ ....	50	-	25	25	25	25
(b) concrete assumed to be load-bearing, reinforced in accordance with BS 5950 ..	75	-	50	50	50	50
2. Solid bricks of clay, composition or sand-lime	100	75	50	50	50	50
3. Solid blocks of foamed slag or pumice concrete reinforced+ in every horizontal joint ... ..	75	60	50	50	50	50
4. Sprayed vermiculite-cement . . . . .	-	-	38	32	19	12.5
<b>B. HOLLOW PROTECTION**</b>						
1. Solid bricks of clay, composition or sand-lime reinforced in every horizontal joint, unplastered ...	115	-	50	50	50	50
2. Solid blocks - of - foamed slag or pumice concrete reinforced+ in every horizontal joint, unplastered	75	-	50	50	50	50
3. Metal lathing with gypsum or cement-lime plaster of thickness of - ... ..	-	-	38§	25	19	12.5
4. (a) Metal lathing with vermiculite-gypsum or perlite- gypsum plaster of thickness of	50§	-	19	16	12.5	12.5

## PART V: STRUCTURAL STEEL - continued

## A Encased steel stanchions (Mass per metre not less than 45 kg) – continued

Construction and materials	Minimum thickness (in mm) of protection for a fire resistance of -					
	4 hours	3 hours	2 hours	1 ½ hours	1 hours	½ hours
5. Gypsum plasterboard with 1.6mm wire binding at 100mm pitch -						
(a) 9.5mm Plasterboard with gypsum plaster of thickness of ... ..	-	-	-	-	12.5	12.5
(b) 19mm Plasterboard with gypsum plaster of thickness of ... ..	-	-	12.5	10	7	7
6. Gypsum plasterboard with 1.6mm wire binding at 100mm pitch-						
(a) 9.5mm plasterboard with vermiculite-gypsum plaster of thickness of ... ..	-	-	16	15	10	10
(b) 19mm plasterboard with vermiculite-gypsum plaster of thickness of ... ..	38§	-	20	13	10	10
7. Vermiculite - cement slabs of 4:1 mix reinforced with wire mesh and finished with plaster skim. Slabs of thickness of .... ..	63	-	25	25	25	25

\* Solid protection means a casing which is bedded close to the steel without intervening cavities and with all joints in that casing made full and solid.

+ Reinforcement shall consist of steel binding wire not less than 2.3mm in thickness , or a steel mesh weighing not less than 0.48 kg/m<sup>2</sup>. In concrete protection, the spacing of that reinforcement shall not exceed 150mm in any direction.

++ Hollow protection means that there is a void between the protective material and the steel. All hollow protection to columns shall be effectively sealed at each floor level.

§ Light mesh reinforcement required 12.5mm to 19mm below surface unless special corner beads are used.

## B Encased steel beams (Mass per metre not less than 30kg)

Construction and materials	Minimum thickness (in mm) of protection for a fire resistance of -					
	4 hours	3 hours	2 hours	1 ½ hours	1 hours	½ hours
<b>A. SOLID PROTECTION + (unplastered)</b>						
1. Concrete not leaner than 1:2:4 mix with natural aggregate -						
(a) concrete not assumed to be load bearing, reinforced <sup>++</sup> ..	75	50	25	25	25	25
(b) concrete assumed to be loadbearing , reinforced in accordance with BS 5950 ..	75	75	50	50	50	50
2. Sprayed vermiculite - cement .... ..	-	-	38	32	19	12.5

## PART V: STRUCTURAL STEEL - continued

## B Encased steel beams (Mass per metre not less than 30kg) - continued

Construction and materials	Minimum thickness (in mm) of protection for a fire resistance of -					
	4 hours	3 hours	2 hours	1 ½ hours	1 hours	½ hours
<b>B. HOLLOW PROTECTION*</b>						
1. Metal lathing -						
(a) with cement-lime plaster of thickness of	-	-	38	25	19	12.5
(b) with gypsum plaster of thickness of ... ..	-	-	22	19	16	12.5
(c) with vermiculite-gypsum or perlite-gypsum plaster of thickness of ... ..	32	-	12.5	12.5	12.5	12.5
2. Gypsum plasterboard with 1.6mm wire binding at 100 mm pitch-						
(a) 9.5mm plasterboard with gypsum plaster of thickness of ..	-	-	-	-	12.5	12.5
(b) 19 mm plasterboard with gypsum plaster of thickness of ..	-	-	12.5	10	7	7
3. Plasterboard with 1.6mm wire at 100m pitch -						
(a) 9.5 mm plaster nailed to wooden cradles finished with gypsum plaster of thickness of .	-	-	-	-	-	12.5
(b) 9.5 mm plasterboard with vermiculite - gypsum plaster of thickness of ... ..	-	-	16	15	10	10
(c) 19 mm plasterboard with vermiculite-gypsum plaster of thickness of ... ..	32	-	10	10	7	7
(d) 19 mm plasterboard with gypsum plaster of thickness of ..	-	-	20	13	10	10
4. Vermiculite-cement slabs of 4:1 mix reinforced with wire mesh and finished with plaster skim. Slabs of thickness of .... ..	63	-	25	25	25	25
5. Gypsum-sand plaster 12.5 mm thick applied to						

- \* Hollow protection means that there is a void between the protective materials and the steel. All hollow protection to columns shall be effectively sealed at each floor level.
- + Solid protection means a casing which is bedded close to the steel without intervening cavities and with all joints in that casing made full and solid.
- ++ Reinforcement shall consist of steel binding wire not less than 2.3mm in thickness, or a steel mesh weighing not less than 0.48 kg/m<sup>2</sup>. In concrete protection, the spacing of that reinforcement shall not exceed 150mm in any direction.
- § Light mesh reinforcement required 12.5mm to 19mm below surface unless special corner beads are used.



## PART VI: STRUCTURAL ALUMINIUM

Encased aluminium alloy stanchions and beams  
(Mass per metre not less than 16 kg)

Construction and materials	Minimum thickness (in mm) of protection for a fire resistance of -				
	4 hours	2 hours	1 ½ hours	1 hour	½ hour
<b>A. SOLID PROTECTION*</b>					
1. Sprayed vermiculite-cement .. .. .	-	-	-	44	19
..					
<b>B. HOLLOW PROTECTION<sup>+</sup></b>					
1. Metal lathing with vermiculite-gypsum or perlite-gypsum plaster of thickness of .. .. .	-	32	22	16	12.5
..					
2. Metal lathing finished with neat gypsum plaster of thickness of .. .. .	-	-	-	19	12.5
3. Gypsum plasterboard 19 mm thick with 1.6 mm wire binding at 100 mm pitch finished with gypsum-vermiculite plaster of thickness of .... .	-	22	16	10	10

\* Solid protection means a casing which is bedded close to the alloy without intervening cavities and with all joints in that casing made full and solid.

+ Hollow protection means that there is a void between the protected material and the alloy. All hollow protection to columns shall be effectively sealed at each floor level.

## PART VII: TIMBER FLOORS

Construction and materials	Minimum thickness (in mm) of protection for a fire resistance of –		
	1 hour	½ hour	modified <sup>++</sup> ½ hour
(A) Plain edge boarding on timber joists not less than 38 mm wide with ceiling of –			
(i) timber lath and plaster - thickness of plaster ..	-	16	16
(ii) timber lath and plaster with plaster of minimum thickness of 16 mm covered on underside with plasterboard of thickness ...	-	12.5	-
(iii) metal lathing and plaster - thickness of plaster			
(a) gypsum .. .. .	-	16	-
(b) vermiculite .. .. .	-	12.5	-
(iv) one layer of plasterboard of thickness .. .. .	-	-	12.5
(v) one layer of plasterboard of minimum thickness of 9.5 mm finished with gypsum plaster of thickness ..	-	-	12.5
(vi) one layer of plasterboards of minimum thickness of 12.5 mm finished with gypsum plaster of thickness .. ..	-	12.5	-
(vii) two layers of plasterboard of total thickness ..	-	25	19
(viii) one layer of fibre insulating board of minimum thickness of 9.5 mm finished with gypsum plaster of thickness ..	-	5	-
(ix) one layer of fibre insulating board of minimum thickness of 12.5 mm finished with gypsum plaster of thickness ..	-	-	12.5
(x) wood wool slab 25 mm thick finished with gypsum plaster of thickness	-	5	-
(B) Tongued and grooved boarding of not less than 16mm (finished) thickness* on timber joists not less than 38 mm wide ceiling of -			
(i) timber lath and plaster - thickness of plaster .. ..	-	-	16
(ii) timber lath and plaster with plaster of minimum thickness of 16 mm covered on underside with plasterboard of thickness	-	9.5	-
(iii) metal lathing and plaster - thickness of plaster			
(a) gypsum .. .. .	22	16	-
(b) vermiculite .. .. .	12.5	12.5	-
(iv) one layer of plasterboard of thickness .. .. .	-	-	9.5

Construction and materials		Minimum thickness (in mm) of protection for a fire resistance		
		1 hour	½ hour	modified <sup>++</sup> ½ hour
(v)	one layer of plasterboard of minimum thickness of 9.5 mm finished with-			
	(a) gypsum plaster of thickness .. ..	-	12.5	-
	(b) vermiculite-gypsum plaster of thickness ... ..	12.5	-	-
(vi)	one layer of plasterboards of minimum thickness of 12.5 mm finished with gypsum plaster of thickness ..	-	5	-
(vii)	two layers of plasterboard of total thickness ... ..	-	22	-
(viii)	one layer of fibre insulating board of minimum thickness of 9.5 mm finished with gypsum plaster of thickness .. ..	-	-	5
(ix)	wood wool slab 25 mm thick finished with -			
	(a) gypsum plaster of thickness .. ..	-	5	-
	(b) vermiculite - gypsum plaster of thickness .. ..	10	-	-
(C)	Tongued and grooved boardings of not less than 21 mm (finished) thickness* on timber joists not less than 175 mm deep by 50 mm wide and ceiling of -			
(i)	timber lath and plaster - thickness of plaster..... ..	-	16	-
(ii)	metal lathing and plaster - thickness of plaster..... ..	-	16	-
(iii)	one layer of plasterboard of thickness .... ..	-	-	9.5
(iv)	one layer of plasterboard of minimum thickness of 9.5mm finished with -			
	(a) gypsum plaster of thickness ..	-	12.5	-
	(b) vermiculite - gypsum plaster of thickness .. ..	12.5	-	-
(v)	one layer of plasterboard of minimum thickness of 12.5 mm finished with gypsum plaster of thickness .. ..	-	5	-
(vi)	two layers of plasterboard of total thickness .. ...	-	19	-
(vii)	one layer of fibre insulating board of thickness .... ..	-	-	12.5
(viii)	one layer of fibre insulating board of minimum thickness of 12.5 mm finished with gypsum plaster of thickness ....	-	12.5	-

\* Or an equivalent thickness of wood chipboard

++ The term “modified ½ hour” refers to the requirements specified in item 3(a) of Table 3.4

## PART VIII: REINFORCED CONCRETE FLOORS (SILICEOUS OR CALCAREOUS AGGREGATE)

Floor construction		Minimum dimension to give fire resistance in hours					
		4	3	2	1 ½	1	½
Solid slab	Average cover to reinforcement	mm 25	mm 25	mm 20	mm 20	mm 15	mm 15
	Depth, overall <sup>†</sup>	150	150	125	125	100	100
Cored slabs in which the cores are circular or are higher than wide. Not less than 50 % of the gross cross section of the floor should be solid material	Average cover to reinforcement	25	25	20	20	15	15
	Thickness under cores	50	40	40	30	25	20
	Depth, overall <sup>†</sup>	190	175	160	140	110	100
Hollow box section with one or more longitudinal cavities which are wider than high	Average cover to reinforcement	25	25	20	20	15	15
	Thickness of bottom flange	50	40	40	30	25	20
	Depth, overall <sup>†</sup>	230	205	180	155	130	105
Ribbed floor with hollow infill blocks of clay, or inverted T-section beams with hollow infill blocks of concrete or clay. A floor in which less than 50 % of the gross cross section is solid material must be provided with a 15 mm plaster coating on soffit	Average cover to reinforcement	25	25	20	20	15	15
	Width or rib, or beam, at soffit	125	100	90	80	70	50
	Depth, overall <sup>†</sup>	190	175	160	140	110	100
	Average bottom cover to reinforcement	65*	55*	45*	35	25	15
Upright T-section	Side cover to reinforcement	65	55	45	35	25	15
	Least width or downstanding leg	150	140	115	90	75	60
	Thickness of flange <sup>†</sup>	150	150	125	125	100	90
	Average bottom cover to reinforcement	65*	55*	45*	35	25	15
Inverted channel sections with radius at intersection of soffits with top of leg not exceeding depth of section	Side cover to reinforcement	40	30	25	20	15	10
	Least width or downstanding leg	75	70	60	45	40	30
	Thickness at crown <sup>†</sup>	150	150	125	125	100	90
	Average bottom cover to reinforcement	65*	55*	45*	35	25	15
Inverted channel sections or U-sections with radius at intersection of soffits with top of leg exceeding dept of section	Side cover to reinforcement	40	30	25	20	15	10
	Least width or downstanding leg	70	60	50	40	35	25
	Thickness at crown <sup>†</sup>	150	150	100	100	75	65
	Average bottom cover to reinforcement	65*	55*	45*	35	25	15

\* Supplementary reinforcement, to hold the concrete cover in position, may be necessary.

<sup>†</sup> Non-combustible screeds and finishes may be included in these dimensions.

## PART IX: PRESTRESSED CONCRETE FLOORS (SILICEOUS OR CALCAREOUS AGGREGATE)

Floor construction		Minimum dimension to give fire resistance in hours					
		4	3	2	1 ½	1	½
		mm	mm	mm	mm	mm	mm
Solid slab	Average cover to tendons	65	50*	40	30	25	15
	Depth, overall <sup>+</sup>	150	150	125	125	100	90
Cored slabs in which the cores are circular or are higher than wide. Not less than 50 % of the gross cross section of the floor should be solid material	Average cover to tendons	65*	50*	40	30	25	15
	Thickness under cores	50	40	40	30	25	20
	Depth, overall <sup>+</sup>	190	175	160	140	110	100
Hollow box section with one or more longitudinal cavities which are wider than high	Average cover to tendons	65*	50*	40	30	25	15
	Thickness of bottom flange	65	50	40	30	25	25
	Depth, overall <sup>+</sup>	230	205	180	155	130	105
Ribbed floor with hollow infill blocks of clay, or inverted T-section beams with hollow infill blocks of concrete or clay. A floor in which less than 50 % of the gross cross section is solid material must be provided with a 15 mm plaster coating on soffit	Average cover to reinforcement	65*	50*	40	30	25	15
	Width or rib, or beam, at soffit	125	100	90	80	70	50
	Depth, overall <sup>+</sup>	190	175	160	140	110	100
Upright T-section	Average bottom cover to reinforcement	100*	85	65*	50*	40	25
	Side cover to reinforcement	100	85	65	50	40	25
	Least width or downstanding leg	250	200	150	110	90	60
	Thickness of flange <sup>+</sup>	150	150	125	125	100	90
Inverted channel sections with radius at intersection of soffits with top of leg not exceeding depth of section	Average bottom cover to tendons	100*	85	65*	50*	40	25
	Side cover to tendons	50	45	35	25	20	10
	Least width or downstanding leg	125	100	60	55	40	30
	Thickness at crown <sup>+</sup>	150	150	125	125	100	90
Inverted channel or U-sections with radius at	Average bottom cover to tendons	100*	85*	65*	50*	40	25
	Side cover to tendons	50	45	35	25	20	15

\* Supplementary reinforcement, to hold the concrete cover in position, may be necessary.

<sup>+</sup> Non-combustible screeds and finishes may be included in these dimensions.

Construction and materials	Minimum thickness of glazing in mm for a period of	
	1 hour	½ hour
<p>1. Glass , in direct combination with metal , the melting point of which is not lower than 982.2 °C , in square not exceeding 0.015 sq.m. in area .. ..</p> <p>Thickness of glass .. .. .. .. ..</p>	-	6.35
<p>2. Glass reinforced with wire not less than 0.46 mm in diameter laid to a square mesh measuring 12.70 mm from centre to centre of wire , and electrically welded at the intersections , or laid to a hexagonal mesh measuring 25.40 mm across the flat side ..</p> <p>Thickness of glass .. .. .. .. ..</p> <p>In windows , doors , borrowed lights , lanterns and skylights , glass complying with paragraphs 1 or 2 of this Table shall be fixed with wood or metal beads or with a glazing compound in conjunction with sprigs or clips in panels not exceeding 0.372 sq.m. in area in timber frames (fixed shut) having a minimum width and thickness of 44.45 mm clear of rebates ..</p>	-	6.35
<p>3. Glass reinforced with wire as in paragraph 2 of this Table , in windows , doors , borrowed lights , lanterns and skylights , fixed with metal beads in panels not exceeding 1.115 sq.m in metal frames (fixed shut) all metal having a melting point not lower than 982.2°C , the thickness of glass .. ..</p> <p style="text-align: center;">.. .. ..</p>	6.35	6.35
<p>4. Glass bricks or blocks in walls .... .. ..</p> <p>Laid in cement / lime / sand mortar with light wire reinforcing mesh in every third horizontal joint in a panel not exceeding 2.438 m in width or height set along the sides and head into recesses in the surrounding non-combustible construction. The depth of such recessed shall be not less than 25.40 mm , the glass blocks extending into the recesses to a depth of 12.70 mm and bedded upon layer of glass fibre. A non-hardening mastic shall be used to fill the spaces between the sides of the recesses and the faces of the panels</p>	-	98.43

In this Table the absence of a figure in a period column indicated that glazing described is not acceptable for the period applicable to that column.

## PART 1

## CALCULATION OF PERMITTED LIMITS OF UNPROTECTED AREAS

## General rules applicable to this Appendix

1. The permitted limit of unprotected areas in any side of a building or compartment shall be calculated by reference to the requirements of Part II.
2. For the purposes of this Appendix , the expression "unprotected area" has the meaning ascribed to it by CL 2(a)(6), but in calculating the size of unprotected areas or the permitted limit of unprotected areas, the following provisions shall apply -
  - (a) where any area of an external wall is an unprotected area, only because it has combustible material attached to it as cladding, the area of that unprotected area shall be deemed to be half the area of such cladding;
  - (b) when unprotected openings in the same compartment are recessed at a distance or an angle to the plane of reference, the width of the unprotected opening can be reduced accordingly when projected to the plane of reference based on Table III and IV. However, such reduction is not applicable to the following:
    - (i) Concave building profile or the like where a specific point on the receiving panel receives radiation from more than one source.
    - (ii) When the unprotected opening is along a continuous circular profile where its size and angle cannot be determine.
  - (c) no account shall be taken of any of the following:
    - (i) an unprotected area which does not exceed  $0.1 \text{ m}^2$  and which is not less than 1.5 m from any other unprotected area in the same side of the building or compartment (unless that other falls within (iii) below);
    - (ii) one or more unprotected areas having an area (or, if more than one, the aggregate area) not exceeding  $1 \text{ m}^2$  and not less than 4 m from any other unprotected area in the same side of the building or compartment (except any such area as is specified in (1) above);
    - (iii) an unprotected area in any part of an external wall which forms part of a protected shaft ;
    - (iv) an unprotected area in the side of a building not divided into compartments , if the area is not less than 28 m above any ground adjoining that side of the building.

**PART II**

## Rules of calculation by reference to an enclosing rectangle

3. The conditions of this Part of this Appendix shall be satisfied if a building or compartment is so situated that no point on the relevant boundary is either between the relevant plane of reference and the side of the building or compartment or at a distance from the relevant plane of reference which is less than the distance specified in the Tables to this Part of this Appendix, according to the purpose group of the building or compartment, the dimensions of the enclosing rectangle and the unprotected percentage.

4. For the purpose of this Part of this Appendix:

"relevant boundary" means as defined in CL 2(f) and for the purpose of this calculation is either parallel to the side of the building under consideration or at an angle of not more than 80° with that side ;

"plane of reference" means any vertical plane which touches the side or some part of the side of a building or compartment but which (however far extended) does not pass within the structure of such building or compartment (and for this purpose, any balcony, coping or similar projection shall be deemed not to be part either of that side or of the structure) ; and the relevant plane of reference shall in each case be taken as that most favourable in that respect to the person erecting the building ;

"enclosing rectangle" means the smallest rectangle on the relevant plane of reference which would-

- (a) enclose all the outer edge of any unprotected area of the building or, if the building is divided into compartments, of the compartment (other than any of an unprotected area which is at an angle of more than 80° to the plane of reference the outer edges being for this purpose projected on the plane of reference by line perpendicular to such plane:
- (b) have two horizontal sides; and
- (c) have height and width falling within those listed in the Tables to this Part of this Appendix:

"unprotected percentage" means the percentage of the area of the enclosing rectangle which is equal to the aggregate of the unprotected areas taken into account in calculating the enclosing rectangle and as projected on it.



## Appendix (B)

Table(1), - BUILDINGS OR COMPARTMENTS OF PURPOSE GROUPS  
 I (SMALL RESIDENTIAL) , II (OTHER RESIDENTIAL) ,III (INSTITUTIONAL) , IV (OFFICE) ,  
 VII (PLACE OF PUBLIC RESORT) & VIII (STORAGE & GENERAL – OPEN-SIDED CARPARKING DECKS ONLY)

Width of enclosing rectangle in metres					Distance in metres from relevant boundary for unprotected percentage not								
					20	30	40	50	60	70	80	90	100
Enclosing rectangle 3 m high													
3	..	..	..	..	1.0	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.0
6	..	..	..	..	1.0	1.0	1.5	2.0	2.0	2.0	2.5	2.5	3.0
9	..	..	..	..	1.0	1.0	1.5	2.0	2.5	2.5	3.0	3.0	3.5
12	..	..	..	..	1.0	1.5	2.0	2.0	2.5	3.0	3.0	3.5	3.5
15	..	..	..	..	1.0	1.5	2.0	2.5	2.5	3.0	3.5	3.5	4.0
18	..	..	..	..	1.0	1.5	2.0	2.5	2.5	3.0	3.5	4.0	4.0
21	..	..	..	..	1.0	1.5	2.0	2.5	3.0	3.0	3.5	4.0	4.5
24	..	..	..	..	1.0	1.5	2.0	2.5	3.0	3.5	3.5	4.0	4.5
27	..	..	..	..	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.0	4.5
30	..	..	..	..	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.0	4.5
40	..	..	..	..	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.0	5.0
No limit	..	..	..	..	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.0	5.0
Enclosing rectangle 6 m high													
3	..	..	..	..	1.0	1.0	1.5	2.0	2.0	2.0	2.5	2.5	3.0
6	..	..	..	..	1.0	1.5	2.0	2.5	3.0	3.0	3.5	4.0	4.0
9	..	..	..	..	1.0	2.0	2.5	3.0	3.5	4.0	4.5	4.5	5.0
12	..	..	..	..	1.5	2.5	3.0	3.5	4.0	4.5	5.0	5.0	5.5
15	..	..	..	..	1.5	2.5	3.0	4.0	4.5	5.0	5.5	5.5	6.0
18	..	..	..	..	1.5	2.5	3.5	4.0	4.5	5.0	5.5	6.0	6.5
21	..	..	..	..	1.5	2.5	3.5	4.0	5.0	5.5	6.0	6.5	7.0
24	..	..	..	..	1.5	2.5	3.5	4.5	5.0	5.5	6.0	7.0	7.0
27	..	..	..	..	1.5	2.5	3.5	4.5	5.0	6.0	6.5	7.0	7.5
30	..	..	..	..	1.5	2.5	3.5	4.5	5.0	6.0	6.5	7.0	8.0
40	..	..	..	..	1.5	2.5	3.5	4.5	5.5	6.5	7.0	8.0	8.5
50	..	..	..	..	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.0	9.0
60	..	..	..	..	1.5	2.5	3.5	5.0	5.5	6.5	7.5	8.5	9.5
80	..	..	..	..	1.5	2.5	3.5	5.0	6.0	7.0	7.5	8.5	9.5
100	..	..	..	..	1.5	2.5	3.5	5.0	6.0	7.0	8.0	8.5	10.0
No limit	..	..	..	..	1.5	2.5	3.5	5.0	6.0	7.0	8.0	8.5	10.0

## PART II Table from Appendix (B) - continued

Table(1) - continued

Width of enclosing rectangle in metres					Distance in metres from relevant boundary for unprotected percentage not								
					20	30	40	50	60	70	80	90	100
Enclosing rectangle 9 m high													
3	..	..	..	..	1.0	1.0	1.5	2.0	2.5	2.5	3.0	3.0	3.5
6	..	..	..	..	1.0	2.0	2.5	3.0	3.5	4.0	4.5	4.5	5.0
9	..	..	..	..	1.5	2.5	3.5	4.0	4.5	5.0	5.5	5.5	6.0
12	..	..	..	..	1.5	3.0	3.5	4.5	5.0	5.5	6.0	6.5	7.0
15	..	..	..	..	2.0	3.0	4.0	5.0	5.5	6.0	6.5	7.0	7.5
18	..	..	..	..	2.0	3.5	4.5	5.0	6.0	6.5	7.0	8.0	8.5
21	..	..	..	..	2.0	3.5	4.5	5.5	6.5	7.0	7.5	8.5	9.0
24	..	..	..	..	2.0	3.5	5.0	5.5	6.5	7.5	8.0	9.0	9.5
27	..	..	..	..	2.0	3.5	5.0	6.0	7.0	7.5	8.5	9.5	10.0
30	..	..	..	..	2.0	3.5	5.0	6.0	7.0	8.0	9.0	9.5	10.5
40	..	..	..	..	2.0	3.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5
50	..	..	..	..	2.0	4.0	5.5	6.5	8.0	9.0	10.0	11.5	12.5
60	..	..	..	..	2.0	4.0	5.5	7.0	8.0	9.5	11.0	11.5	13.0
80	..	..	..	..	2.0	4.0	5.5	7.0	8.5	10.0	11.5	12.5	13.5
100	..	..	..	..	2.0	4.0	5.5	7.0	8.5	10.0	11.5	12.5	14.5
120	..	..	..	..	2.0	4.0	5.5	7.0	8.5	10.0	11.5	12.5	14.5
No limit	..	..	..	..	2.0	4.0	5.5	7.0	8.5	10.5	12.0	12.5	15.0
Enclosing rectangle 12 m high													
3	..	..	..	..	1.0	1.5	2.0	2.0	2.5	3.0	3.0	3.5	3.5
6	..	..	..	..	1.5	2.5	3.0	3.5	4.0	4.5	5.0	5.0	5.5
9	..	..	..	..	1.5	3.0	3.5	4.5	5.0	5.5	6.0	6.5	7.0
12	..	..	..	..	1.5	3.5	4.5	5.0	6.0	6.5	7.0	7.5	8.0
15	..	..	..	..	2.0	3.5	5.0	5.5	6.5	7.0	8.0	8.5	9.0
18	..	..	..	..	2.5	4.0	5.0	6.0	7.0	7.5	8.5	9.0	10.0
21	..	..	..	..	2.5	4.0	5.5	6.5	7.5	8.5	9.0	10.0	10.5
24	..	..	..	..	2.5	4.5	6.0	7.0	8.0	8.5	9.5	10.5	11.5
27	..	..	..	..	2.5	4.5	6.0	7.0	8.0	9.0	10.5	11.0	12.0
30	..	..	..	..	2.5	4.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
40	..	..	..	..	2.5	5.0	6.5	8.0	9.5	10.5	12.0	12.0	14.0
50	..	..	..	..	2.5	5.0	7.0	8.5	10.0	11.0	13.0	14.0	15.0
60	..	..	..	..	2.5	5.0	7.0	9.0	10.5	12.0	13.5	14.5	16.0
80	..	..	..	..	2.5	5.0	7.0	9.0	11.0	13.0	14.5	16.0	17.0
100	..	..	..	..	2.5	5.0	7.5	9.5	11.5	13.5	15.0	16.5	18.0
120	..	..	..	..	2.5	5.0	7.5	9.5	11.5	13.5	15.0	17.0	18.5
No limit	..	..	..	..	2.5	5.0	7.5	9.5	12.0	14.0	15.5	17.0	19.0

## PART II Table from Appendix (B) - continued

Table(1) - continued

Width of enclosing rectangle in metres					Distance in metres from relevant boundary for unprotected percentage not								
					20	30	40	50	60	70	80	90	100
Enclosing rectangle 15 m high													
3	..	..	..	..	1.0	1.5	2.0	2.5	2.5	3.0	3.5	3.5	4.0
6	..	..	..	..	1.5	2.5	3.0	4.0	4.5	5.0	5.5	5.5	6.0
9	..	..	..	..	2.0	3.0	4.0	5.0	5.5	6.0	6.5	7.0	7.5
12	..	..	..	..	2.0	3.5	5.0	5.5	6.5	7.0	8.0	8.5	9.0
15	..	..	..	..	2.0	4.0	5.5	6.5	7.0	8.0	9.0	9.5	10.0
18	..	..	..	..	2.5	4.5	6.0	7.0	8.0	8.5	9.5	10.5	11.0
21	..	..	..	..	2.5	5.0	6.5	7.5	8.5	9.5	10.5	11.0	12.0
24	..	..	..	..	3.0	5.0	6.5	8.0	9.0	10.0	11.0	12.0	13.0
27	..	..	..	..	3.0	5.5	7.0	8.5	9.5	10.5	11.5	12.5	13.5
30	..	..	..	..	3.0	5.5	7.5	8.5	10.0	11.0	12.0	13.5	14.0
40	..	..	..	..	3.0	6.0	8.0	9.5	11.0	12.5	13.5	15.0	16.0
50	..	..	..	..	3.5	6.0	8.5	10.0	12.0	13.5	15.0	16.5	17.5
60	..	..	..	..	3.5	6.5	8.5	10.5	12.5	14.0	15.5	17.0	18.0
80	..	..	..	..	3.5	6.5	9.0	11.0	13.5	15.0	17.0	18.5	20.0
100	..	..	..	..	3.5	6.5	9.0	11.5	14.0	16.0	18.0	19.5	21.5
120	..	..	..	..	3.5	6.5	9.0	11.5	14.0	16.5	18.5	20.5	22.5
No limit	..	..	..	..	3.5	6.5	9.0	12.0	14.5	17.0	19.0	21.0	23.0
Enclosing rectangle 18 m high													
3	..	..	..	..	1.0	1.5	2.0	2.5	2.5	3.0	3.5	4.0	4.0
6	..	..	..	..	1.5	2.5	3.5	4.0	4.5	5.0	5.5	6.0	6.5
9	..	..	..	..	2.0	3.5	4.5	5.0	6.0	6.5	7.0	8.0	8.5
12	..	..	..	..	2.5	4.0	5.0	6.0	7.0	7.5	8.5	9.0	10.0
15	..	..	..	..	2.5	4.5	6.0	7.0	8.0	8.5	9.5	10.5	11.0
18	..	..	..	..	2.5	5.0	6.5	7.5	8.5	9.5	11.0	11.5	13.0
21	..	..	..	..	3.0	5.5	7.0	8.0	9.5	10.5	11.5	12.5	13.0
24	..	..	..	..	3.0	5.5	7.5	8.5	10.0	11.0	12.0	13.0	14.0
27	..	..	..	..	3.5	6.0	8.0	9.0	10.5	11.5	12.5	13.5	14.5
30	..	..	..	..	3.5	6.5	8.0	9.5	11.0	12.0	13.5	14.5	15.5
40	..	..	..	..	4.0	7.0	9.0	11.0	12.0	13.5	15.0	16.5	17.5
50	..	..	..	..	4.0	7.0	9.5	11.5	13.0	15.0	16.5	18.0	19.0
60	..	..	..	..	4.0	7.5	10.0	12.0	14.0	16.0	17.5	19.5	20.5
80	..	..	..	..	4.0	7.5	10.0	13.0	15.0	17.0	19.0	21.0	22.5
100	..	..	..	..	4.0	7.5	10.0	13.5	16.0	18.0	20.5	22.5	24.0
120	..	..	..	..	4.0	7.5	10.0	14.0	16.5	19.0	21.0	23.5	25.5
No limit	..	..	..	..	4.0	8.0	10.0	14.0	17.0	19.5	22.0	24.0	26.5

## PART II Table from Appendix (B) - continued

Table(1) - continued

Width of enclosing rectangle in metres					Distance in metres from relevant boundary for unprotected percentage not									
					20	30	40	50	60	70	80	90	100	
Enclosing rectangle 21 m high														
3	..	..	..	..	0.5	1.5	2.0	2.5	3.0	3.0	3.5	4.0	4.5	
6	..	..	..	..	1.5	2.5	3.5	4.0	5.0	5.5	6.0	6.5	7.0	
9	..	..	..	..	2.0	3.5	4.5	5.5	6.5	7.0	7.5	8.5	9.0	
12	..	..	..	..	2.5	4.0	5.5	6.5	7.5	8.5	9.0	10.0	10.5	
15	..	..	..	..	2.5	5.0	6.5	7.5	8.5	9.5	10.5	11.0	12.0	
18	..	..	..	..	3.0	5.5	7.0	8.0	9.5	10.5	11.5	12.5	13.0	
21	..	..	..	..	3.0	6.0	7.5	9.0	10.5	11.0	12.5	13.5	14.0	
24	..	..	..	..	3.5	6.0	8.0	9.5	10.5	12.0	13.0	14.0	15.0	
27	..	..	..	..	3.5	6.5	8.5	10.0	11.5	13.0	14.0	15.0	16.0	
30	..	..	..	..	4.0	7.0	9.0	10.5	12.0	13.0	14.5	16.0	16.5	
40	..	..	..	..	4.5	7.5	10.0	12.0	13.5	15.0	16.5	18.0	19.0	
50	..	..	..	..	4.5	8.0	11.0	13.0	14.5	16.5	18.0	20.0	21.0	
60	..	..	..	..	4.5	8.5	11.5	13.5	15.5	17.5	19.5	21.0	22.5	
80	..	..	..	..	4.5	8.5	12.0	14.5	17.0	19.0	21.0	23.5	25.0	
100	..	..	..	..	4.5	9.0	12.0	15.5	18.0	20.5	22.5	25.0	27.0	
120	..	..	..	..	4.5	9.0	12.0	16.0	18.5	21.5	23.5	26.5	28.5	
No limit	..	..	..	..	4.5	9.0	12.0	16.0	19.0	22.0	25.0	26.5	29.5	
Enclosing rectangle 24 m high														
3	..	..	..	..	0.5	1.5	2.0	2.5	3.0	3.5	3.5	4.0	4.5	
6	..	..	..	..	1.5	2.5	3.5	4.5	5.0	5.5	6.0	7.0	7.0	
9	..	..	..	..	2.0	3.5	5.0	5.5	6.5	7.5	8.0	9.0	9.5	
12	..	..	..	..	2.5	4.5	6.0	7.0	8.0	8.5	9.5	10.5	11.5	
15	..	..	..	..	3.0	5.0	6.5	8.0	9.0	10.0	11.0	12.0	13.0	
18	..	..	..	..	3.0	5.5	7.5	8.5	10.0	11.0	12.0	13.0	14.0	
21	..	..	..	..	3.5	6.0	8.0	9.5	10.5	12.0	13.0	14.0	15.0	
24	..	..	..	..	3.5	6.5	8.5	10.0	11.5	12.5	14.0	15.0	16.0	
27	..	..	..	..	4.0	7.0	9.0	11.0	12.5	13.5	15.0	16.0	17.0	
30	..	..	..	..	4.0	7.5	9.5	11.5	13.0	14.0	15.5	17.0	18.0	
40	..	..	..	..	4.5	8.5	11.0	13.0	14.5	16.0	18.0	19.0	20.5	
50	..	..	..	..	5.0	9.0	12.0	14.0	16.0	17.5	19.5	21.0	22.5	
60	..	..	..	..	5.0	9.5	12.5	15.0	17.0	19.0	21.0	23.0	24.5	
80	..	..	..	..	5.0	10.0	13.5	16.5	18.5	21.0	23.5	25.5	27.5	
100	..	..	..	..	5.0	10.0	13.5	17.0	20.0	22.5	25.0	27.5	29.5	
120	..	..	..	..	5.5	10.0	13.5	17.5	20.5	23.5	26.5	29.0	31.0	
No limit	..	..	..	..	5.5	10.0	13.5	18.0	21.0	24.0	27.5	30.0	32.5	

## PART II Table from Appendix (B) - continued

Table(1) - continued

Width of enclosing rectangle in metres					Distance in metres from relevant boundary for unprotected percentage not									
					20	30	40	50	60	70	80	90	100	
Enclosing rectangle 27 m high														
3	..	..	..	..	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.0	4.5	
6	..	..	..	..	1.5	2.5	3.5	4.5	5.0	6.0	6.5	7.0	7.5	
9	..	..	..	..	2.0	3.5	5.0	6.0	7.0	7.5	8.5	9.5	10.0	
12	..	..	..	..	2.5	4.5	6.0	7.0	8.0	9.0	10.5	11.0	12.0	
15	..	..	..	..	3.0	5.5	7.0	8.5	9.5	10.5	11.5	12.5	13.5	
18	..	..	..	..	3.5	6.0	8.0	9.0	10.5	11.5	12.5	13.5	14.5	
21	..	..	..	..	3.5	6.5	8.5	10.0	11.5	13.0	14.0	15.0	16.0	
24	..	..	..	..	3.5	7.0	9.0	11.0	12.5	13.5	15.0	16.0	17.0	
27	..	..	..	..	4.0	7.5	10.0	11.5	13.0	14.0	16.0	17.0	18.0	
30	..	..	..	..	4.0	8.0	10.0	12.0	13.5	15.0	17.0	18.0	19.0	
40	..	..	..	..	5.0	9.0	11.5	14.0	15.5	17.5	19.0	20.5	22.0	
50	..	..	..	..	5.5	9.5	12.5	15.0	17.0	19.0	21.0	22.5	24.0	
60	..	..	..	..	5.5	10.5	13.5	16.0	18.5	20.5	22.5	24.5	26.5	
80	..	..	..	..	6.0	11.0	14.5	17.5	20.5	22.5	25.0	27.5	29.5	
100	..	..	..	..	6.0	11.0	15.5	19.0	21.5	24.5	27.0	30.0	32.0	
120	..	..	..	..	6.0	11.5	15.5	19.5	22.5	26.0	28.5	32.0	34.0	
No limit	..	..	..	..	6.0	11.5	15.5	20.0	23.5	27.0	29.5	33.0	35.0	

## PART II Table from Appendix (B) - continued

Table(2) - **BUILDINGS OR COMPARTMENTS OF PURPOSE GROUPS****V (SHOPS), VI (FACTORY) & VIII (STORAGE & GENERAL – OPEN-SIDED CARPARKING DECKS – SEE TABLE 1)**

Width of enclosing rectangle in metres					Distance in metres from relevant boundary for unprotected percentage not								
					20	30	40	50	60	70	80	90	100
Enclosing rectangle 3 m high													
3	..	..	..	..	1.0	1.5	2.0	2.0	2.5	2.5	2.5	3.0	3.0
6	..	..	..	..	1.5	2.0	2.5	3.0	3.0	3.5	3.5	4.0	4.0
9	..	..	..	..	1.5	2.5	3.0	3.5	4.0	4.0	4.5	5.0	5.0
12	..	..	..	..	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	5.5
15	..	..	..	..	2.0	2.5	3.5	4.0	4.5	5.0	5.5	6.0	6.0
18	..	..	..	..	2.0	2.5	3.5	4.0	5.0	5.0	6.0	6.5	6.5
21	..	..	..	..	2.0	3.0	3.5	4.5	5.0	5.5	6.0	6.5	7.0
24	..	..	..	..	2.0	3.0	3.5	4.5	5.0	5.5	6.0	7.0	7.5
27	..	..	..	..	2.0	3.0	4.0	4.5	5.5	6.0	6.5	7.0	7.5
30	..	..	..	..	2.0	3.0	4.0	4.5	5.5	6.0	6.5	7.5	8.0
40	..	..	..	..	2.0	3.0	4.0	5.0	5.5	6.5	7.0	8.0	8.5
50	..	..	..	..	2.0	3.0	4.0	5.0	6.0	6.5	7.5	8.0	9.0
60	..	..	..	..	2.0	3.0	4.0	5.0	6.0	7.0	7.5	8.5	9.5
80	..	..	..	..	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	9.5
No limit	..	..	..	..	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Enclosing rectangle 6 m high													
3	..	..	..	..	1.5	2.0	2.5	3.0	3.0	3.5	3.5	4.0	4.0
6	..	..	..	..	2.0	3.0	3.5	4.0	4.5	5.0	5.5	5.5	6.0
9	..	..	..	..	2.5	3.5	4.5	5.0	5.5	6.0	6.5	7.0	7.0
12	..	..	..	..	3.0	4.0	5.0	5.5	6.5	7.0	7.5	8.0	8.5
15	..	..	..	..	3.0	4.5	5.5	6.0	7.0	7.5	8.0	9.0	9.0
18	..	..	..	..	3.5	4.5	5.5	6.5	7.5	8.0	9.0	9.5	10.0
21	..	..	..	..	3.5	5.0	6.0	7.0	8.0	9.0	9.5	10.0	10.5
24	..	..	..	..	3.5	5.0	6.0	7.0	8.5	9.5	10.0	10.5	11.0
27	..	..	..	..	3.5	5.0	6.5	7.5	8.5	9.5	10.5	11.0	12.0
30	..	..	..	..	3.5	5.0	6.5	8.0	9.0	10.0	11.0	12.0	12.5
40	..	..	..	..	3.5	5.5	7.0	8.5	10.0	11.0	12.0	13.0	14.0
50	..	..	..	..	3.5	5.5	7.5	9.0	10.5	11.5	13.0	14.0	15.0
60	..	..	..	..	3.5	5.5	7.5	9.5	11.0	12.0	13.5	15.0	16.0
80	..	..	..	..	3.5	6.0	7.5	9.5	11.5	13.0	14.5	16.0	17.5
100	..	..	..	..	3.5	6.0	8.0	10.0	12.0	13.5	15.0	16.5	18.0
120	..	..	..	..	3.5	6.0	8.0	10.0	12.0	14.0	15.5	17.0	19.0
No limit	..	..	..	..	3.5	6.0	8.0	10.0	12.0	14.0	16.0	18.0	19.0

## PART II Table from Appendix (B)- continued

Table(2) - continued

Width of enclosing rectangle in metres					Distance in metres from relevant boundary for unprotected percentage not								
					20	30	40	50	60	70	80	90	100
Enclosing rectangle 9 m high													
3	..	..	..	..	1.5	2.5	3.0	3.5	4.0	4.0	4.5	5.0	5.0
6	..	..	..	..	2.5	3.5	4.5	5.0	5.5	6.0	6.5	7.0	7.0
9	..	..	..	..	3.5	4.5	5.5	6.0	6.5	7.5	8.0	8.5	9.0
12	..	..	..	..	3.5	5.0	6.0	7.0	7.5	8.5	9.0	9.5	10.5
15	..	..	..	..	4.0	5.5	6.5	7.5	8.5	9.5	10.0	11.0	11.5
18	..	..	..	..	4.5	6.0	7.0	8.5	9.5	10.0	11.0	12.0	12.5
21	..	..	..	..	4.5	6.5	7.5	9.0	10.0	11.0	12.0	13.0	13.5
24	..	..	..	..	5.0	6.5	8.0	9.5	11.0	12.0	13.0	13.5	14.5
27	..	..	..	..	5.0	7.0	8.5	10.0	11.5	12.5	13.5	14.5	15.0
30	..	..	..	..	5.0	7.0	9.0	10.5	12.0	13.0	14.0	15.0	16.0
40	..	..	..	..	5.5	7.5	9.5	11.5	13.0	14.5	15.5	17.0	17.5
50	..	..	..	..	5.5	8.0	10.0	12.5	14.0	15.5	17.0	18.5	19.5
60	..	..	..	..	5.5	8.0	11.0	13.0	15.0	16.5	18.0	19.5	21.0
80	..	..	..	..	5.5	8.5	11.5	13.5	16.0	17.5	19.5	21.5	23.0
100	..	..	..	..	5.5	8.5	11.5	14.5	16.5	18.5	21.0	22.5	24.5
120	..	..	..	..	5.5	8.5	11.5	14.5	17.0	19.5	21.5	23.5	26.0
No limit	..	..	..	..	5.5	8.5	11.5	15.0	17.5	20.0	22.5	24.5	27.0
Enclosing rectangle 12 m high													
3	..	..	..	..	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	5.5
6	..	..	..	..	3.0	4.0	5.0	5.5	6.5	7.0	7.5	8.0	8.5
9	..	..	..	..	3.5	5.0	6.0	7.0	7.5	8.5	9.0	9.5	10.5
12	..	..	..	..	4.5	6.0	7.0	8.0	9.0	9.5	11.0	11.5	12.0
15	..	..	..	..	5.0	6.5	8.0	9.0	10.0	11.0	12.0	13.0	13.5
18	..	..	..	..	5.0	7.0	8.5	10.0	11.0	12.0	13.0	14.0	14.5
21	..	..	..	..	5.5	7.5	9.0	10.5	12.0	13.0	14.0	15.0	16.0
24	..	..	..	..	6.0	8.0	9.5	11.5	12.5	14.0	15.0	16.0	16.5
27	..	..	..	..	6.0	8.0	10.5	12.0	13.5	14.5	16.0	17.0	17.5
30	..	..	..	..	6.5	8.5	10.5	12.5	14.0	15.0	16.5	17.5	18.5
40	..	..	..	..	6.5	9.5	12.0	14.0	15.5	17.5	18.5	20.0	21.0
50	..	..	..	..	7.0	10.0	13.0	15.0	17.0	19.0	20.5	23.0	23.0
60	..	..	..	..	7.0	10.5	13.5	16.0	18.0	20.0	21.5	23.5	25.0
80	..	..	..	..	7.0	11.0	14.5	17.0	19.5	21.5	23.5	26.0	27.5
100	..	..	..	..	7.5	11.5	15.0	18.0	21.0	23.0	25.5	28.0	30.0
120	..	..	..	..	7.5	11.5	15.0	18.5	22.0	24.0	27.0	29.5	31.5
No limit	..	..	..	..	7.5	12.0	15.5	19.0	22.5	25.0	28.0	30.5	34.0

## PART II Table from Appendix (B)- continued

Table(2) - continued

Width of enclosing rectangle in metres					Distance in metres from relevant boundary for unprotected percentage not								
					20	30	40	50	60	70	80	90	100
Enclosing rectangle 15 m high													
3	..	..	..	..	2.0	2.5	3.5	4.0	4.5	5.0	5.5	6.0	6.0
6	..	..	..	..	3.0	4.5	5.5	6.0	7.0	7.5	8.0	9.0	9.0
9	..	..	..	..	4.0	5.5	6.5	7.5	8.5	9.5	10.0	11.0	11.5
12	..	..	..	..	5.0	6.5	8.0	9.0	10.0	11.0	12.0	13.0	13.5
15	..	..	..	..	5.5	7.0	9.0	10.0	11.5	12.5	13.5	14.5	15.0
18	..	..	..	..	6.0	8.0	9.5	11.0	12.5	13.5	14.5	15.5	16.5
21	..	..	..	..	6.5	8.5	10.5	12.0	13.5	14.5	16.0	16.5	17.5
24	..	..	..	..	6.5	9.0	11.0	13.0	14.5	15.5	17.0	18.0	19.0
27	..	..	..	..	7.0	9.5	11.5	13.5	15.0	16.5	18.0	19.0	20.0
30	..	..	..	..	7.5	10.0	12.0	14.0	16.0	17.0	18.5	20.0	21.0
40	..	..	..	..	8.0	11.0	13.5	16.0	18.0	19.5	21.0	22.5	23.5
50	..	..	..	..	8.5	12.0	15.0	17.5	19.5	21.5	23.0	25.0	26.0
60	..	..	..	..	8.5	12.5	15.5	18.0	21.0	23.5	25.0	27.0	28.0
80	..	..	..	..	9.0	13.5	17.0	20.0	23.0	25.5	28.0	30.0	31.5
100	..	..	..	..	9.0	14.0	18.0	21.5	24.5	27.5	30.0	32.5	34.5
120	..	..	..	..	9.0	14.0	18.5	22.5	25.5	28.5	31.5	34.5	37.0
No limit	..	..	..	..	9.0	14.5	19.0	23.0	27.0	30.0	34.0	36.0	39.0
Enclosing rectangle 18 m high													
3	..	..	..	..	2.0	2.5	3.5	4.0	5.0	5.0	6.0	6.5	6.5
6	..	..	..	..	3.5	4.5	5.5	6.5	7.5	8.0	9.0	9.5	10.0
9	..	..	..	..	4.5	6.0	7.0	8.5	9.5	10.0	11.0	12.0	12.5
12	..	..	..	..	5.0	7.0	8.5	10.0	11.0	12.0	13.0	14.0	14.5
15	..	..	..	..	6.0	8.0	9.5	11.0	12.5	13.5	14.5	15.5	16.5
18	..	..	..	..	6.5	8.5	11.0	12.0	13.5	14.5	16.0	17.0	18.0
21	..	..	..	..	7.0	9.5	11.5	13.0	14.5	16.0	17.0	18.0	19.5
24	..	..	..	..	7.5	10.0	12.0	14.0	15.5	16.5	18.5	19.5	20.5
27	..	..	..	..	8.0	10.5	12.5	14.5	16.5	17.5	19.5	20.5	21.5
30	..	..	..	..	8.0	11.0	13.5	15.5	17.0	18.5	20.5	21.5	22.5
40	..	..	..	..	9.0	12.0	15.0	17.5	19.5	21.5	23.5	25.0	26.0
50	..	..	..	..	9.5	13.0	16.5	19.0	21.5	23.5	26.0	27.5	29.0
60	..	..	..	..	10.0	14.0	17.5	20.5	23.0	26.0	27.5	29.5	31.0
80	..	..	..	..	10.0	15.0	19.0	22.5	26.0	28.5	31.0	33.5	35.0
100	..	..	..	..	10.0	16.0	20.5	24.0	28.0	31.0	33.5	36.0	38.5
120	..	..	..	..	10.0	16.5	21.0	25.5	29.5	32.5	35.5	39.0	41.5
No limit	..	..	..	..	10.0	17.0	22.0	26.5	30.5	34.0	37.0	41.0	43.5



## PART II Table from Appendix (B)- continued

Table(2)- continued

Width of enclosing rectangle in metres					Distance in metres from relevant boundary for unprotected percentage not								
					20	30	40	50	60	70	0	90	100
Enclosing rectangle 21 m high													
3	..	..	..	..	2.0	3.0	3.5	4.5	5.0	5.5	6.0	6.5	7.0
6	..	..	..	..	3.5	5.0	6.0	7.0	8.0	9.0	9.5	10.0	10.5
9	..	..	..	..	4.5	6.5	7.5	9.0	10.0	11.0	12.0	13.0	13.5
12	..	..	..	..	5.5	7.5	9.0	10.5	12.0	13.0	14.0	15.0	16.0
15	..	..	..	..	6.5	8.5	10.5	12.0	13.5	14.5	16.0	16.5	17.5
18	..	..	..	..	7.0	9.5	11.5	13.0	14.5	16.0	17.0	18.0	19.5
21	..	..	..	..	7.5	10.0	12.5	14.0	15.5	17.0	18.5	20.0	21.0
24	..	..	..	..	8.0	10.5	13.0	15.0	16.0	18.0	20.0	21.0	22.0
27	..	..	..	..	8.5	11.5	14.0	16.0	18.0	19.0	21.0	22.5	23.5
30	..	..	..	..	9.0	12.0	14.5	16.5	18.5	20.5	22.0	23.5	25.0
40	..	..	..	..	10.0	13.5	16.5	19.0	21.5	23.0	25.5	27.0	28.5
50	..	..	..	..	11.0	14.5	18.0	21.0	23.5	25.5	28.0	30.0	31.5
60	..	..	..	..	11.5	15.5	19.5	22.5	25.5	28.0	30.5	32.5	33.5
80	..	..	..	..	12.0	17.0	21.0	25.0	28.5	31.5	34.0	36.5	38.5
100	..	..	..	..	12.0	18.0	22.5	27.0	31.0	34.5	37.0	40.0	42.0
120	..	..	..	..	12.0	18.5	23.5	28.5	32.5	36.5	39.5	43.0	45.5
No limit	..	..	..	..	12.0	19.0	25.0	29.5	34.5	38.0	41.5	45.5	48.0
Enclosing rectangle 24 m high													
3	..	..	..	..	2.0	3.0	3.5	4.5	5.0	5.5	6.0	7.0	7.5
6	..	..	..	..	3.5	5.0	6.0	7.0	8.5	9.5	10.0	10.5	11.0
9	..	..	..	..	5.0	6.5	8.0	9.5	11.0	12.0	13.0	13.5	14.5
12	..	..	..	..	6.0	8.0	9.5	11.5	12.5	14.0	15.0	16.0	16.5
15	..	..	..	..	6.5	9.0	11.0	13.0	14.5	15.5	17.0	18.0	19.0
18	..	..	..	..	7.5	10.0	12.0	14.0	15.5	16.5	18.5	19.5	20.5
21	..	..	..	..	8.0	10.5	13.0	15.0	16.5	18.0	20.0	21.0	22.0
24	..	..	..	..	8.5	11.5	14.0	16.0	18.0	19.5	21.0	22.5	24.0
27	..	..	..	..	9.0	12.5	15.0	17.0	19.0	20.5	21.5	24.0	25.5
30	..	..	..	..	9.5	13.0	15.5	18.0	20.0	21.5	23.5	25.0	26.5
40	..	..	..	..	11.0	14.5	18.0	20.5	23.0	25.0	27.5	29.0	30.5
50	..	..	..	..	12.0	16.0	19.5	22.5	25.5	27.5	30.0	32.0	33.5
60	..	..	..	..	12.5	17.0	21.0	24.5	27.5	30.0	32.5	35.0	36.5
80	..	..	..	..	13.5	18.5	23.5	27.5	31.0	34.5	37.0	39.5	41.5
100	..	..	..	..	13.5	20.0	25.0	29.5	33.5	37.0	40.0	43.0	45.5
120	..	..	..	..	13.5	20.5	26.5	31.0	36.0	39.5	43.0	46.5	49.0
No limit	..	..	..	..	13.5	21.0	27.5	32.5	37.5	42.0	45.5	49.5	52.0

## PART II Table from Appendix (B) - continued

Table(2) - continued

Width of enclosing rectangle in metres					Distance in metres from relevant boundary for unprotected percentage not									
					20	30	40	50	60	70	80	90	100	
Enclosing rectangle 27 m high														
3	..	..	..	..	2.0	3.0	4.0	4.5	5.5	6.0	6.5	7.0	7.5	
6	..	..	..	..	3.5	5.0	6.5	7.5	8.5	9.5	10.5	11.0	12.0	
9	..	..	..	..	5.0	7.0	8.5	10.0	11.5	12.5	13.5	14.5	15.0	
12	..	..	..	..	6.0	8.0	10.5	12.0	13.5	14.5	16.0	17.0	17.5	
15	..	..	..	..	7.0	9.5	11.5	13.5	15.0	16.5	18.0	19.0	20.0	
18	..	..	..	..	8.0	10.5	12.5	14.5	16.5	17.5	19.5	20.5	21.5	
21	..	..	..	..	8.5	11.5	14.0	16.0	18.0	19.0	21.0	22.5	23.5	
24	..	..	..	..	9.0	12.5	15.0	17.0	19.0	20.5	22.5	24.0	25.5	
27	..	..	..	..	10.0	13.0	16.0	18.0	20.0	22.0	24.0	25.5	27.0	
30	..	..	..	..	10.0	13.5	17.0	19.0	21.0	23.0	25.0	26.5	28.0	
40	..	..	..	..	11.5	15.5	19.0	22.0	24.5	26.5	29.0	30.5	32.5	
50	..	..	..	..	12.5	17.0	21.0	24.0	27.0	29.5	32.0	34.5	36.0	
60	..	..	..	..	13.5	18.5	22.5	26.5	29.5	32.0	35.0	37.0	39.0	
80	..	..	..	..	14.5	20.5	25.0	29.5	33.0	36.5	39.5	42.0	44.0	
100	..	..	..	..	15.5	21.5	27.0	32.0	36.5	40.5	43.0	46.5	48.5	
120	..	..	..	..	15.5	22.5	28.5	34.0	39.0	43.0	46.5	50.5	53.0	
No limit	..	..	..	..	15.5	23.5	29.5	35.0	40.5	44.5	48.5	52.0	55.5	

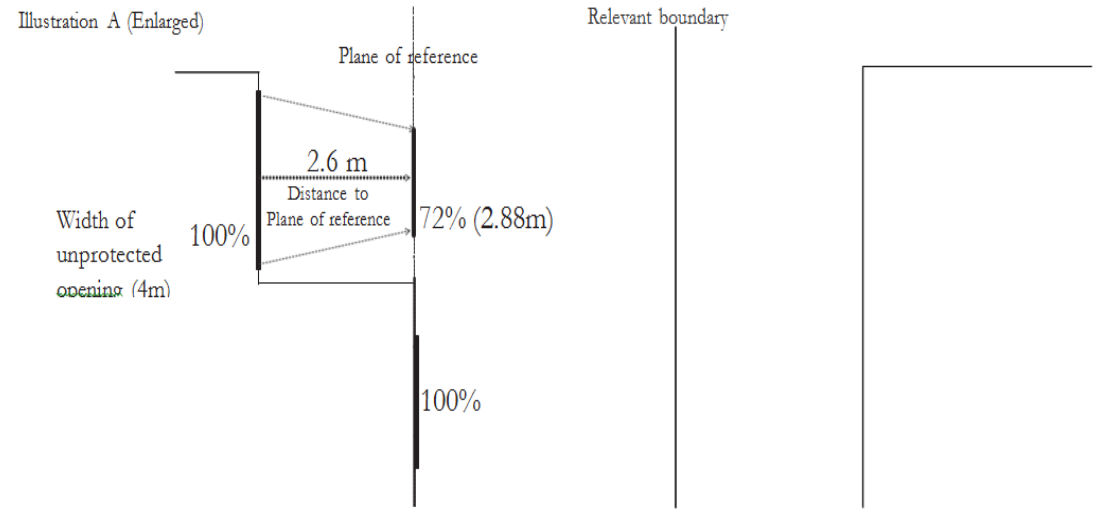
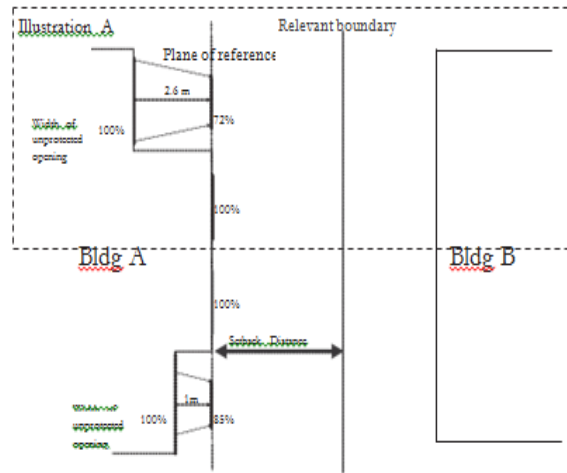
## PART I Table (3) from Appendix (B)

Percentage of the width of the unprotected openings upon their projection onto the plane of reference  
(in view of distance of the openings from the plane of reference)

	Distance to reference plane <sup>+</sup>																										
	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m	16m	17m	18m	19m	20m	21m	22m	23m	24m	25m	26m	27m
3m	72%	54%	41%	33%	28%	24%	21%	18%	16%	15%	13%	12%	11%	11%	10%	9%	9%	8%	8%	7%	7%	7%	6%	6%	6%	6%	6%
6m	85%	72%	62%	54%	47%	41%	37%	33%	30%	28%	25%	24%	22%	21%	19%	18%	17%	16%	15%	15%	14%	13%	13%	12%	12%	11%	11%
9m	90%	80%	72%	65%	59%	54%	49%	45%	41%	38%	36%	33%	31%	29%	28%	26%	25%	24%	22%	21%	21%	20%	19%	18%	17%	17%	16%
15m	94%	88%	82%	77%	72%	68%	64%	60%	57%	54%	51%	48%	46%	43%	41%	40%	38%	36%	35%	33%	32%	31%	30%	29%	28%	27%	26%
21m	95%	91%	87%	83%	79%	75%	72%	69%	66%	63%	61%	58%	56%	54%	51%	50%	48%	46%	44%	43%	41%	40%	39%	38%	36%	35%	34%
27m	96%	93%	90%	86%	83%	80%	77%	75%	72%	70%	67%	65%	63%	61%	59%	57%	55%	54%	52%	50%	49%	48%	46%	45%	44%	43%	41%
30m	97%	94%	90%	88%	85%	82%	79%	77%	74%	72%	70%	68%	66%	64%	62%	60%	58%	57%	55%	54%	52%	51%	49%	48%	47%	46%	45%
40m	98%	95%	93%	90%	88%	86%	84%	82%	80%	78%	76%	74%	73%	71%	69%	68%	66%	65%	63%	62%	60%	59%	58%	57%	55%	54%	53%
50m	98%	96%	94%	92%	90%	89%	87%	85%	84%	82%	80%	79%	77%	76%	74%	73%	72%	70%	69%	68%	66%	65%	64%	63%	62%	61%	60%
60m	98%	97%	95%	94%	92%	90%	89%	88%	86%	85%	83%	82%	81%	79%	78%	77%	76%	74%	73%	72%	71%	70%	69%	68%	67%	66%	65%
70m	99%	97%	96%	94%	93%	92%	90%	89%	88%	87%	86%	84%	83%	82%	81%	80%	79%	78%	76%	75%	74%	73%	72%	71%	70%	70%	69%
80m	99%	98%	96%	95%	94%	93%	92%	90%	89%	88%	87%	86%	85%	84%	83%	82%	81%	80%	79%	78%	77%	76%	75%	74%	74%	73%	72%
90m	99%	98%	97%	96%	95%	94%	93%	92%	90%	90%	89%	88%	87%	86%	85%	84%	83%	82%	81%	80%	79%	78%	78%	77%	76%	75%	74%
100m	99%	98%	97%	96%	95%	94%	93%	92%	91%	90%	90%	89%	88%	87%	86%	85%	84%	84%	83%	82%	81%	80%	80%	79%	78%	77%	77%
110m	99%	98%	97%	96%	96%	95%	94%	93%	92%	91%	90%	90%	89%	88%	87%	87%	86%	85%	84%	83%	83%	82%	81%	81%	80%	79%	78%
120m	99%	98%	98%	97%	96%	95%	94%	94%	93%	92%	91%	90%	90%	89%	88%	88%	87%	86%	85%	85%	84%	83%	83%	82%	81%	81%	80%

Note: \* To take next higher width when actual width exceeds that of the table. Interpolation of the figures is not permitted.

+ To take the lower distance from table when actual distance exceeds that of the table. Interpolation of the figures is not permitted.



## PART I Table (3) from Appendix (B)

Percentage of the width of the unprotected openings upon their projection onto the plane of reference  
(in view of distance of the openings from the plane of reference)

Table (3) - continued

	Distance to																										
	28m	29m	30m	31m	32m	33m	34m	35m	36m	37m	38m	39m	40m	41m	42m	43m	44m	45m	46m	47m	48m	49m	50m	51m	52m	53m	54m
3m	5%	5%	5%	5%	5%	5%	4%	4%	4%	4%	4%	4%	4%	4%	4%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
6m	11%	10%	10%	10%	9%	9%	9%	9%	8%	8%	8%	8%	7%	7%	7%	7%	7%	7%	6%	6%	6%	6%	6%	6%	6%	6%	6%
9m	16%	15%	15%	14%	14%	13%	13%	13%	12%	12%	12%	11%	11%	11%	11%	10%	10%	10%	10%	9%	9%	9%	9%	9%	9%	8%	8%
15m	25%	24%	24%	23%	22%	22%	21%	21%	20%	19%	19%	19%	18%	18%	17%	17%	17%	16%	16%	16%	15%	15%	15%	14%	14%	14%	14%
21m	33%	32%	32%	31%	30%	29%	28%	28%	27%	26%	26%	25%	25%	24%	24%	23%	23%	22%	22%	21%	21%	21%	20%	20%	19%	19%	19%
27m	40%	39%	38%	37%	37%	36%	35%	34%	33%	33%	32%	31%	31%	30%	29%	29%	28%	28%	27%	27%	26%	26%	25%	25%	24%	24%	24%
30m	43%	42%	41%	40%	40%	39%	38%	37%	36%	35%	35%	34%	33%	33%	32%	31%	31%	30%	30%	29%	29%	28%	28%	27%	27%	26%	26%
40m	52%	51%	50%	49%	48%	47%	46%	45%	45%	44%	43%	42%	41%	41%	40%	39%	39%	38%	37%	37%	36%	36%	35%	35%	34%	34%	33%
50m	59%	58%	57%	56%	55%	54%	53%	52%	51%	50%	50%	49%	48%	47%	47%	46%	45%	45%	44%	43%	43%	42%	41%	41%	40%	40%	39%
60m	64%	63%	62%	61%	60%	59%	58%	57%	57%	56%	55%	54%	54%	53%	52%	51%	51%	50%	49%	49%	48%	47%	47%	46%	46%	45%	45%
70m	68%	67%	66%	65%	64%	63%	63%	62%	61%	60%	59%	59%	58%	57%	57%	56%	55%	55%	54%	53%	53%	52%	51%	51%	50%	50%	49%
80m	71%	70%	69%	68%	68%	67%	66%	65%	65%	64%	63%	63%	62%	61%	60%	60%	59%	58%	58%	57%	57%	56%	55%	55%	54%	54%	53%
90m	74%	73%	72%	71%	71%	70%	69%	68%	68%	67%	66%	66%	65%	64%	64%	63%	62%	62%	61%	61%	60%	59%	59%	58%	58%	57%	57%
100	76%	75%	74%	74%	73%	72%	72%	71%	70%	70%	69%	68%	68%	67%	66%	66%	65%	65%	64%	63%	63%	62%	62%	61%	61%	60%	60%
110m	78%	77%	76%	76%	75%	74%	74%	73%	72%	72%	71%	71%	70%	69%	69%	68%	68%	67%	67%	66%	65%	65%	64%	64%	63%	63%	62%
120	79%	79%	78%	77%	77%	76%	76%	75%	74%	74%	73%	73%	72%	72%	71%	70%	70%	69%	69%	68%	68%	67%	67%	66%	66%	65%	65%

Note: \* To take next higher width when actual width exceeds that of the table. Interpolation of the figures is not permitted.

+ To take the lower distance from table when actual distance exceeds that of the table. Interpolation of the figures is not permitted

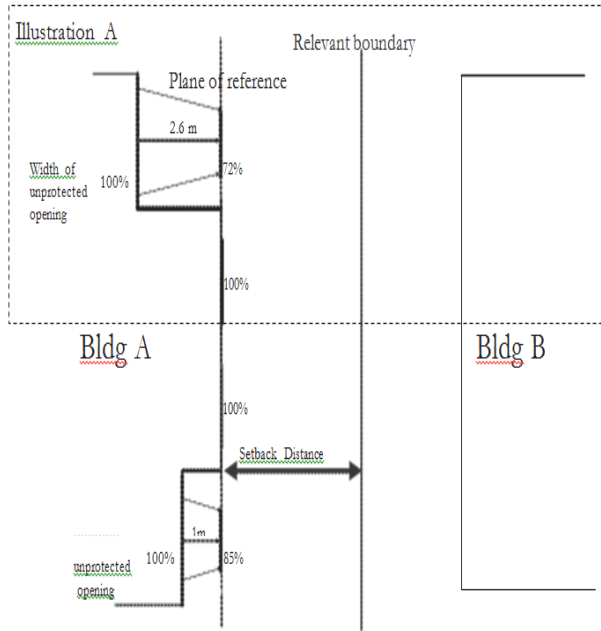
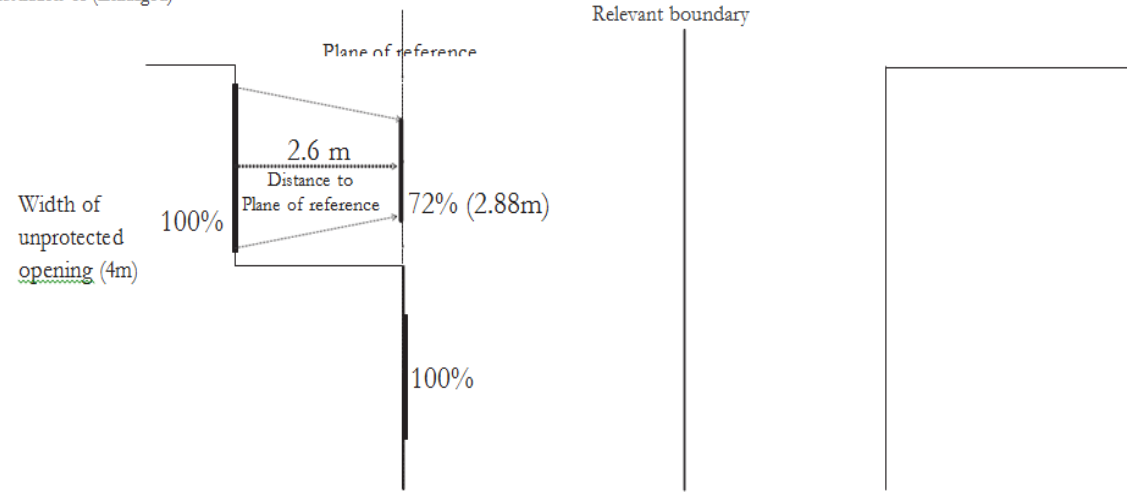


Illustration A (Enlarged)

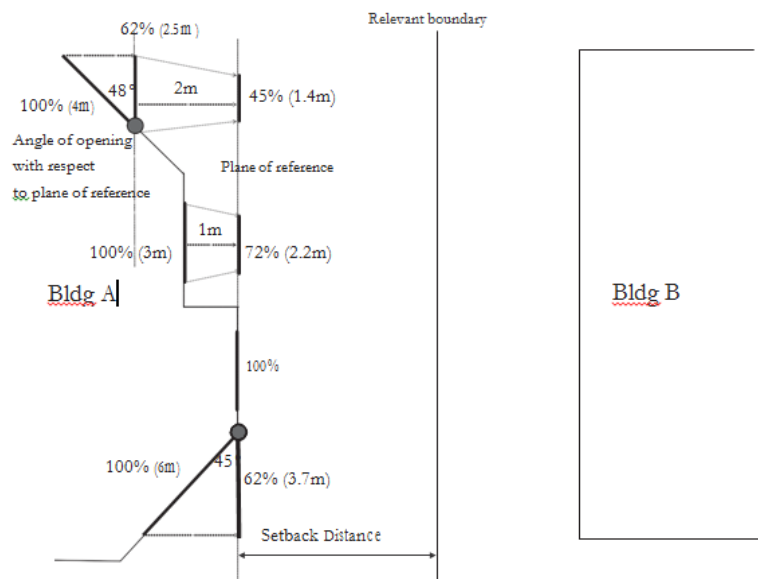


PART I Table (3) from Appendix (B)

Percentage of the width of the unprotected openings upon their projection onto the plane of reference  
(in view of the angle of openings with respect to the plane of reference)

Angle of unprotected opening to reference plane*	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°
Actual percentage of unprotected opening width on reference plane	96%	91%	87%	83%	78%	74%	70%	66%	62%	58%	54%	50%	46%	43%	39%	36%	32%	29%

Note: \*: To take the smaller angle from table when actual angle exceeds that of the table. Interpolation of the angles is not permitted.



## Chapter (5)

### Fire Fighting Appliances Planning and External Extinguishing Proposals

30. The provision for external access to building for fire-fighting and accessibility of site to fire-fighting appliances shall comply with the following standards;
- (a) Accessway and access opening shall be provided for accessibility of site to fire-fighting, search and rescue appliances. To permit fire-fighting appliances to be deployed, the accessway shall have a minimum width of 6m throughout its entire length of fire engines which are currently using in Myanmar Fire Services Department. Access openings shall be provided along the external walls of buildings fronting the accessway to provide access into the building for fire-fighting and rescue operations. Accessway shall be provided to within 18m of breaching inlet for buildings that exceed the habitable height of 10m.
  - (b) Accessway For Fire Fighting Appliances
    - (i) For building under Purpose Group I in Table (1.4), accessway will not be required, irrespective of the building height. However, in cluster housing developments, fire engine access road with a minimum 4m width shall be provided for access by pump appliance to within a travel distance of 60m from every point on the projected plan area of any building in the housing developments.

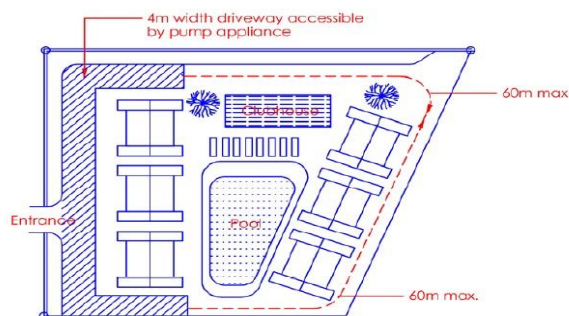


Figure (5.1)



- (ii) For building under Purpose Group II, no accessway will be required for buildings that do not exceed the habitable height of 10m. However, fire engine access road having minimum 4m width for access by pump appliance shall be provided to within a travel distance of 60m of every point on the projected plan area of the building. This requirement for fire engine access road shall not apply to non-residential standalone building, such as clubhouse, auditorium, carpark, etc. (excluding guardhouse and substation) that are located within the housing development. The non-residential standalone building shall comply with C1.30 (b) (iv) and C1.30(c & d).

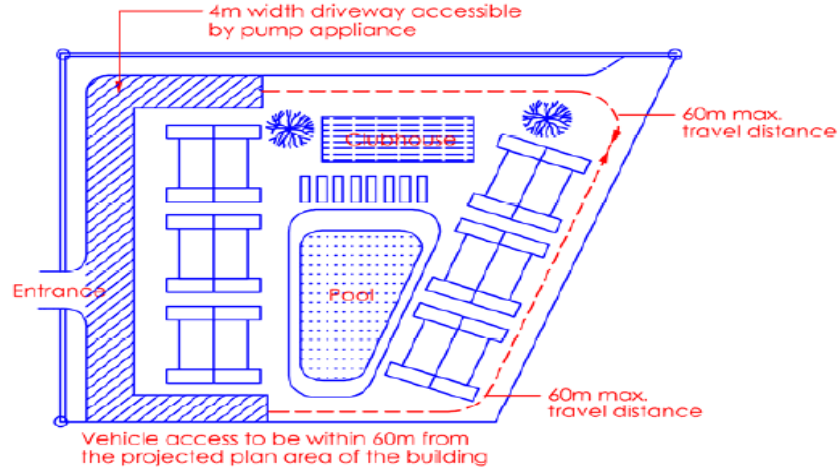


Figure (5.2)

- (iii) For buildings under purpose Group II that exceed the habitable height of 10m, fire engine access road shall be provided within a travel distance of 18m to the entrance of all exit staircases where the landing valves (dry or wet riser). The fire engine access road shall have a minimum 4m width and designed to sustain the load of stationary 40 tonnes fire engine fighting appliance, and shall be provided within 18m of dry riser breeching inlets of the building. The breeching inlets shall be located at the exterior, readily, visible and accessible from the fire engine access road.

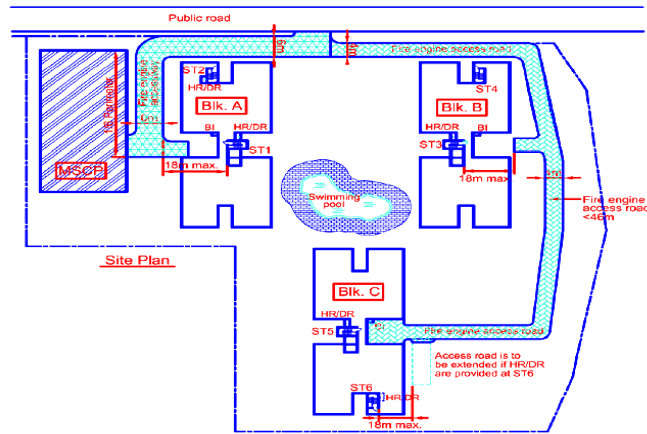


Figure (5.3)

- (iv) For buildings under Purpose Groups III (excluding hospitals and clinic), IV, V and VII not exceeding the habitable height of 10m, accessway will not be required. However, provision of fire engine access road having minimum 4m width for pump appliance will be required to within a travel distance of 45m of every point on the projected plan area of the building.
- (v) In the case of basement, the fire engine access road shall be provided within a travel distance of 18m to the entrance of all exit staircases that are provided with landing valve (dry or wet riser). The measurement of 18m shall be between the fire engine access road and the entrance of exit staircase.
- (c) For buildings under Purpose Groups III, IV, V and VII exceeding the habitable height of 10m, accessway shall be located directly below the access openings to provide direct outreach to the access openings. Accessway shall be provided based on the largest gross floor area (any floor including 1<sup>st</sup>storey and if there are more than one floor interconnected, the aggregate areas of all the floor interconnected) of the following:
- (i) Minimum - 1/6 perimeter (min 15m)
  - (ii) from 2000m<sup>2</sup> to 4000m<sup>2</sup> - 1/4 perimeter

- (iii) from 4001m<sup>2</sup> to 8000m<sup>2</sup> - ½ perimeter
- (iv) From 8001m<sup>2</sup> to 16,000m<sup>2</sup> - ¾ perimeter
- (v) Above 16000m<sup>2</sup> - island site access
- (d) For buildings under Purpose Groups III, IV, V and VII exceeding the habitable height of 10m which are protected by an automatic sprinkler system, the floor area ( any floor including 1<sup>st</sup> storey and if there are more than one floor interconnected, the aggregate areas of all the floor interconnected) shall be doubled as follows:
- (i) Minimum - 1/6 perimeter ( min 15m)
- (ii) from 4000 m<sup>2</sup> to 8000m<sup>2</sup> - ¼ perimeter
- (iii) from 8001 m<sup>2</sup> to 16,000m<sup>2</sup> - ½ perimeter
- (iv) from 16,001 m<sup>2</sup> to 32,000m<sup>2</sup> - ¾ perimeter
- (v) Above 32,000 m<sup>2</sup> - island site access.

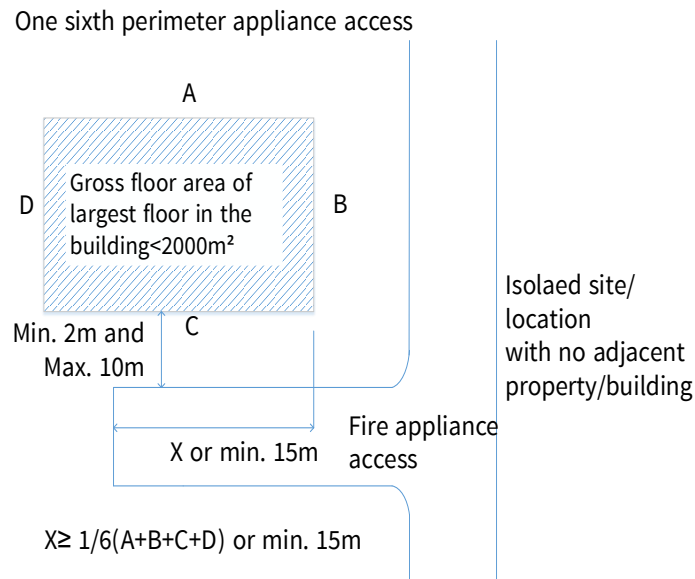


Figure (5.4)

## One fourth perimeter appliance access

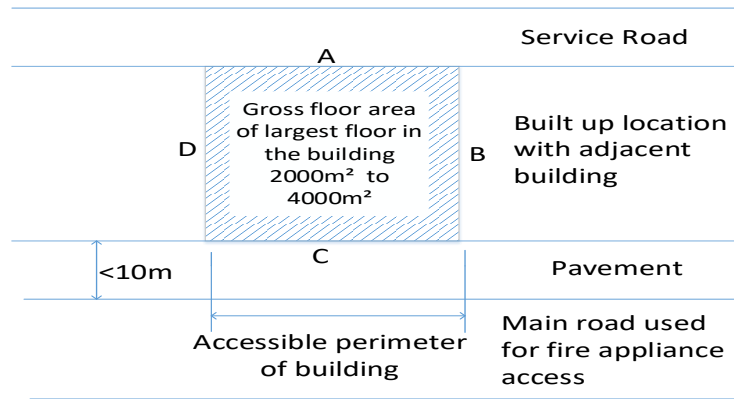


Figure (5.5)

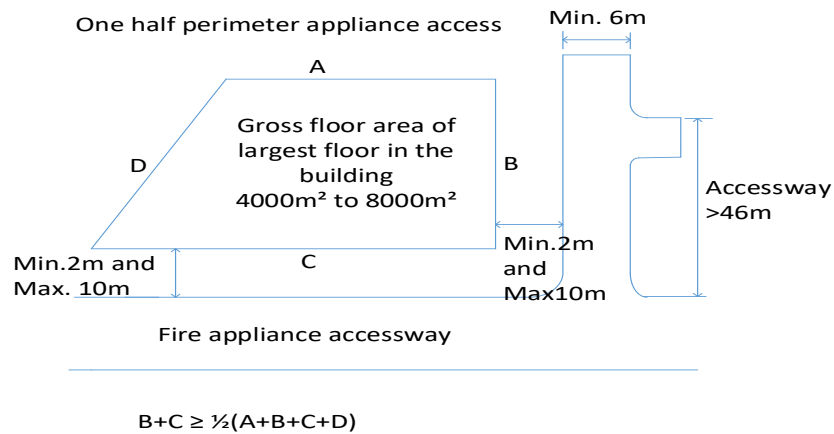


Figure (5.6)

(e) For buildings under Purpose Groups VI and VIII, accessway shall be provided for fire-fighting appliances. The provision of accessway shall be calculated based on the following gross cubical extent of the building as follows:

- |       |                              |   |                         |
|-------|------------------------------|---|-------------------------|
| (i)   | Minimum                      | - | 1/6 perimeter (min 15m) |
| (ii)  | Above 28,400m <sup>3</sup>   | - | 1/4 perimeter           |
| (iii) | Above 56,800 m <sup>3</sup>  | - | 1/2 perimeter           |
| (iv)  | Above 85,200 m <sup>3</sup>  | - | 3/4 perimeter           |
| (v)   | Above 113,600 m <sup>3</sup> | - | island site access.     |

- (f) For buildings under Purpose Groups VI and VIII which are protected by an automatic sprinkler system, the cubical extent of the building can be doubled as follows:

- (i) Minimum - 1/6 perimeter ( min 15m)
- (ii) Above 56,800m<sup>3</sup> - 1/4 perimeter
- (iii) Above 113,600m<sup>3</sup> - 1/2 perimeter
- (iv) Above 170,400m<sup>3</sup> - 3/4 perimeter
- (v) Above 227,200m<sup>3</sup> - island site access.

One sixth perimeter appliance access

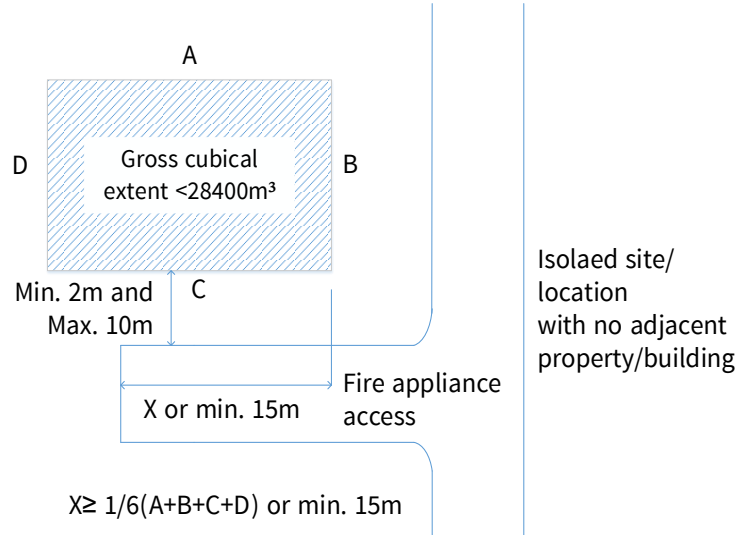


Figure (5.7)

One fourth perimeter appliance access

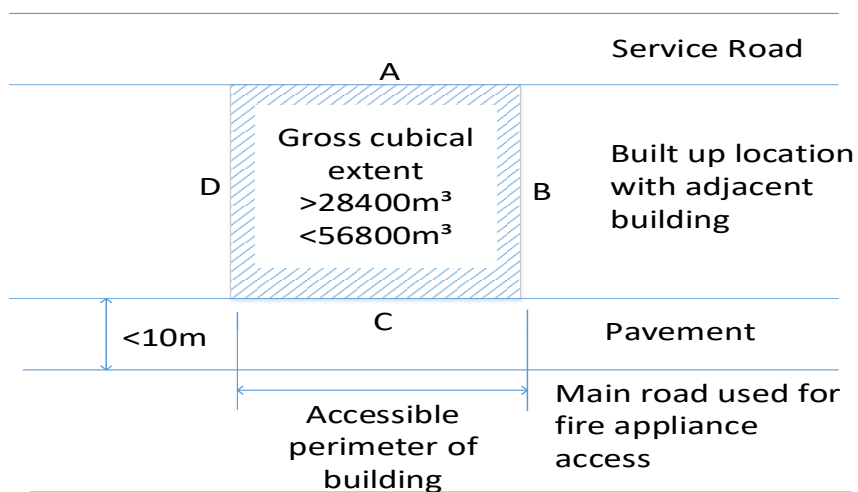


Figure (5.8)

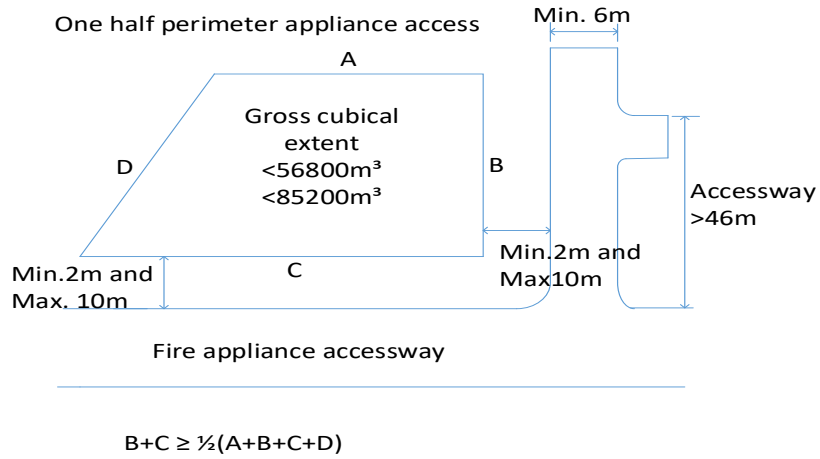


Figure (5.9)

- (g) Accessway must have the loading capacity of stationary 40 tonnes for fire-fighting appliances. See Appendix (5) for technical data on fire-fighting appliance.
- (h) The accessway shall have a minimum width of 6m throughout. Such accessway must be able to accommodate the entry and manoeuvring of fire-fighting engines, extended ladders pumping appliances, turntable and/ or hydraulic platforms.

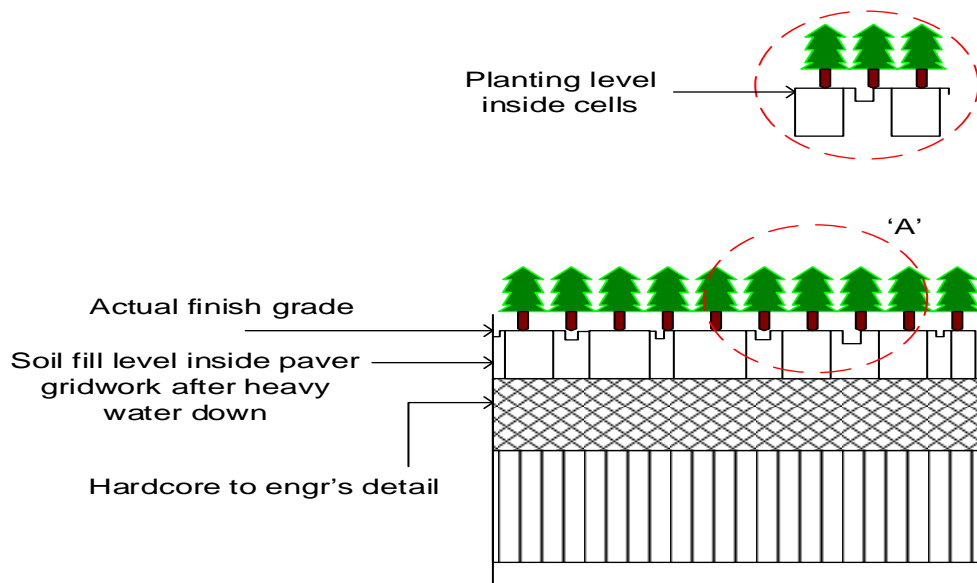


Figure (5.10)

- (i) Accessway shall be positioned so that the nearer edge shall be not less than 2m or more than 10m from the centre position of the access opening, measured horizontally.
- (j) Accessway shall be laid on a level platform or if on an incline, the gradient shall not exceed 1:15. Access road shall be laid on an incline not exceeding a gradient of 1:8.3.
- (k) Dead end accessway and fire engine access road shall not exceed 46 m in length or if exceeding 46m, be provided with turning facilities as shown in Figure (5.11) and (5.12).

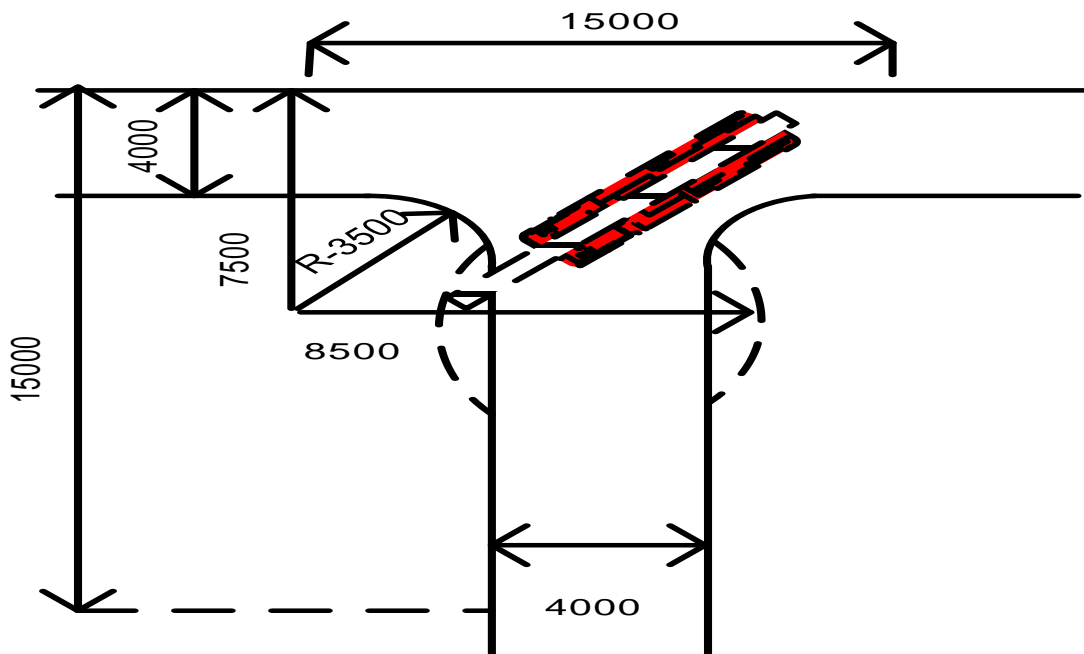


Figure (5.11)

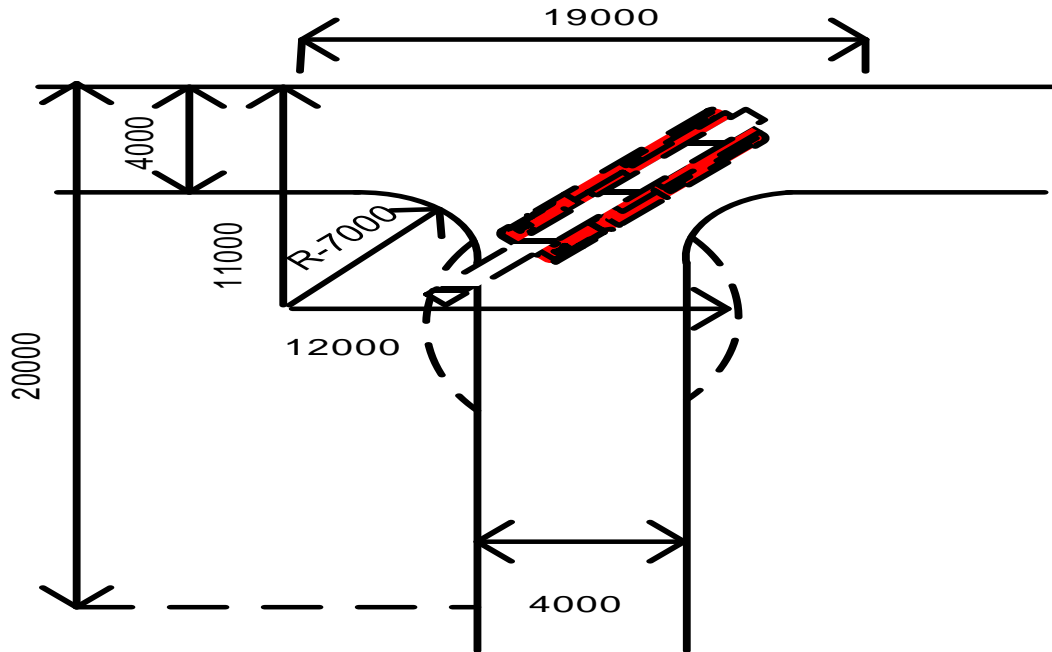


Figure (5.12)

- (l) The outer radius for turning of accessway and fire engine access road shall comply with the requirements as shown in Figure (5.13) and (5.14).

#### U-Turn Radii of Pumper Appliances(24 tonnes)

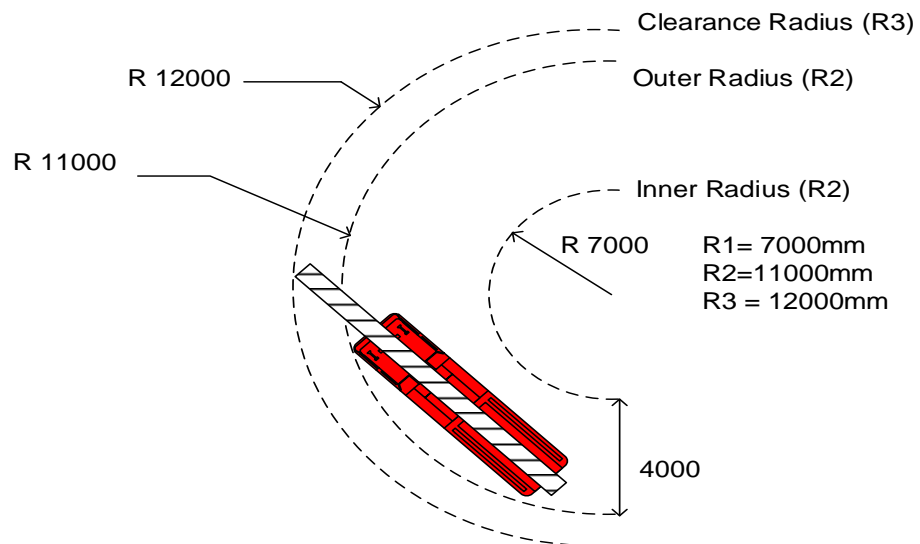


Figure (5.13)



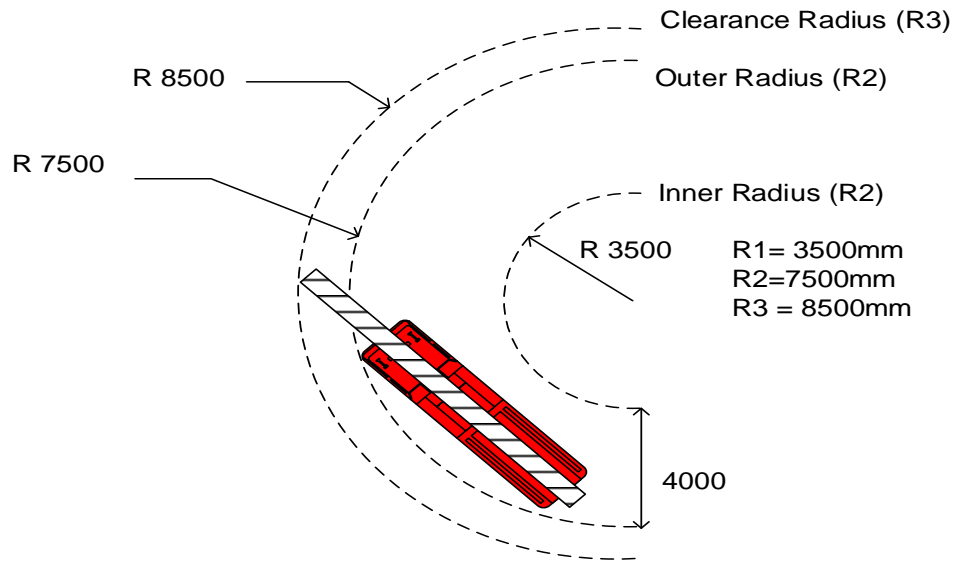


Figure (5.14)

- (m) Overhead clearance of accessway and fire engine access road shall be at least 4.5m for passage of fire-fighting appliances. Porch and any obstacle are not allowed along the accessway and access road.
- (n) Public roads can serve as accessway provided the location of such public roads is in compliance with the requirements of distance from access openings.

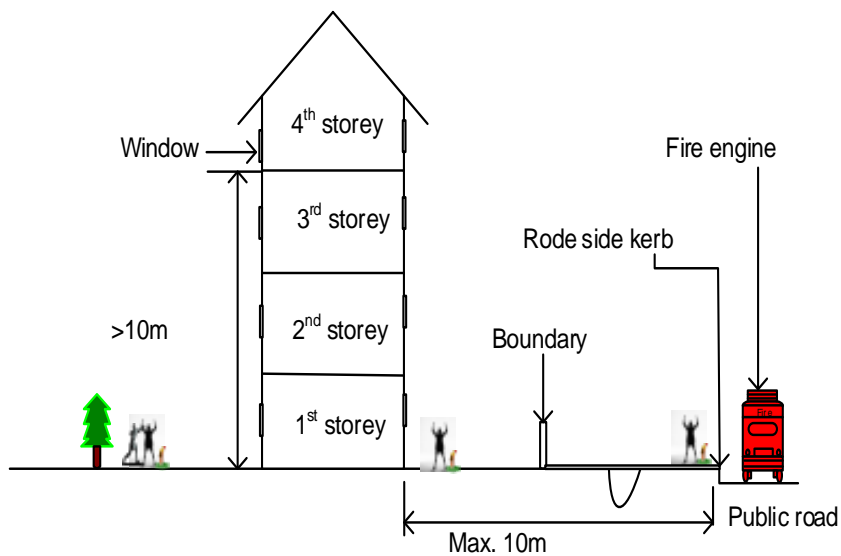


Figure (5.15)

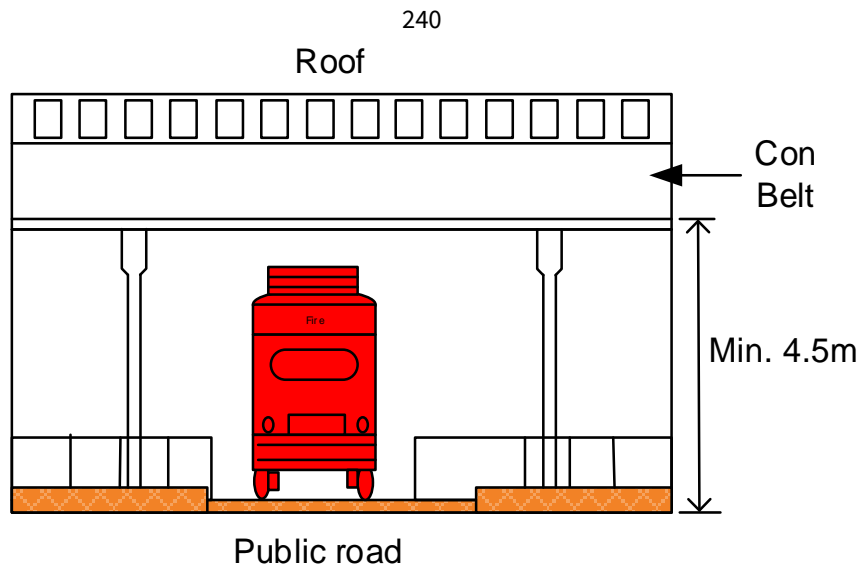


Figure (5.16)

- (o) Accessway and fire engine access road shall be kept clear of obstructions and other parts of the building, plants, trees or other fixtures shall not obstruct the path between the accessway and access openings.

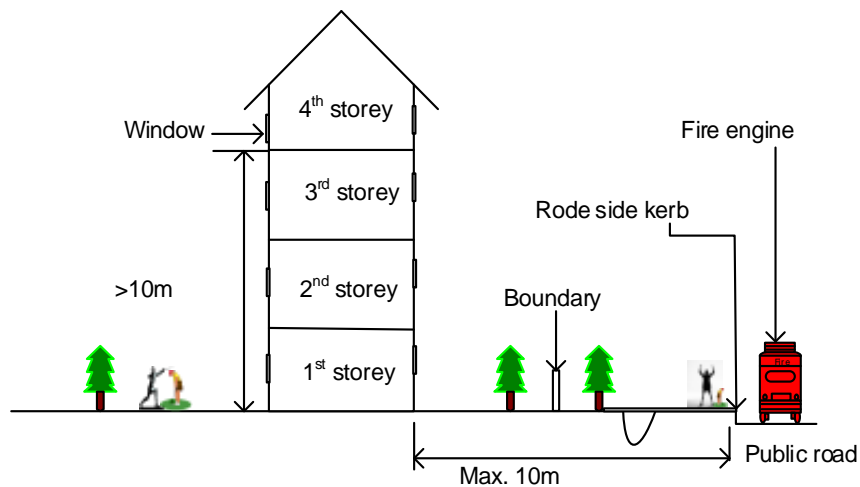


Figure (5.17)

- (p) The marking of fire engine accessway must follow accordingly;
- (i) All corners of accessway shall be marked.
  - (ii) Marking of corners shall be in contrasting colour to the ground surfaces or finishes.

- (iii) If the accessway is provided on turfed area, the markings are to be at an interval not more than 3m apart.
- (iv) Sign post displaying the wordings “Fire Engine Access- Keep Clear” shall be provided at the entrance of the accessway. Size of wordings shall not be less than 50mm.

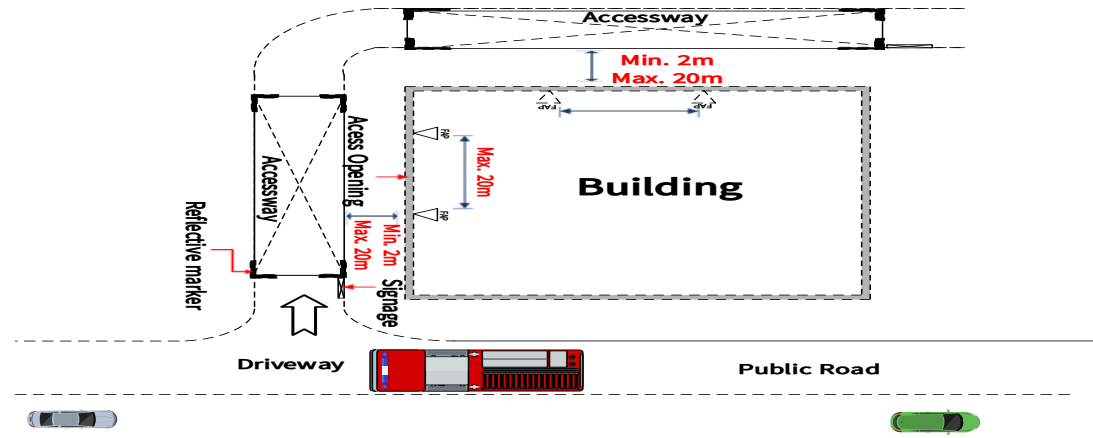


Figure (5.18)

31. The access opening to building for fire-fighting shall be in accordance with the following standards;

- (a) Openings on the external wall for external fire- fighting and rescue operation. Access openings shall include unobstructed external wall openings, windows, balcony doors, glazed wall panels or access panels. Windows, doors, wall panels or access panels must be readily open able from the inside and outside. Inside and outside of access openings shall be unobstructed at all times during the occupancy of the building.

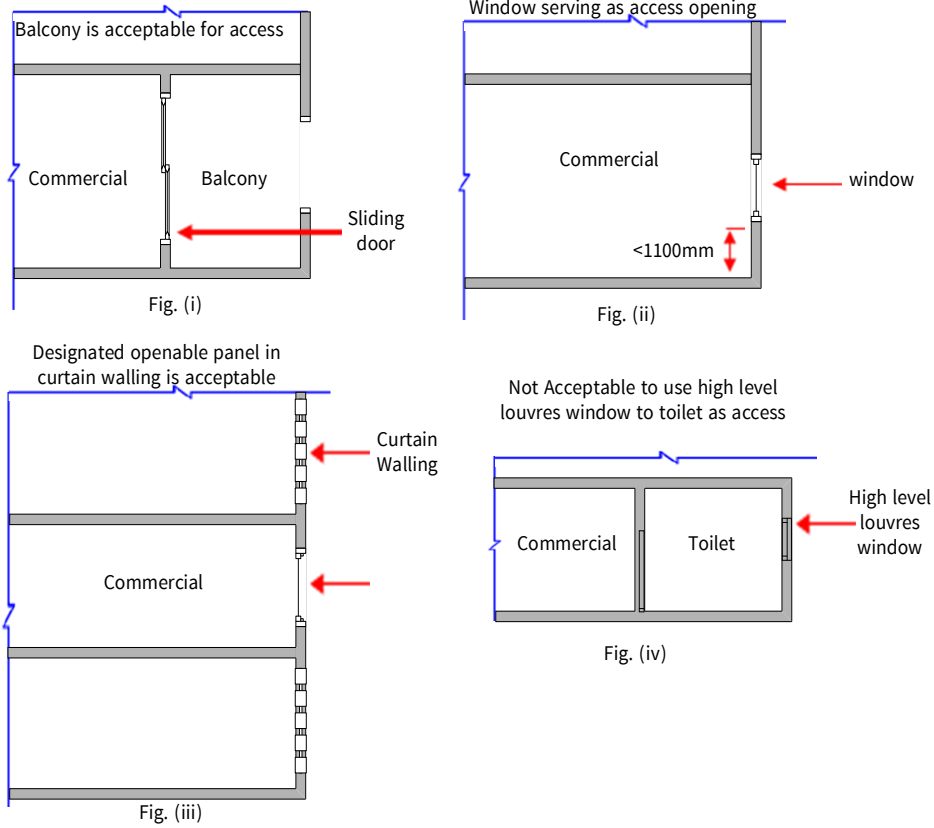


Figure (5.19)

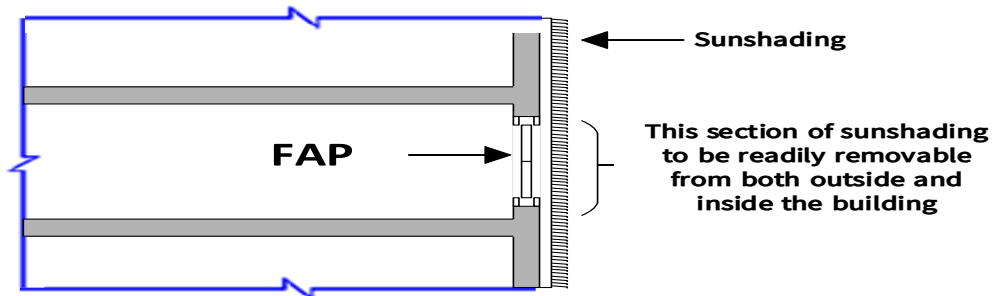
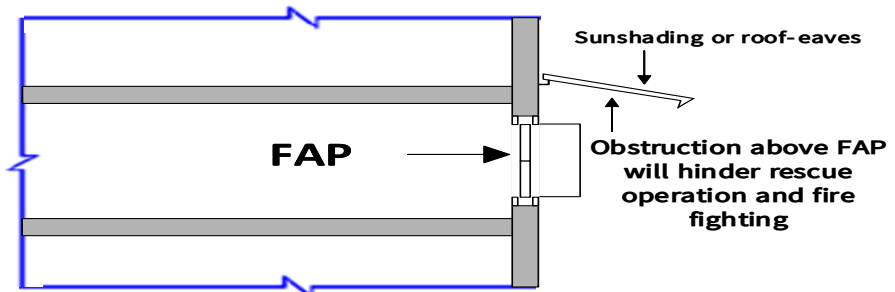


Fig. (v)



FAP: Fire Fighting Access Panel

Fig. (vi)

Figure (5.20)

- (b) Where an external wall which faces the accessway has external openings on each storey level that meet the requirements of Cl 31(a, e & f) there is no need to designate any access opening.
- (c) An external wall which faces the accessway and is windowless or a blank-wall shall be provided with access openings at each storey level.
- (d) Panels to access openings shall be posted with either a red or orange triangle of equal sides (minimum 150mm on each side), which can be upright or inverted, on the external side of the wall and with wordings "Fire Fighting Access - Do Not Obstruct" of at least 25mm height on the internal side.

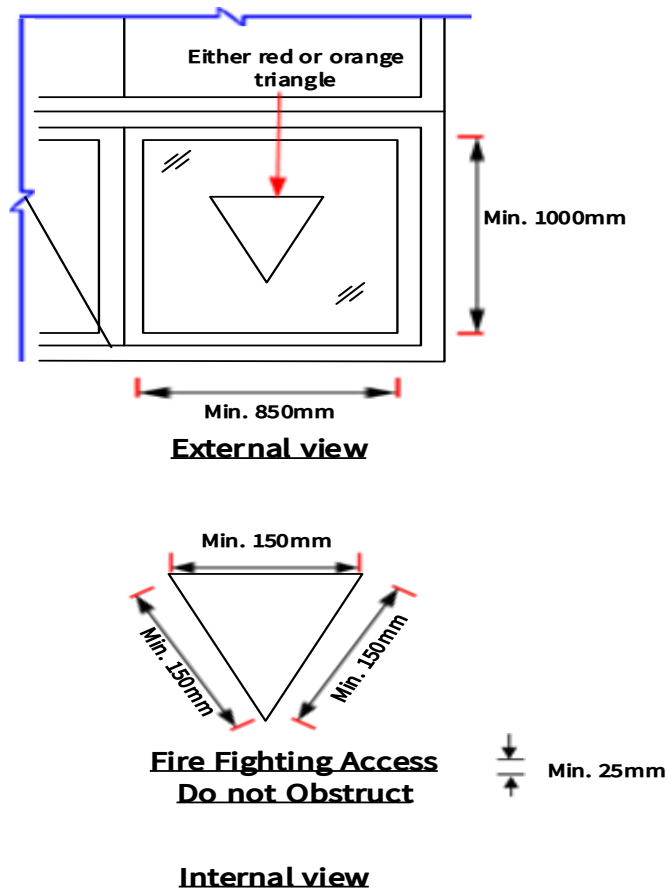


Figure (5.21)

- (e) Access openings shall be not less than 850mm wide by 1000mm high with sill height of not more than 1100mm and head height not less than 1800mm above the inside floor level. The access opening shall not be placed at plant/

store room, staircase, smoke-stop lobby or “dead space”. It shall be placed against an occupied space.

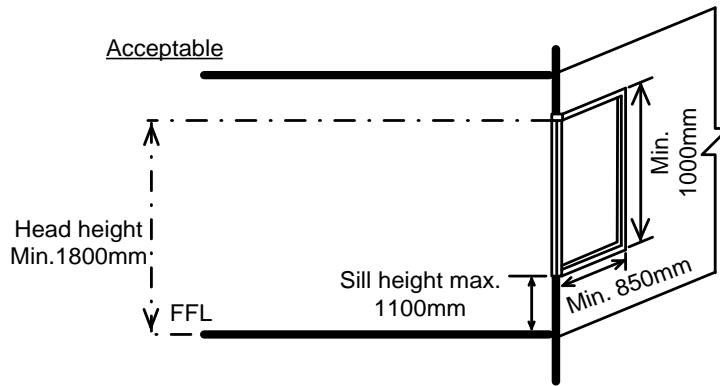


Figure (5.22.a)

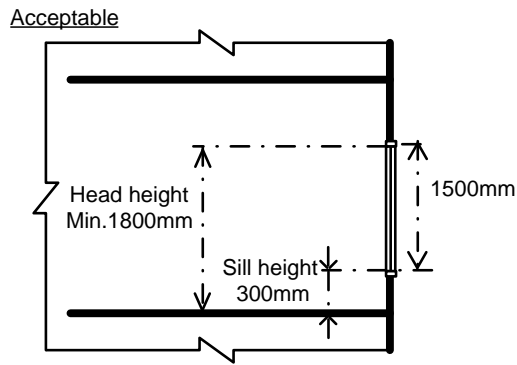


Figure (5.22.b)

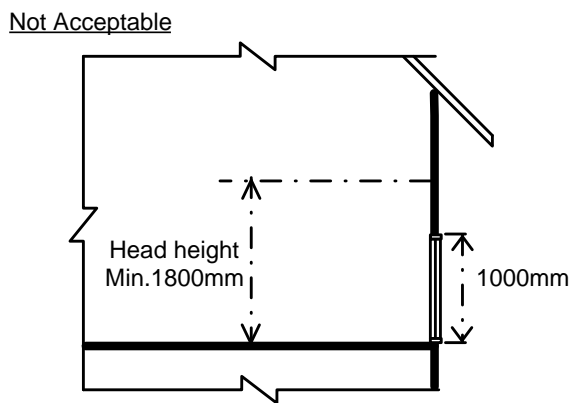


Figure (5.22.c)

- (f) The number and position of access openings for buildings other than residential shall be in accordance with the following standards:
- (i) For buildings under Purpose Groups III, IV, V and VII exceeding the habitable height of 10 m up to 45 m, access opening is required at every storey level, other than 1st storey, opening directly onto accessway.
  - (ii) For building under Purpose Groups VI and VIII, access openings located over accessway shall be provided and evenly distributed along the external walls up to a habitable height of 45 m vertically.
  - (iii) Access openings shall be remote from each other and located along the side of the building. Such access openings shall be spaced at not more than 20m apart measured along the external wall from centre to centre of the access openings.

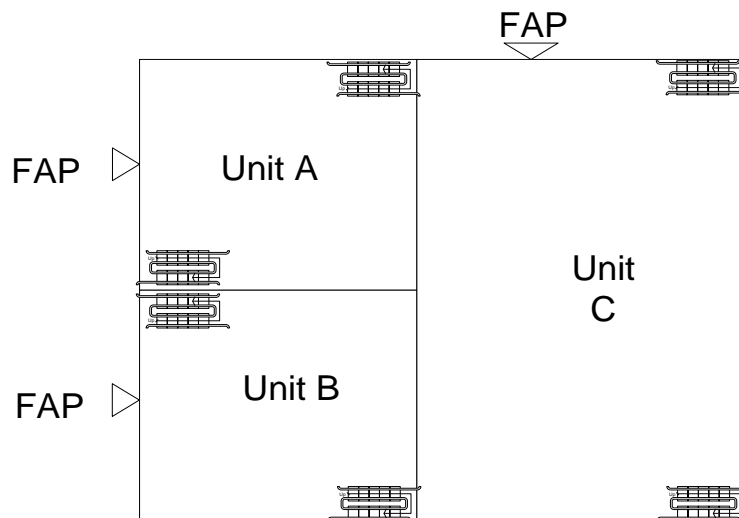


Figure (5.23)

- (iv) For buildings under Purpose Groups III IV, V, VI, VII and VIII where an area or space has a ceiling height greater than 10m, additional high level access openings for smoke venting and fire-fighting purposes

shall be provided and located in the external walls opening into the area or space.

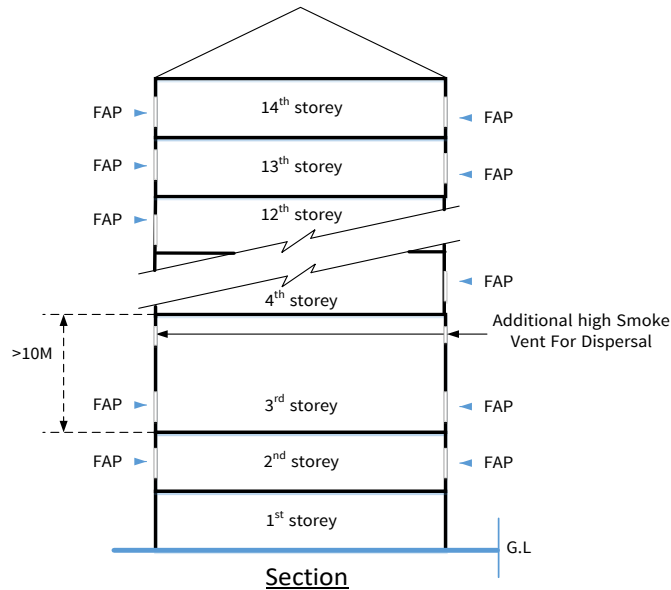


Figure (5.24)

- (g) The provision of access openings shall not be applicable to buildings under Purpose Groups I and II, including buildings under Purpose Group II that have non-residential uses located in the same buildings.

32. The access to buildings with rising mains- Buildings fitted with rising mains and automatic sprinkler system shall have accessways for pumping appliances within 18m of the breaching inlet. The breaching inlets shall be visible from the accessways.

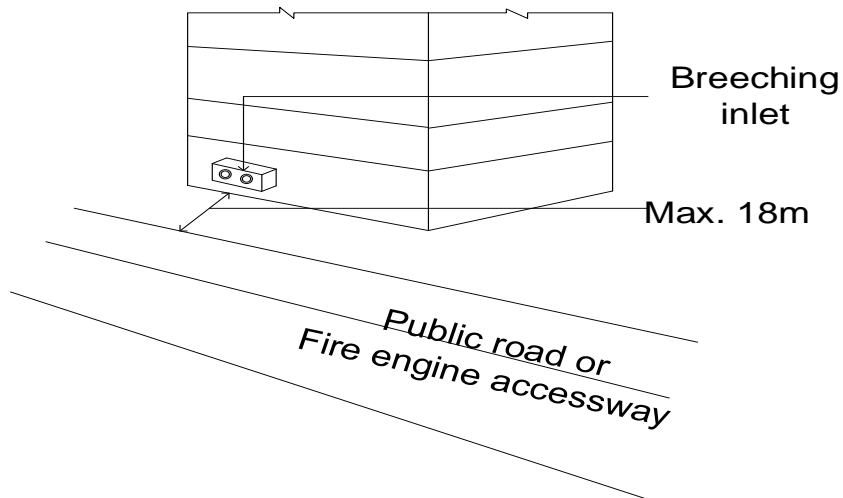


Figure (5.25)



### 33. Private Fire Hydrant

- (a) The requirements of the private fire hydrant shall comply with the following standards:
- (i) Every part of a fire engine access road and/or an accessway in a private lot shall be within an unobstructed distance of 50m from a hydrant. Where a public hydrant conforming to such requirement is not available, private hydrant(s) shall be provided (See Figure (5.26)).
  - (ii) Existing public hydrants along one side of a public road shall not be designated to serve developments that are sited across the other side of the public road. These hydrants can be used for a one-way or two-way lanes road. (See Figure (5.27)).

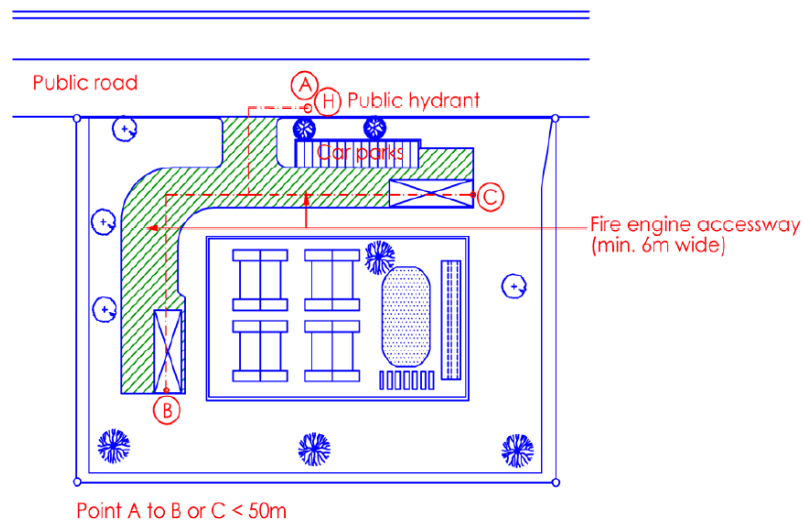


Figure (5.26)

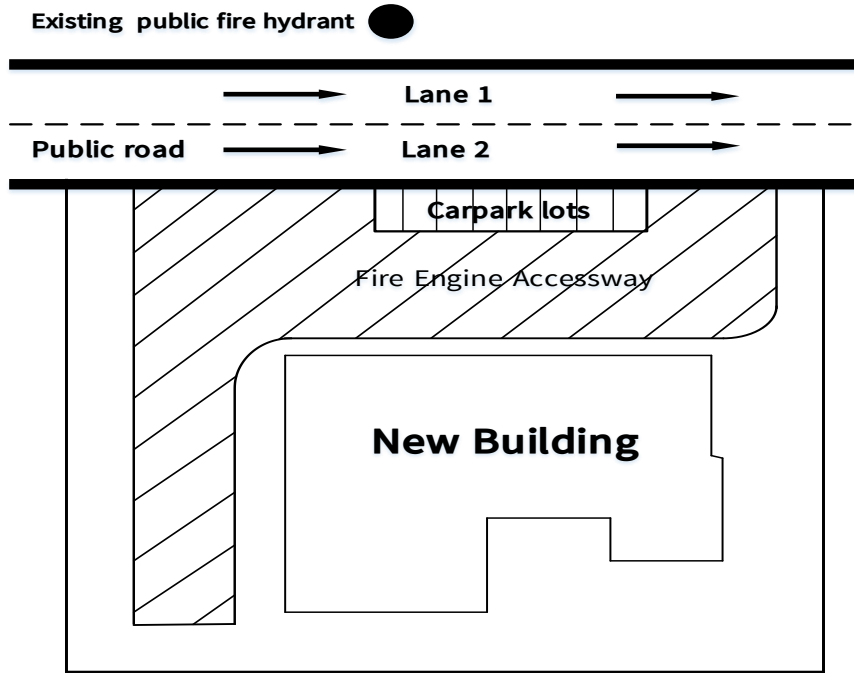


Figure (5.27)

- (b) In situations where more than one private hydrants are required, the hydrants shall be located along the fire engine access road and/or an accessway such that every part of the access road and/or accessway is within an unobstructed distance of 50m from any hydrant (See Figure 5.28).

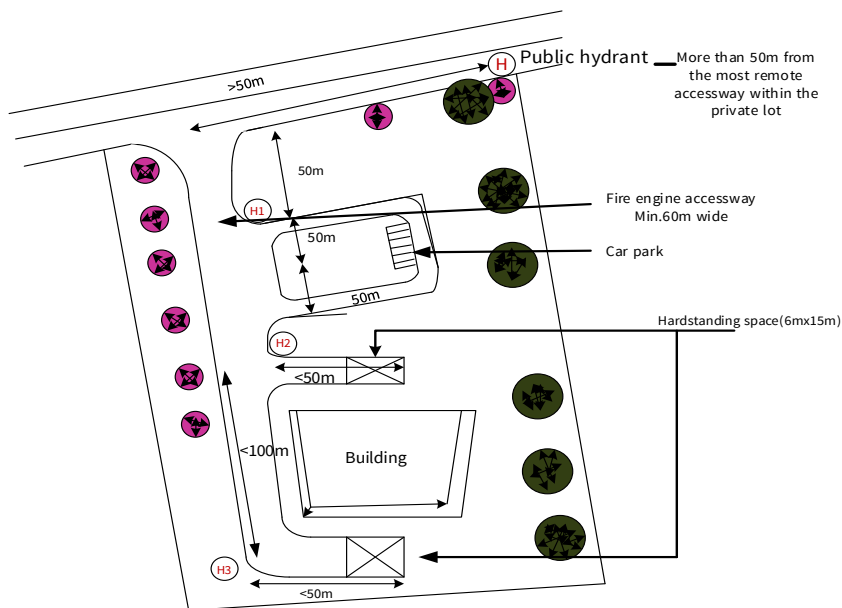


Figure (5.28)

- (c) Siting and types of fire hydrants shall comply with acceptable by Myanmar Fire Services Department and other relevant authorities according to the international standards for Fire Hydrant Systems and Hose reels. The colour of public hydrant must be red. The private hydrant shall be painted yellow band with the size of 100mm on the red pillar and it shall comply with BS 750. The inspection test and maintenance work of fire hydrants must be taken responsibilities by relevant owner or qualified person.

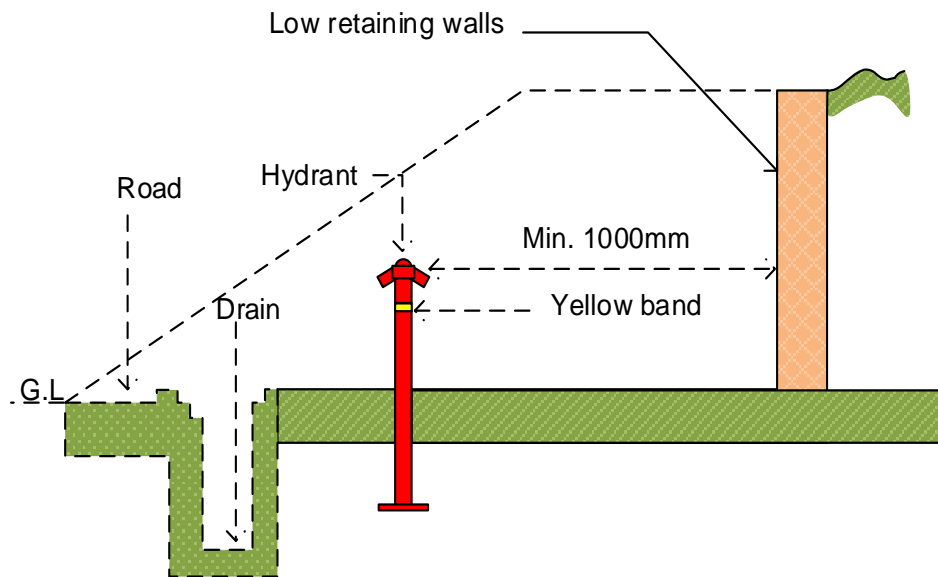


Figure (5.29)

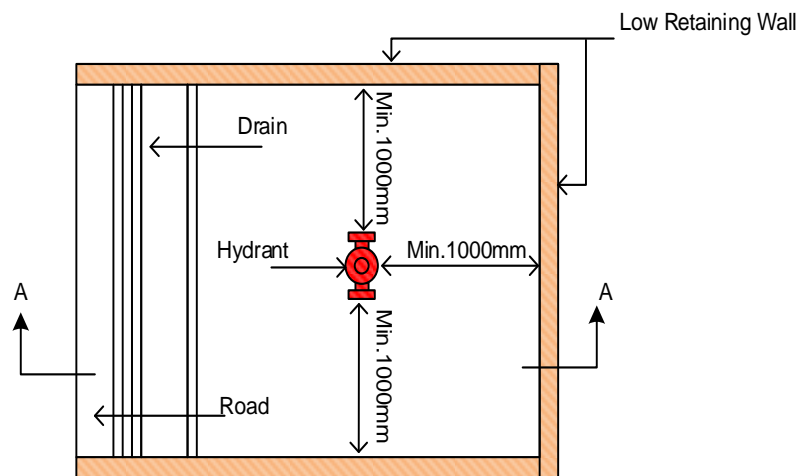


Figure (5.30)

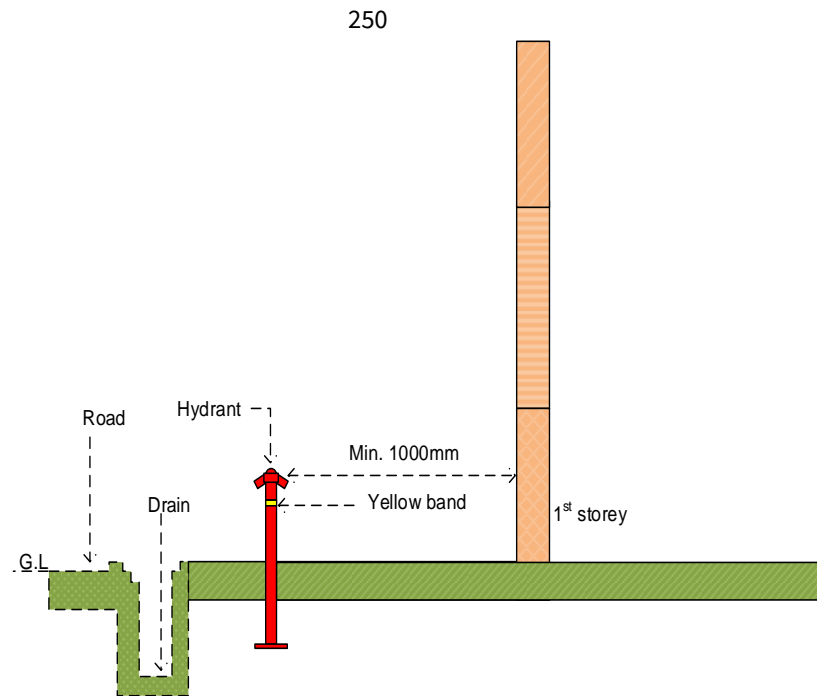


Figure (5.31)

- (d) For a building that is required to have island site accessway under CL.30 (c & d), the hydrant pipe shall be a ringed system. Isolation valves shall be provided on the hydrant ring such that any section of ring. Locking device shall be provided to lock the valves in open position during normal operation.

#### 34. Water Supply for Private Hydrant

- (a) A storage tank of sufficient capacity for fire hydrant system shall be provided according to the buildings usage under Table (5.1). The hydrant system shall comply with the internationally recognized standard which is accepted by Myanmar Fire Services Department and other relevant authorities.

#### (b) Water Supply and Storage Requirements for Private Hydrant

The water supply for hydrants serving residential and non-residential developments shall be as Table (5.1).

### 35. Protection of hydrant mains in buildings

All hydrant mains which pass through a building shall have its full length within the building protected with fire resistance construction complying with the same fire resistance as the element of structure, provided the following requirements are complied with:

- (a) The hydrant mains shall be located in common circulation areas, such as car parking spaces and driveways; i.e. they shall not pass through private or confined spaces;
- (b) No services (except sprinkler pipes) shall be located above or crossing over the hydrant mains;
- (c) The hydrant mains shall be located away from explosion risk areas; and
- (d) The protective enclosure to the hydrant mains shall be labelled with words “HYDRANT MAIN” of minimum 50mm height at suitable intervals.

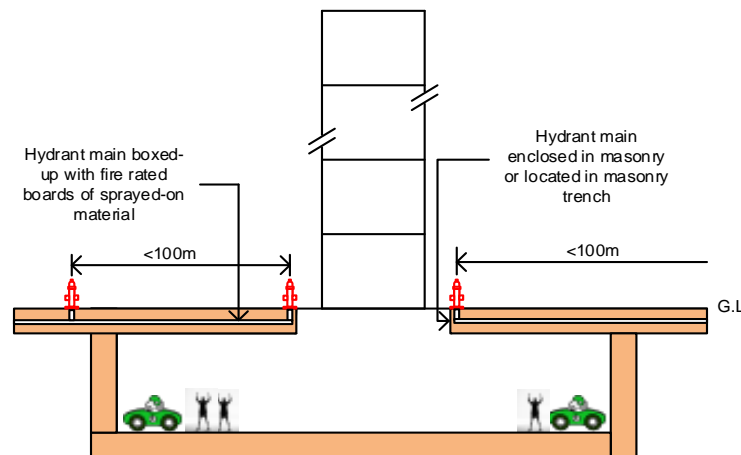


Figure (5.32)

Table(5.1) Water Supply &amp; Storage Requirements For Private Hydrant

Purpose Group/ Requirement	Purpose Group I & II	Purpose Group (* )III,IV,V,VII	Purpose Group (* )VI & VIII
Minimum running pressure	2 bar	2 bar	2 bar
Minimum flow rate	27 L/s	<1000m <sup>2</sup> - 38 L/s <5000m <sup>2</sup> - 57 L/s <10000m <sup>2</sup> - 76 L/s (57 L/s if sprinkler protected) Additional 19 L/s for subsequence 5000m <sup>2</sup>	500m <sup>2</sup> - 38 L/s <5000m <sup>2</sup> - 57 L/s <10000m <sup>2</sup> - 76 L/s (57 L/s if sprinkler protected) Additional 19 L/s for subsequence 5000m <sup>2</sup>
Minimum duration	45 mins	45 mins	90 mins

Remark: Based on the floor area of the largest compartment in the building.

## Chapter (6)

### Electrical Power Supplies

36. In order to get effective implementation for fire-fighting, search and rescue processes, the installation of the primary source, battery and other form of secondary sources for fire-fighting equipment, control and distribution of wiring of electrical equipment in buildings shall comply with SS CP 5 and SS CP 16 Standards that are recognized by Myanmar Fire Services Department therein;

- (a) The installation, control and distribution of wiring of electrical equipment in buildings shall be in accordance with this Fire Safety Code.
- (b) Electrical Insulation and enclosures and barriers give protection against contact with live parts. Non-sheathed insulated conductors must be protected by conduit or trunking or be within a suitable enclosure.
- (c) The primary source, battery and other form of secondary source of power supply shall be in accordance with this Fire Safety Code and the following standards;
  - (i) Where electrical passenger or goods lift or fire lift is required, its electrical installations, inclusive of battery and other form of secondary source of power supply, shall comply with SS 550 .
  - (ii) Where electrical fire alarm system is required, its primary power supply as well as type and capacity of battery shall comply with SS CP 10.
  - (iii) Where exit or emergency lighting system is required, its electrical wiring, type and capacity of battery or other form of secondary source of power supply shall comply with the requirement of SS 563.

- (iv) Where an emergency voice communication system is required, its electrical wiring shall be fire rated or otherwise fire protected in accordance with the requirement of SS 546.
  - (v) Where a wet rising main system is required, the relevant electrical supply shall be installed in accordance the requirement of SS 575. A secondary source of power supply with capacity shall be provided for the wet rising main pumps.
  - (vi) Installation of electrical supply for main pump of sprinkler system shall comply with the requirement SS CP 52. Capacity of secondary source of supply, where required, shall satisfy the operation requirements under the respective hazard category.
- (d) Mechanical ventilation where required for the following rooms or spaces shall be provided with secondary source of supply.
- (i) exit staircases and exit passageways;
  - (ii) smoke stop and fire fighting lobbies;
  - (iii) areas of refuge within the same building;
  - (iv) basement carparks;
  - (v) fire command centres;
  - (vi) flammable liquid/gas storage rooms;
  - (vii) emergency power generator room, and engine driven fire pump room;
  - (viii) Carpark smoke purging system;
  - (ix) powered smoke control systems;
  - (x) any other fire precautionary measure.



- (e) Power supply cables for equipment that is required to operate during a fire emergency shall be of fire resistant type. The fire resistant cables shall comply with SS 299.
  - (f) All motors and their control equipment as well as the associated wiring and accessories shall be suitable for their particular application and for the environment they are exposed to.
    - (i) High Rupturing Capacity Fuses (HRC) or Moulded Case Circuit Breakers (MCCB) with magnetic release shall be installed and capable of protecting the cable connections to the motor, and carrying the stalled current of the motor which such a current would cause the motor windings to fail.
    - (ii) Any no-volt release mechanism shall be of the automatic resetting type such that on restoration of supply the motor can start automatically;
    - (iii) Thermal overload trips shall not be permitted;
    - (iv) Magnetic (short circuit) trips are permitted for use in motor circuits of mechanical ventilation systems serving essential services.
37. The following systems shall be provided with secondary source of supply:
- (a) Atrium smoke control system, including associated AHU (Air Handling Units) forming part of the system;
  - (b) All smoke control systems where required by this Fire Safety Code.
38. Where emergency generators are provided as a secondary source of supply, they shall comply with SS 535.

**Chapter (7)**  
**Fire Fighting Systems**

39. Portable Fire Extinguishers shall be sited in the following:
- (a) In Accordance with the Relevant Authority (MFSD), all Purpose Group shall be provided with portable fire extinguishers.
  - (b) All portable fire extinguishers where required to be provided shall be charged, tested and maintained in fully operational conditions and properly tagged in conformity with requirements in SS 578 Code of Practice for use and Maintenance of Portable Fire Extinguishers.
  - (c) The size, quantity and siting of these portable fire extinguishers shall comply with the requirements in SS 578 under the respective class of occupancy hazard.
  - (d) Operating instructions of the extinguishers, written in Myanmar Language and/or English, shall be located on the front of the extinguisher when the extinguisher is correctly mounted.
  - (e) The travel distance from any point of the floor to the nearest extinguisher shall not exceed 15 m. Extinguishers provided to deal with special risks shall be sited near to the risk concerned.
  - (f) Extinguishers with gross weight not exceeding 4 kg shall be installed so that the carrying handle of the extinguisher is not more than 1.2 m above the floor. Extinguishers with gross weight exceeding 4 kg shall be installed so that the carrying handle of the extinguisher is not more than 1 m from the floor.
  - (g) Portable fire extinguishers provided shall be installed and conspicuously marked in accordance with requirements by International Standards.

40. The type of rising main and hose reel systems shall be provided appropriate to the building as follows:
- (a) Dry rising main shall be installed in buildings except purpose Groups I where the habitable height is more than 10 m, but does not exceed 24 m. Moreover, dry rising main conforming to SS 575 shall be provided to any part of a single or multiple level basements.
  - (b) Wet rising main shall be installed in buildings with habitable height exceeding 24 m.
  - (c) Where the building has access from more than one ground level or road level, the height measurements for the purpose of this Fire Safety Code shall be taken from the level of accessway or fire engine access road (applicable to buildings under Purpose Group II) provided.
41. Number, location, size of rising mains and landing valves shall comply with SS 575 and shall locate in the following:
- (a) The number and distribution of rising mains/ downcomers shall be such that all parts of any floor is within 38 m from a landing valve. If the coverage shall exceed 38 m, another landing valve shall be installed. The distance is to be measured along a route suitable for hose lines, having regard to obstructions.
  - (b) Rising mains/Downcomers and the associated landing valves shall be kept free of obstruction both physically and visually and located.
  - (c) Landing valves shall be located in the order or priority- within fire-fighting lobby, smoke-stop lobby and exit staircase.
  - (d) In the case where there is no fire-fighting lobby, smoke-stop lobby or external corridor, it shall be located inside exit staircase or in the common area and within a protected shaft, immediately out-side the door of the exit staircase.

42. Breeching inlets for rising main shall comply with the requirements in SS 575 and including the following:

- (a) On an external wall or in a boundary wall of a building and to be within 18 m of the adjacent fire appliances accessways and shall be visible from the accessways or fire engine access road (For purpose group II only).
- (b) Fitted directly at the foot of the same riser stack for each dry rising main provided for buildings under purpose group II. If this is not achievable due to site constraint, the maximum horizontal run of the water pipe between the breeching inlet and the same riser stack shall not exceed 12 m.
- (c) As close as possible to the rising main they serve with any connecting pipe between the inlets and the vertical run of the rising main kept to a minimum and given a fall towards the drain valve.
- (d) In a conspicuous position readily visible and accessible to the firemen.
- (e) About 760 mm to 1000 mm above ground level.
- (f) Inlets with instantaneous male couplings for connecting to the Fire Engine's 63.5 mm diameter standard hose shall be fitted to each rising main as follows:
  - (1) A two-way breeching inlet for a 100 mm bore rising main
  - (2) A four-way breeching inlet for a 150 mm bore rising main
- (g) For a wet rising main/downcomer, the inlets shall be connected to feed the storage tank or pump suction tank located no higher than 24 m above the adjacent accessway.
- (h) All inlets shall be enclosed in a glass-fronted inlet box and the box shall be indicated with the letter.
- (i) All such inlets shall be painted red for wet rising mains and yellow for dry rising mains.

- (j) The breeching inlet for a dry rising main shall be fitted with a 25 mm drain valve to facilitate draining the rising main after use.

43. Capacity of the water supply, the storage capacity, the location of storage tank, running pressure, static pressure for a wet rising main system shall comply with the requirements in SS 575.

44. Standby fire hose shall be provided for every rising main except for those in buildings under Purpose Group (I & II) and its type, folding method and positions shall be provided as the following:

- (a) The standby fire hose shall be of 63.5 mm nominal internal diameter in order to ensure that the hose coupling will fit existing coupling tail pieces. The fire hose shall be stipulated in the BS 6391.
- (b) The fire hose couplings shall be manufactured to BS specification or equivalent and of light alloy or gun-metal. The coupling shall be of type 63.5 mm and be of the instantaneous type with standard (double pull) release mechanism. The couplings shall be tied in by binding with galvanized mild steel wire and applied over a hose guard of synthetic fiber. It shall be able to withstand a minimum working pressure of 15 bars.
- (c) Each hose shall have a standard length of 30 m and shall be kept stowed in a Dutch Rolled position and housed in a glass fronted cabinet. The Dutch Roll shall be rolled in the manner shown in Diagram (7.1).

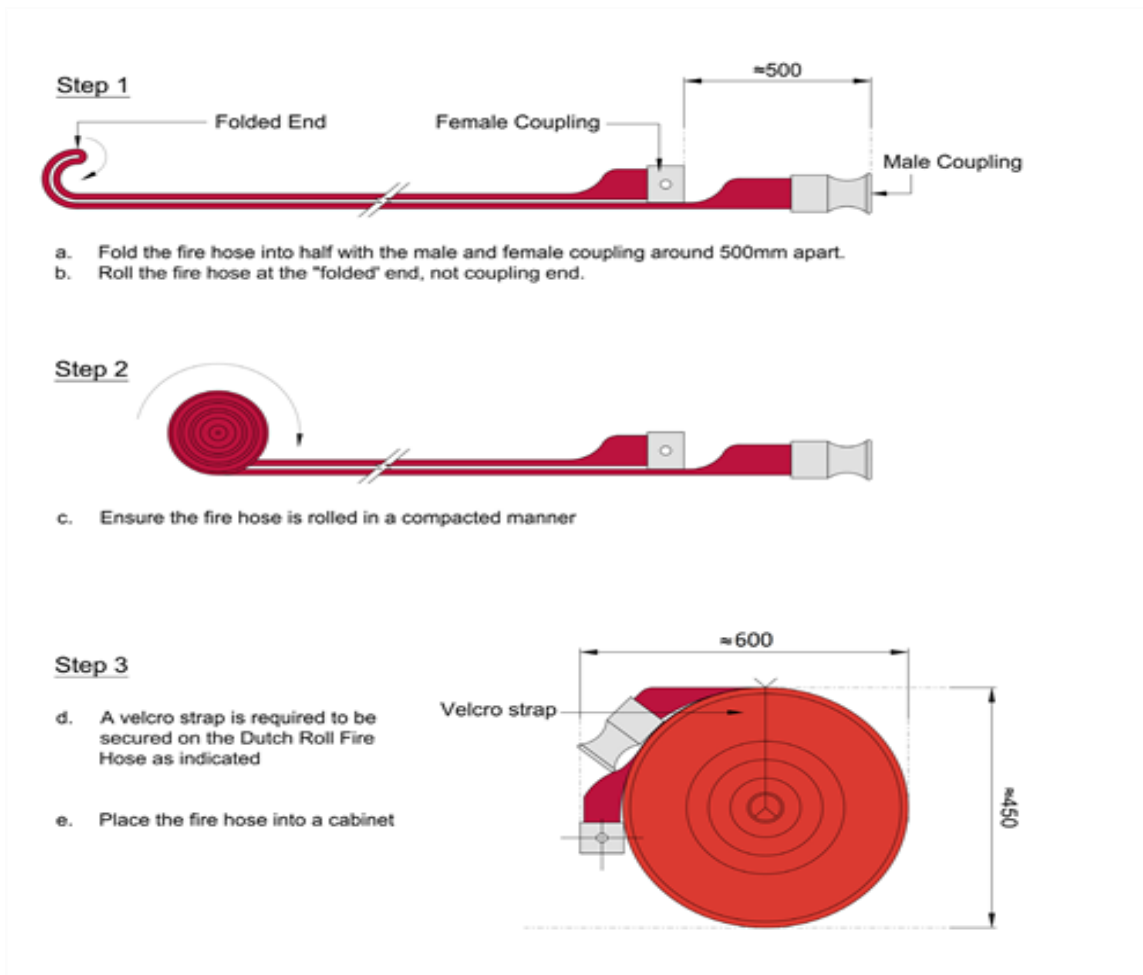


Diagram (7.1)

- (d) The fire hose shall be installed just next to, but not more than 2 m from the landing valve.
- (e) The entire fire hose and cabinet shall be out of direct sunlight.
45. The wall mounted fire hose and cabinet shall be as follows:
- (a) The cabinet shall be firmly mounted on the wall and rigid to take either one or two fire hose weight.
- (b) The cabinet shall be constructed of non-combustible material and maintenance free.
- (c) The cabinet lock, if provided, shall be one of the type that could be operated manually from the inside without the use of a key when the front plain glass/plastic (minimum 300 mm x 300 mm) is broken by the fire fighter.

- (d) The cabinet swing door shall be made open able such that it will not obstruct the retrieving of the fire hose by the fire-fighter.
- (e) The depth of the cabinet shall not exceed 250 mm for one fire hose or 350 mm for two fire hoses.
- (f) The cabinet shall be painted in a contrasting colour such that it is conspicuous and easily identified.
- (g) The wording, "FIRE HOSE", with letter height of at least 50 mm and shown in contrasting color, shall be painted directly on the front panel.
- (h) In lieu of the cabinet, simple wall mounted cradle for the fire hose can be provided, but only in the riser main shaft. The cradle shall be constructed and positioned to facilitate the retrieving of fire hose by the fire-fighter.
- (i) The cradle (in lieu of the cabinet) shall be maintenance free. The fire hose installation height shall be limited as indicated.
- (j) Only clean, dry and compact rolled (Dutch Roll) with the Velcro strap secured as indicated in the cabinet.
- (k) BS 6391 stipulates the technical requirements for quality acceptance standards of the fire hose.

46. In building under Construction, when a building is required to be equipped with rising mains, such rising mains shall be installed progressively as the building attains height during the course of construction. All outlets, landing valves and inlets, water tanks and pumps, and hydrants as may be required for the system, shall be properly installed as directed by the Relevant Authority (MFSD), so as to be readily operational in case of fire.

47. Where boiler room/s or storage room/s containing highly combustible materials are located in basement or not easily accessible for fire-fighting, foam inlets and pipe works shall be provided for the purpose of delivering foam solution to an area close to

the room/s concerned. A 2-way breeching inlet shall be provided at ground level with pipe run of minimum 100 mm bore terminating in landing valve just outside the high fire risk room/s. The provision of the breeching inlet shall comply with the relevant requirements. In situations where such rooms have access openings along accessway, provision of foam solution inlets and outlets is not required.

48. Except the following, hose reels shall be provided with the requirements in SS 575 in every storey of every building.

- (a) Purpose Group I buildings;
- (b) Non-residential occupancy at the 1st storey of a residential building, and fulfilling the following conditions:
  - (1) Floor area of the shop or office unit does not exceed 150 m<sup>2</sup>;
  - (2) Compartmented from the residential floors and other parts of the building;
  - (3) Not being used as an eating establishment, storage of flammable materials;
  - (4) Not being used as public entertainment outlet;
  - (5) Not belonging to Purpose Group VI & VIII.
- (c) Any other small standalone single-storey guardhouse, bin center, electrical sub-station and open-sided shed not exceeding 200 m<sup>2</sup> (excluding those in Purpose Group VI & VIII).

49. The hose reel not exceeding 30 m in length and shall be of 20 mm or 25 mm nominal diameter. Water supply for hose reels in terms of flow rate and minimum running pressure shall comply with the requirements in SS 575. Nozzles shall be of 4 mm or 6 mm.



50. Fire safety equipment is illustrated clearly in buildings provided the signs. The Table (7.1) shows the different size of the graphical symbol with respect to the viewing distance.

51. ELECTRICAL FIRE ALARM SYSTEM shall be installed as follow:

- (a) Every building or part of a building, except Group 1 and 2 , having a total floor area of more than that specified in Table 7.2 having regard to the purpose group of the building or part of the building, shall be installed with a fire alarm system, either of the automatic or manual type, which shall be complied with the standard requirements of the SS CP 10 Code of Practice for the Installation and Servicing of Electrical Fire Alarm Systems. These systems shall be connected to Myanmar Fire Services Department through an approved alarm monitoring station if required under Cl. 56.
- (b) For a building of mixed commercial-cum-residential usage, the residential floors located on the upper storeys of the building shall be provided with manual fire alarm system at the common area. If the habitable height of the building does not exceed 24m, only the alarm bell of the fire alarm system need be extended to the common lobby area of each residential floor.
- (c) For residential developments which are located over car parks (irrespective of whether the car parks are in the basement) where fire alarm system is required under Table 7.2, the alarm bells of the fire alarm system shall be extended to the common lobby area of each residential floor, irrespective of the height of the building.
- (d) Notwithstanding (a) above, if the total floor area per storey of a 2 to 4 storey building of all Purpose Group except Small Residential and Other Residential which exceeds the sizes as stipulated in Table 4.1, the building shall be provided with an automatic fire alarm system.

- (e) For dormitories, including workers' dormitories, electrical fire alarm system shall be provided to comply with SS CP 10 as follows:
  - (i) Dormitories not exceeding 4-storey, manual fire alarm system is to be provided.
  - (ii) Dormitories exceeding 4-storey, automatic fire alarm system shall be provided.

52. Fire Alarm Panel shall be provided as follow:

- (a) A fire alarm panel shall be provided to comply with SS CP 10 for the electrical fire alarm system of the automatic or manual type in order to indicate the location of the alarm which has been actuated or operated.
- (b) The associated control and supervisory equipment, indicating equipment, wiring and arrangement of power supplies for the fire alarm panel shall comply with the requirements in SS CP 10.
- (c) All automatic systems which are activated via the general building alarm (Detectors/ Manual Call Points/ Flow Switches/ Others I/O Modules) shall be connected directly to the fire alarm panel.
- (d) The fire alarm panel should be located near the main entrance of the building, in the fire command centre, in the guardhouse or in the fire-fighting lobby.
- (e) Sub fire alarm panel, where provided, shall comply with the requirements in SS CP 10 be located at the fire-fighting lobby, smoke stop lobby, protected staircase in that order of priority or at the main point of entry into the area covered by the alarm zone.

53. Manual Call Point shall be provided as follow:

- (a) In a manual alarm system, except as otherwise exempted in Cl. 51, the manual call points shall be provided on every storey of the building or part of the building and shall be located that no person need to travel more than 30m from any position within the building to activate the alarm.

- (b) Manual call points should be located on exit routes preferably next to hose reels and in particular on the floor landings of exit staircases and at exits to the street. In the case where an automatic fire alarm system or manual fire alarm system is provided, grouping for indication of location of the manual call points shall comply with the requirements in SS CP 10.
- (c) Manual call points should be fixed at a height of 1.4m above the floor and shall be located at easily accessible and conspicuous positions free from obstructions. The installation of the sounding device shall be in accordance with SS CP 10.
- (d) Subject to compliance with Cl. 10.b , provision of manual call point on the mezzanine floor of factory unit is not required provided no person on the mezzanine floor need to travel more than 30m to activate the nearest manual call point located on the main floor.
- (e) Where an automatic fire alarm system is required by this Fire Safety Code, the type, location, spacing and installation of the detectors shall comply with the requirements in SS CP 10.

54. Alarm Device shall be provided as follow:

- (a) The type, number and location of the alarm device shall comply with the requirements in SS CP 10.
- (b) The fire alarm sounder shall have a sound that is readily distinguishable from any other alarm system.
- (c) All sounders in the building should be actuated simultaneously in the event of activation. However, in cases permitted or required by the Relevant Authority (MFSD) where the operation of alarm sounders are grouped or activated in stages, the arrangement shall comply with the requirements in SS CP 10.

- (d) In discos, night clubs, other places of entertainment outlets or areas where audible alarms may be ineffective (background noise is excessive), both audible alarms signals and visual alarm signals shall be provided. In general, visual signals shall not be used in place of audible alarms. The intensity of the light shall be sufficient to draw the attention of people in the vicinity. Otherwise, the sound system in the above places shall be electrically interlocked with the fire alarm system to enable the sound to be automatically cut-off in the event that the fire alarm system is activated.

55. A theatre or cinema shall be provided with an electrical fire alarm system of the manual type complying with the following:

- (a) The manual alarm system shall be installed in the lobbies and other areas adjoining the hall and shall be connected to a fire station through an approved alarm monitoring station, and
- (b) Visual and audible alarm indicators shall be installed in the projection room and in another room where a responsible person is readily available to alert the audience in case of a fire, and
- (c) The provision of the fire protection system in cinema which forms part of the building shall be similar to that of the building.

56. The electrical fire alarm system required to be installed in a building or premises under this clause shall be connected to a fire station through an approved alarm monitoring station when the building or premises is

- (a) Health care occupancy, hotel or other such like occupancy,
- (b) An oil refinery, oil depot, general warehouse, chemical plant or other high hazard factory or premises,
- (c) A theatre, cinema or concert hall as specified in Cl.55, or
- (d) (i) A building required under the provisions of this Fire Safety Code to be protected by an automatic fire alarm or fire extinguishing system.

- (ii) If a car park in a building is provided with both manual and automatic fire alarm system, then the manual fire alarm need not be connected to the fire station through an approved alarm monitoring company.

57. The following shall be provided with an automatic sprinkler system:

- (a) Whenever compartmentation requirements under Chapter 4 (Structural Fire Precaution) of this Fire Safety Code cannot be complied with.
- (b) Every storey of a building, except that of Purpose Group I and II, the habitable height of which is more than 24m irrespective of whether or not the compartmentation requirements are complied with.
- (c) In the case of residential occupancy forming the upper storeys of a building of mixed occupancy with habitable height exceeding 24m, every storey of the non-residential portion only, shall be provided with an automatic sprinkler system.
- (d) Automatic Sprinkler System for all basement storeys shall be provided complying with the followings:
  - (i) All basement storeys, except for those used as residential units, shall be provided with an automatic sprinkler system irrespective of compartment size. Where the upper storeys of the building is fully compartmented from the basement storey, the requirement for provision of an automatic sprinkler system for floors above the basement shall be considered separately and in accordance with sub. Cl.57 (a), (b) and (c).
  - (ii) Where the basement storey is effectively cross-ventilated such as to avoid smoke logging conditions, the basement storey may be exempted from the requirements of provision of an automatic sprinkler system, at the discretion of the Relevant Authority (MFSD).

- (iii) In the case of residential development located over basement car park, relaxation on the provision of these sprinkler system and smoke purging systems to the basement car park may be granted if the following conditions are satisfactorily fulfilled:
- (aa) basement car parking shall consist of one level only;
  - (bb) external openings shall be provided to achieve effective cross-ventilation by means of evenly distributed vertical openings along the perimeter walls and evenly distributed voids over the basement in such manner that:
    - (1) no point within the basement is more than 12m from any vertical opening or void for spaces that are in between two openings or voids;
    - (2) no point shall be more than 6m from any opening or void for spaces that are ventilated by such opening or void on only one side; and
    - (3) such vertical openings shall be at least 600mm in height;
- (e) total aggregate area of these voids and vertical openings shall be not less than 20% of the total basement floor area;
- (f) automatic fire alarm system shall be provided to the basement car parks with extension of alarm bells to the common/lobby areas of the upper storeys in accordance with Cl.51(a) and (c).
- (g) With the exception of industrial buildings, such as factories, warehouses and storage depots, the following areas are exempted from sprinkler protection in a sprinklered building:
- (i) Canopies/Car porches
    - (aa) Such areas are used solely for the purpose of passengers pick-up and drop-off point; and
    - (bb) There shall be no commercial activities or storage within these areas; and

- (cc) Cut-off sprinklers and fire rated wall are not required to be provided to separate the sprinklered and non-sprinklered areas.
- (ii) External corridors not exceeding 4m in width provided there are no commercial activities or storage within these areas.
- (iii) Atrium ceilings which are less than the height of 12m shall be provided automatic sprinkler system. If Atrium ceilings which exceed the height of 12m, water monitor system, Deluge system, extended coverage sprinkler system and effective detectors (eg.smoke, infra-red, Beam Detector etc.) shall be installed. There shall be no commercial activities or storage within the floor spaces below the atrium roofs.
- (iv) External open-sided linkways not exceeding 4m in width provided there are no commercial activities or storage within these areas.

58. Installation of the sprinkler system and its associated water supply, control and testing requirements shall comply with the SS CP 52 Code of Practice for Automatic Fire Sprinkler System.

59. The sprinkler system shall be electrically monitored so that on the operation of any sprinkler head, the fire signal is automatically transmitted to Main Fire Alarm Panel.

- (a) Installation of fire pumps for sprinkler system shall comply with the requirements of SS CP 52. Sprinkler pumps shall be installed within a fire compartmented fire pump room, whose fire rating shall be in accordance with Table 7.3. The sprinkler pump room floor level (Plinth of the Pump Room) shall not be lower than the main floor level. Sprinkler control valve(s) shall be located in the following order of priority:
  - (i) facing external within close proximity to Fire Command Centre;
  - (ii) within fire-fighting lobby/ smoke-stop lobby; and
  - (iii) within sprinkler pump room that has proper access; and

- (iv) within fire compartmented enclosure located near to fire-fighting stair and readily accessible from the common areas.

60. Special Purpose Rooms shall be provided with automatic sprinkler system as followings:

- (a) Where a building is required to be provided with an automatic sprinkler system under this Fire Safety Code, parts of the building which are used for purposes stipulated in Table 7.3 shall be compartmented. Exemptions of sprinkler provision for such rooms or spaces are indicated in Table 7.3.
- (b) Where a building is not required to be provided with an automatic sprinkler system under this Fire Safety Code, special purpose rooms stipulated in Table 7.3 shall be compartmented.
- (c) Where automatic sprinklers are to be replaced by an automatic fire extinguishing system to protect special purpose rooms for the use as communication nerve centres, data process centres and process control rooms composing of high value computers or telecommunication equipment, the enclosure to the hazard or occupancy shall comply with the following:
  - (i) it shall be constructed to have minimum 1-hour fire resistance rating;
  - (ii) any door opening shall be protected with minimum 1-hour fire door;
  - (iii) it shall not be provided with more than 2 exits;
  - (iv) the direct travel distance to any exit door of the enclosure shall not exceed 15m; and
  - (v) The fire extinguishing system using clean agent shall conform to Cl.63

61. Water mist system may be permitted as a substitute of automatic sprinklers in sprinkler protected buildings provided that the following requirements are complied with:



- (a) Water mist system shall be a propriety design that has been tested to meet the performance requirements of a standard acceptable to the Relevant Authority (MFSD);
- (b) Design and installation of water mist system shall conform to NFPA 750 (Standard for the Installation of Water Mist System) or AS 4587 (Water Mist Protection System–System Design, Installation and Commissioning); and
- (c) Components of water mist system shall be recognised by the Relevant Authority (MFSD)

62. Except under Purpose group I , any building not exceeding 24m in habitable height, where any car parking area above ground is provided with natural ventilation in accordance with Cl.16(i), the provision of automatic sprinkler to the car parking area is not required provided:

- (a) An automatic fire alarm system shall be provided to the car parking area under Purpose groups III, IV, V & VII; and
- (b) Manual fire alarm system shall be provided to the car parking area under Other Residential Group II subject to Table 7.2.

63. Installation of any fixed automatic fire extinguishing systems which are not deemed to be required by this Fire Safety Code shall not be accepted as substitute of any provision stipulated in this Fire Safety Code unless otherwise approved as such by the Relevant Authority (MFSD). Such systems will be considered as additional protection for property safety and their installation shall not adversely affect the performance of the stipulated systems. Design and installation of such automatic fire extinguishing systems shall comply with corresponding Code of Practice.

64. Using lifts for building evacuation during emergency requirements are applicable to all buildings. Lift hoistways shall be vented.

- (a) Emergency power supply for the lifts shall be provided complying with the followings;

- (i) Emergency power supply for lighting, ventilation and alarm systems for all passenger lifts shall be provided and complied with the requirements in SS 550.
  - (b) In the buildings which require the provision of standby generating plant for special emergency operations, provision for special emergency operation for lifts shall comply with the requirements in SS 550 for the following:
    - (i) Public buildings;
    - (ii) Buildings under Purpose Group II exceeding the habitable height of 24m;
    - (iii) Buildings under Purpose Group II where the passenger lifts serve the upper storey residential floors and the non-residential basement;
    - (iv) Mixed developments where the passenger lifts serve both the residential and non-residential floors;
    - (v) Industrial buildings under Purpose Group VI and VIII, which are multi-storey.
    - (vi) All basement occupancies.
  - (c) The power supply to the lift shall be connected by a separated line. The power cables serving the lift installation shall be routed inside Lift hoistways or Protected Shaft.
65. Fire Lift shall be installed complying with the following provisions;
- (a) With the exception of Purpose Group I, all other buildings shall be provided with at least one fire lifts if the habitable height exceeds 24m. All buildings shall also be provided with at least one fire lift if the depth of the basement exceeds 9m below the average ground level. The fire lift(s) shall be contained within a separate protected shaft or a common protected shaft containing other lifts subject to such other lifts being

served at each storey by the fire fighting lobby, which is required by the provisions of Cl.6(m)(2) of this Fire Safety Code.

- (b) A fire lift shall be adjacent and accessible to an exit staircase and be approached by a fire-fighting lobby at each storey. The fire lift shaft shall be continuous throughout the building and serve every storey.
- (c) Fire lift shall be provided with an operational feature that would enable firemen to cancel first or earlier call which had been inadvertently made to the fire lift during an emergency. This operational feature could be built into the lift control system or alternatively a separate by-pass switch could be provided. If the operational feature is built into the lift control, it is not mandatory to provide a separate by-pass switch.
- (d) A lift mainly intended for the transport of goods shall not be designated as a fire lift.
- (e) The installation of the fire lift shall be in accordance with SS 550 Code of Practice for Installation, Operation and Maintenance of Electric Passenger and Goods Lifts.
- (f) The fire lift shall be located such that any part of every storey shall be accessible to fire-fighters from the fire lift.
- (g) Regardless of whether the building is installed with automatic sprinkler system, one fire lift shall be provided. Any part of a storey of the building is within 60m coverage from the fire lift door.

66. In a fire emergency, Homing of Lifts shall be provided complying with the following:

- (a) In a fire emergency of the buildings which are required to be provided with fire alarm system, when any one of the fire detection devices or fire alarm systems is activated, all the passenger lifts shall be brought to the Exit Discharge floor (usually 1st storey) and park there with the lift landing doors remaining opened.

- (b) In the event of power failure or power interruption in the building which are required to have standby generating plant, the supply to the lifts shall be automatically switched over to the emergency power supply from the generating plant and the lifts shall be brought to the designated floor and park there with the lift landing doors remaining open until all the lifts have been brought down to the designated floor. Thereafter, one or more lifts may resume operation depending on the capacity of the emergency generating plant, in addition to the fire lift. Normal operation of the lift shall be automatically reset on the return of normal power supply.
- (c) In the Homing of lifts for buildings which are not required to have standby generating plant, all passenger lifts, including hydraulic lifts, shall be provided with Automatic Rescue Device (ARD). The ARD shall permit the lifts to move and park at the nearest lift landing floor with the lift/landing doors in the opened position in the event of power failure. Homing any of the lifts to a basement storey is not permitted.
- (d) Homing of lifts for mixed developments comprising residential and non-residential components shall be provided with the following:
  - (i) All passenger lifts which serve the residential and non-residential floors shall be required to home to the designated or alternative designated floor in the event of power failure and/or fire. The lifts shall be provided with secondary power supplies from standby generating plant of sufficient capacity.
  - (ii) Where the passenger lifts serve the upper residential floors and the basement non-residential floor/s, including car parks, the lifts shall be provided with emergency power supply from standby generating plant for homing to the designated floor when there is a power failure in the building. In a fire emergency, the passenger lifts shall be brought to the designated floor when any of the fire alarm system in the basement nonresidential floor/s is activated.
- (e) Alternative designated floor shall be provided with the following:

- (i) Where the lifts open directly into an occupancy area in a designated floor, for example, a shopping floor or an office floor, an alternative designated floor (eg 2nd storey) shall also be identified. The lifts shall be brought to the alternative floor in the event that there is a fire in the designated floor, in close vicinity of the lift landing door. The activation of any detector or sprinkler head covering the lift landing space at the designated floor would cause the lift to be re-directed to home to the alternative floor.
- (ii) The alternative floor shall have minimum fire hazard and pre-selected for the homing of passenger lifts, and where people can escape to safety in an exit staircase or other exit from the lift landing door.
- (iii) In building under 66 (e) (i) which are not provided with sprinkler or automatic fire alarm system, suitable Detection Systems shall be provided at ceiling level to cover the lift landing space. The activation of any sensor would cause the lifts to be re-directed to home to the alternative floor.
- (iv) The above requirements on homing of lifts to an alternative floor need not be applied to standalone open-sided car park and small residential buildings Under purpose Group.

**Table 7.1 the graphical symbol with respect to the viewing distance**

Viewing Distance	0 m to 6 m	>6 m to 9 m	>9 m to 12 m	12 m or more
Z=100	min. 60 mm	min. 90 mm	min. 120 mm	min. 150 mm

The graphical symbol for fire-fighting equipment shall be sized such that the height and width are same. The size of symbol is not inclusive of borders.

**TABLE 7.2 PROVISION OF FIRE ALARMS ACCORDING TO PURPOSE GROUP, HEIGHT &  
SIZE OF THE BUILDING**

<b>A</b> <b>Purpose group &amp; No</b> <b>of storeys of building</b>	<b>B</b> <b>Total floor area</b> <b>(per storey in sq m) in</b> <b>excess of which alarm</b> <b>must be provided</b>	<b>C</b> <b>Type of</b> <b>Alarm</b>
<b>III (Institutional)</b>		
(i) Schools & others		
a - single storey building	NL	-
b - Building of 2 to 4 storeys	400.‡	(m)+
c - Building of more than 4 storeys	400**	(a)
(ii) Health care occupancy with stay-in facilities		
a - Single storey building	NR	(m)
b - Building of 2 to 4 storeys	NR	(a)
c - Building of more than 4 storeys	NR	(a)
(iii) Health care occupancy without stay-in facilities		
a - Single storey building	NL	-
b - Building of 2 to 4 storeys	200.‡	(m)
c - Building of more than 4 storeys	NR	(a)
(iv) Dormitories		
a - Single storey building	NR	(m)
b-Building of 2 to 4 storeys	NR	(m)
c-Building of more than 4 storeys	NR	(a)
<b>IV (Office)</b>		
Single storey building	400*	(m)
Building of 2 to 4 storeys	200.‡	(m)
Building of more than 4 storeys	NR	(a)

<b>A</b> <b>Purpose group &amp; No of storeys of building</b>	<b>B</b> <b>Total floor area (per storey in sq m) in excess of which alarm must be provided</b>	<b>C</b> <b>Type of Alarm</b>
<b>V (Shop)</b>		
Single storey building	400*	(m)
Building of 2 to 4 storeys	200.‡	(m)
Building of more than 4 storeys	NR	(a)
<b>VI (Factory)</b>		
Single storey building	400*	(m)
Building of 2 to 4 storeys	200.‡	(m)
Building of more than 4 storeys	NR	(a)
<b>VII (Place of Public Resort)</b>		
(i) With stay-in facilities i.e. hotels, boarding houses, serviced apartments, hostels, backpackers hotel:		
a - Single storey building	NR	(m)
b - Building of 2 to 4 storeys	NR	(a)
c - Building of more than 4 storeys	NR	(a)
(ii) Without stay-in facilities:		
a - Single storey building	400*	(m)
b - Building of 2 to 4 storeys	200.‡	(m)
c - Building of more than 4 storeys	NR	(a)
<b>VIII (Storage)</b>		
a - Single storey building	2000*	(m)
b - Building of 2 to 4 storeys	1000.‡	(m)
c - Building of more than 4 storeys	NR	(a)

\* Single storey building with area less than indicated is not required to be provided with alarm system unless otherwise specified by the Relevant Authority.



- \*\* Building of more than 4 storeys but area less than 400sqm, only manual alarm system is required.
- + Where used for sleeping accommodation, automatic alarm system may be required by the Relevant Authority.
- .‡ The total floor area per storey shall not exceed that as stated in Cl.51(d).
 

NL	=	no limit	(m)	=	manual type
NR	=	not relevant	(a)	=	automatic + manual type

- Remarks:
- (1) When there are 2 or more purpose groups in a building, the strictest requirement for any one of the purpose groups shall be applicable to the whole building.
  - (2) Where purpose group II forms part of a mixed use building, Cl.51 (b) shall be followed.

**Table 7.3: Compartmentation requirements for special purpose rooms in buildings**

Usage (1)	Non-sprinkler protected building (2)		Sprinkler protected building (3)		
	Compartmentation (2a)	Door rating (2b)	Compartmentation (3a)	Door rating (3b)	Sprinkler (3c)
Store room <sup>1</sup>	1 hr	1 hr	N	N	S
AHU room <sup>3</sup>	N	N	N	N	S
Kitchen <sup>2</sup>	1 hr	1/2 hr	1 hr	1/2 hr	S
Boiler room (oil fired)	2 hr	2 hr	1 hr	1 hr	S
Low voltage Switch room	B	B	B	B	Ex
High voltage Switch room	B	B	B	B	Ex
Transformer room (oil type)	B	B	B	B	Ex
Oil Tank room	2 hr	2 hr	1 hr	1 hr	S
Generator room	2 hr	2 hr	1 hr	1 hr	S
A/C Plant room	2 hr	2 hr	1 hr	1 hr	S
Electric Lift motor room	2 hr	2 hr	2 hr	2 hr	Ex
Hydraulic Lift motor room	2 hr	2 hr	1 hr	1 hr	S
Essential Fan room	2 hr	2 hr	1 hr	1 hr	S
Electrical room	2 hr	2 hr	2 hr	2 hr	Ex
Battery room	2 hr	2 hr	2 hr	2 hr	Ex
Sprinkler/Wet Riser Tank room	B	B	B	B	S
Fire Pump room	B	B	B	B	S
Fire Command centre	2 hr	2 hr	2 hr	2 hr	S
Usage	Non-sprinkler		Sprinkler protected building		

(1)	protected building		(3)		
	(2)				
	Compartmentation (2a)	Door rating (2b)	Compartmentation (3a)	Door rating (3b)	Sprinkler (3c)
MDF room	N	N	B	B	Ex
			N	N	S
PABX room	N	N	B	B	Ex
			N	N	S

Compartmentation and door rating in this table are specified in one of the following ways:

N = no specific requirement on compartmentation

B = compartmentation and door rating of the special purpose room shall not be less than the fire resistance of the elements of structure of the building where the room is located

The fire resistance rating stipulated in this table shall be the minimum.

Requirement for sprinkler in the special purpose rooms is specified in one of the following ways:

S = Sprinkler system has to be extended into such rooms.

Ex = Sprinkler system is exempted from the corresponding area provided the area is fitted with an automatic fire alarm system installed according to SS CP 10.

-1 Requirements stated herein apply to store room which is required to be compartmentalized

-2 Requirements stated herein apply to kitchens in hotel, restaurant, coffee house or other similar places where the preparation of food is required. However, special considerations will be given to the followings:

(a) kitchens where 'open flame' cooking appliances are NOT used, or

(b) kitchens where all the cooking facilities are fitted with approved extinguishing systems.

- 3 Where AHU rooms are vertically stacked, each AHU room shall be separated by a compartment floor at every level. In the case of AHU serving more than one compartment, fire dampers shall be provided in air ducts at penetration through the compartment wall and floors, see Cl.68.

## Chapter (8)

### Mechanical Ventilation and Smoke Control Systems

67. Air Conditioning and Mechanical Ventilation Systems shall be provided complying with the following:
- (a) Where air conditioning system is provided in lieu of mechanical ventilation system during emergency, all the requirements specified in this Fire Safety Code for the mechanical ventilation system shall apply to the air conditioning system.
  - (b) Ducts for air conditioning and mechanical ventilation systems shall be constructed in compliance with the following requirements:
    - (i) All air conditioning or other ventilation ducts including framing thereof, shall be constructed of steel, aluminium, glass fibre batt or mineral wool batt or other approved material.
    - (ii) All air conditioning or other ventilation ducts shall be adequately supported.
    - (iii) Duct covering and lining should be non-combustible. However, if it is necessary to use combustible material, it shall;
      - (aa) a Class 0 flame spread rating for the covering and lining materials shall be required;
      - (bb) when involved in fire generate a minimum amount of smoke and toxic gases; and
      - (cc) be at least 1m away from a fire damper.
    - (iv) Flexible connections at the extremity of ventilation ductwork connecting terminal units, extract units and ventilation grilles shall not exceed 4m (12 feet). Flexible joints, which are normally provided to prevent and/or allow for thermal movements in the duct system, shall not exceed 250mm in length. Flexible joints shall be made of material classified as 'not easily ignitable'.

- (c) Insulation for pipe work associated with the air conditioning and mechanical ventilation systems shall comply with the following requirements:
- (i) Insulation material for pipework together with vapour barrier lining and adhesives shall when tested in accordance with the methods specified in this Fire Safety Code, have a surface flame spread of not lower than Class 1 but in areas of buildings where Class 0 flame spread is required for the ceiling construction under this Fire Safety Code a Class 0 rating for the insulation material shall be required.
  - (ii) Notwithstanding the requirements of CL.67 (c)(i), the use of plastic and foam rubber insulation materials of a lower classification may be permissible if:
    - (aa) the material is the self-extinguishing type acceptable to the Myanmar Fire Services Department;
    - (bb) the insulation material is covered by or encased in a metal sheath or hybrid plaster or other noncombustible cladding materials acceptable to the Myanmar Fire Services Department. provided that any opening in the element of structure or other part of a building penetrated by the pipework shall be effectively fire stopped by replacement of the insulation material at the junction of penetration with fire resistant material having equal fire rating.
  - (d) Enclosure of ducts shall comply with the requirements in CL. 22 (i)
  - (e) Ventilation ducts should not pass through smoke stop or firefighting lobby. Where unavoidable the part of the ventilation duct within the lobby shall be enclosed in construction with fire resistance rating at least equal to that of the elements of structure. Such construction shall be in masonry. If other form of fire resisting construction is used, fire damper shall be fitted where the duct penetrates the lobby enclosure.

- (f) A concealed space between the ceiling and floor above it, ceiling and roof, or raised floor and structural floor of a building can use as a plenum provided that
- (i) The concealed space contains only:
    - (aa) mineral insulated metal sheathed cable, aluminium sheathed cable, copper sheathed cable, rigid metal conduit, enclosed metal trunking, flexible metal conduit, liquid tight flexible metal conduit in lengths not more than 2 m, or metal clad cables;
    - (bb) electric equipment that is permitted within the concealed spaces of such structures if the wiring materials, including fixtures, are suitable for the expected ambient temperature to which they will be subjected;
    - (cc) other ventilation ducts complying with CL. 67(b);
    - (dd) communication cables for computers, television, telephone and inter communication system;
    - (ee) fire protection installations;
    - (ff) pipes of non-combustible material conveying nonflammable liquids
  - (ii) The supports for the ceiling membrane are of non-combustible material.
  - (iii) Exception- Low-smoke and low-flame plenum rated PVC cables conforming to permitted to be run exposed in plenum, provided that:
    - (aa) The plenum space shall be protected by sprinkler system or gaseous total flooding system.
    - (bb) FCU or AHU using plenum for air return and serving more than one rooms, shall be provided with smoke detector at the

return air plenum space to shut down the FCU/ AHU on detection of smoke.

- (g) No air conditioning or ventilation ducts shall penetrate separating walls.
- (h) Any fire damper shall have a fire resisting rating of not less than that required for the compartment wall or compartment floor through which the relevant section of the ventilation duct passes. Fire dampers shall be of the type approved by the Myanmar Fire Services Department.
- (i) Ventilation ducts which pass directly through a compartment wall or compartment floor shall comply with the following;
  - (aa) where the ventilation duct does not form a protected shaft or is not contained within a protecting structure, the duct shall be fitted with a fire damper where it passes through the compartment wall or compartment floor;
  - (bb) where the ventilation duct forms a protected shaft or is contained within a protecting structure, the duct shall be fitted with fire dampers at the inlets to the shaft and outlets from it.
- (ii) Fire dampers shall be installed in the following:
  - (aa) Fire dampers shall be installed so that the casing completely penetrates through the compartment wall or floor and the casing shall be retained either:
    - (1) On both sides by means of flanges in such a manner that it can expand under fire conditions without distorting the blades in the closed position, or
    - (2) On the accessible side by means of one flange only, which can be fixed to the damper and to the wall through slotted holes to allow for expansion.



- (bb) Flanges shall be butted against the face of the compartment wall or floor and fixed to the damper casing.
- (cc) Ductwork connected to the damper shall be attached in such a manner as to ensure that the damper remains securely in position and is fully functional in the event of damage of ductwork.
- (dd) The clearance between the damper body and the sides of the penetration shall not be less than that of the tested prototype and not greater than half the width of the angle section of the collar.
- (ee) The space between the damper body and the opening in the wall or floor shall be fire-stopped.
- (ff) Vertically positioned fire dampers shall be installed in such a manner that the direction of air flow assists the closure of the damper.
- (gg) The distance between the plane through a closed fire damper and ducting, flexible connections, duct coverings, internal linings and the like, shall be:-
  - (1) Not less than 1m when such parts are made of materials with fusing temperatures less than 1000°C, and
  - (2) Not less than three times the diagonal or diameter of the damper and in no case less than 2m when such parts are made of materials that are combustible except for vapour barrier to thermal insulation.
- (hh) Each fire damper installation shall be provided with an inspection access door either upstream or downstream as appropriate. The access door dimension shall preferably measure 450mm (length) × 450 mm (width); for smaller

ducts, the door width dimension may be reduced to the width or depth of the duct. Access doors shall be hinged and fitted with sash locks, and constructed of minimum 1.25mm sheet steel suitably braced.

- (iii) Fire dampers shall not be fitted in the following locations:
  - (aa) openings in walls of a smoke extract shaft or return air shaft which also serves as a smoke extract shaft;
  - (bb) openings in walls of a protected shaft when the openings have a kitchen exhaust duct passing through it; or
  - (cc) anywhere in an air pressurizing system;
  - (dd) where explicitly prohibited in this Fire Safety Code.
- (iv) Where a fire damper is required by this Fire Safety Code to be installed in the air-conditioning and mechanical ventilation system, its type, details of installation, connection of accessories, inspection door, etc. shall be in accordance with acceptable Standards by Myanmar Fire Services Department.
- (i) Fire Resisting Floor ceiling and Roof ceiling shall be in accordance with the following standard:
  - (i) The space above a suspended ceiling which forms part of a fire rated floor ceiling or roof ceiling construction shall not contain ducting unless ducting was incorporated in a prototype that qualified for the required fire resistance rating, in which case the ducting shall be identical to that incorporated in the tested prototype.
  - (ii) Openings in the ceiling, including openings to enable the ceiling to be used as a plenum, shall be protected by fire dampers identical to

those used in the tested prototype and such openings in the ceiling shall be so arranged that -

- (aa) No opening is greater in area than that corresponding in the prototype test panel;
  - (bb) The aggregate area of the openings per unit ceiling area does not exceed that of the prototype test panel; and
  - (cc) The proximity of any opening to any structural member is not less than that in the prototype test panel.
- (j) Fire rated duct shall be installed in the following:
- (i) Where proprietary fire rated materials are used to construct the fire rated duct, the fire rating of the fire rated duct shall have the same period of fire resistance as the wall or floor it penetrates.
  - (ii) Proprietary fire rated duct shall be tested to BS 476 Pt 24 or equivalent and its usage be approved by the Myanmar Fire Services Department
  - (iii) Running of non-fire rated duct and/ or other building services above the proprietary fire rated duct should be avoided. When unavoidable due to physical constraints, the supports to such non-fire rated duct and/or other building services running above the proprietary fire rated duct shall be strengthened such that the tensile stress generated on the supports shall not exceed  $10\text{N/mm}^2$  and the non-fire rated duct and/ or building services shall also be adequately protected to prevent collapse in a fire which will otherwise affect the stability of the proprietary fire rated duct below.
  - (iv) Fans forming part of a fire rated duct shall also be enclosed in the same fire rated enclosure.

- (k) Intakes of outdoor air openings and Return Air Openings shall be located in the following:
  - (i) Openings for the intakes of outdoor air to all air handling systems, mechanical ventilation systems, pressurization systems of exit staircases and internal corridors, and smoke control systems shall be no less than 5m from any exhaust discharge openings.
  - (ii) All return air openings and outdoor air intakes shall be so located and arranged that sources of ignition such as lighted matches and cigarette butts accidentally entering the openings and intakes shall not be deposited onto the filter media.

68. Air handling unit room shall be complied with the following:

- (a) Air handling systems shall not use protected shaft of exits, smoke-stop lobbies, including its concealed space for supply, exhaust or return air plenums. Rooms having no other usage than housing air handling equipment or package units, and their associated electrical controls are not regarded as areas of high risk. However, in situations where the air handling equipment serves more than one compartment, fire dampers shall be provided in air ducts at penetrations through the compartment walls and floors to comply with the requirements in Cl.67(h). Where AHU rooms are vertically stacked, each AHU room shall be separated by a compartment floor at every level.
- (b) Smoke detectors of approved type shall be incorporated in the return air stream immediately adjacent to:
  - (i) air handling units serving more than one storey or compartment; or
  - (ii) a single unit in excess of 15000 m<sup>3</sup>/h; or
  - (iii) any AHU as may be required by the Myanmar Fire Services Department.

- (c) The function of smoke detectors where required by this Fire Safety Code is to initiate action to shut down the AHU automatically when the smoke density in the return air system has become unacceptable for recycling. Details of the requirements shall be in accordance with Mechanical Ventilation and Air conditioning in Buildings.
  - (d) Where the air handling units in a building are not centrally controlled, each air-handling unit exceeding 8,500m<sup>3</sup>/h shall be provided with a manual stop switch located at a convenient and accessible point to facilitate quick shutting down of the fan in case of fire. This switch shall preferably be located on the wall next to the door opening of the air handling equipment room.
69. Exits shall be complied with the following:
- (a) Protected shaft of exits, smoke-stop lobbies, including its concealed space shall not be used for supply, exhaust or return air plenum of air handling systems.
  - (b) Mechanical ventilation system for each exit staircase and internal exit passageway, if provided, shall be an independent system of supply mode only exclusive to the particular staircase, and it shall comply with the following requirements:
    - (i) Supply air for the system shall be drawn directly from the external, with intake point not less than 5m from any exhaust discharge openings.
    - (ii) For exit staircase serving more than 4 storeys, supply air shall be conveyed via a vertical duct extending throughout the staircase height and discharging from outlets distributed at alternate floor.
    - (iii) Where the supply air duct serving the exit staircase has to penetrate the staircase enclosure, the portion of the duct where it traverses outside the staircase shall be enclosed in masonry construction or drywall complying with Cl.22(g) of at least the same fire resistance

as the elements of structure and it shall not be fitted with fire dampers.

- (iv) The ventilation system shall be of supply mode only of not less than 4 air changes per hour.
- (v) The mechanical ventilation system shall be automatically activated by the building fire alarm system. In addition, a remote manual start stop switch shall be made available to firemen at the fire command center, or at the fire alarm panel where there is no fire command center. Visual indication of the operation status of the mechanical ventilation system shall be provided.

70. Mechanical ventilation system for smoke stop lobbies and firefighting lobbies shall be a system exclusive to these lobbies, and it shall comply with the following requirements:

- (a) The ventilation system shall be of supply mode only of not less than 10 air changes per hour.
- (b) Supply air shall be drawn directly from the external with intake point not less than 5m from any exhaust discharge or openings for natural ventilation.
- (c) Any part of the supply duct running outside the smoke stop or fire-fighting lobby which it serves shall either be enclosed or constructed to give a fire resistance rating of at least 1 hour. The Myanmar Fire Services Department may at its discretion require a higher fire resistance rating if the duct passes through an area of high fire risk.
- (d) The mechanical ventilation system shall be automatically activated by the building fire alarm system. In addition, a remote manual start stop switch shall be made available to firemen at the fire command center, or at the fire alarm panel where there is no fire command center. Visual indication of the operation status of the mechanical ventilation system shall be provided.

71. Where mechanical ventilation system is installed to provide a smoke free environment for the room housing the following equipment, such system shall be independent of each other and any other system serving other parts of the building:

- (a) Supply air shall be drawn directly from the external and its intake point shall not be less than 5m from any exhaust discharge openings. Exhaust discharge shall also be direct to the external and shall not be less than 5m from any air intake openings.
- (b) Where the corresponding ducts run outside the room they shall either be enclosed in a structure or be constructed to give at least the same fire rating as the room which they serve or that of the room through which they traverse, whichever is higher. The rating shall apply to fire exposure from both internal and external of the duct or structure. Where the duct risers are required to be enclosed in a protected shaft constructed of masonry or drywall complying with Cl. 22(i)), they shall be compartmented from the rest of the shaft space containing other ducts or services installations.
- (c) No fire damper shall be fitted in either supply or exhaust duct required under Cl 71.
- (d) Duct serving areas other than rooms housing equipment stated in Cl.71 shall not pass through such rooms.

72. The Fire Command Centre can either be Air Conditioning, Natural Ventilation, or Mechanical Ventilation. The Air Conditioning or Mechanical Ventilation shall be independent of each other and any other system serving other parts of the building. Where mechanical ventilation is required, it shall also comply with the following requirements:

- (a) Supply air shall be drawn directly from the external and its intake point shall not be less than 5m from any exhaust discharge openings. Exhaust

discharge shall also be direct to the external and shall not be less than 5m from any air intake openings.

- (b) Where the corresponding ducts run outside the fire command center, they shall either be enclosed in a structure or be constructed to give at least the same fire rating as the room which they serve or that of the room through which they traverse, whichever is higher. Where the duct risers are required to be enclosed in a protected shaft constructed of masonry or drywall complying with Cl.22 (i), they shall be compartment from the rest of the shaft space containing other ducts or services installations.
- (c) No fire damper shall be fitted in either supply or exhaust duct required under Cl.72.
- (d) Duct serving areas other than the fire command center shall not pass through the room.

73. Kitchen mechanical exhaust system shall be complied with the following:

- (a) Mechanical exhaust system for the cooking area of a kitchen in a hotel, restaurant, coffee house or the like shall be independent of those serving other parts of the building. It shall also comply with the following requirements:
  - (i) The hood and ducts for the exhaust shall have a clearance of 0.5m from unprotected combustible materials;
  - (ii) The exhaust shall be discharged directly to the external and shall not be less than 5m from any air intake openings;
  - (iii) The exhaust duct where it runs outside the kitchen shall either be enclosed in a structure or be constructed to give at least the same fire rating as the kitchen or that of the room through which it traverses, whichever is higher. The rating shall apply to fire exposure from both internal and external of the duct or structure. Where the duct riser is required to be enclosed in a protected shaft constructed of masonry or drywall complying with Cl.22(i), it shall



- be compartmented from the rest of the shaft space containing other ducts or services installations;
- (iv) No fire damper shall be fitted in kitchen exhaust ducts.
- (b) Sharing of kitchen exhaust system for a food court is allowed provided the following conditions are complied with:
- (i) the food court shall be under a single ownership/ operator;
  - (ii) there must be provision for maintenance and cleaning of the exhaust system;
  - (iii) the food court owner/operator shall ensure that the kitchen exhaust system is degreased and cleaned regularly;
  - (iv) All kitchen exhaust ducts running outside the food court shall have fire resistant rating of at least 1 hour.
- (c) Sharing of kitchen exhaust system for a restaurant is allowed provided the following conditions are complied with:
- (i) the restaurants that are sharing the same kitchen exhaust system shall be located next to each other and be on the same storey;
  - (ii) the aggregate floor area of the restaurants shall not exceed 1000 m<sup>2</sup>;
  - (iii) common duct shall be provided with common exhaust fan;
  - (iv) there must be provision for maintenance and cleaning of the common exhaust system;
  - (v) the common kitchen exhaust system shall be degreased and cleaned regularly;
  - (vi) the building shall be protected by an automatic fire sprinkler system;
  - (vii) the exhaust hood shall be fitted with a wet chemical fire extinguishing system;
  - (viii) the fire rating of the common kitchen exhaust duct running outside the restaurants shall have fire resistance rating of at least 1 hour.

- (d) Sharing of kitchen exhaust system for other smaller F&B outlets such as snack bars, food kiosks is allowed provided the following conditions are complied with:
- (i) within close proximity from each other;
  - (ii) within a zone of 1000 m<sup>2</sup>;
  - (iii) with hood-to-hood distance of not more than 10m;
  - (iv) located on the same storey.
  - (v) the kitchen exhaust duct running outside the F&B outlets shall have fire resistance rating of at least 1 hour and
  - (vi) all other conditions stipulated in CL. 73(c) (iii) to (vii) above shall be complied with.

(Note: Kitchen exhaust duct includes both horizontal and vertical ducts)

74. Mechanical ventilation system where required for rooms which involve the use of flammable and explosive substances shall be independent from those serving other parts of the building. It shall comply with the following requirements:

- (a) Ventilation system shall consist of exhaust and supply part with a rate of 20 air change per hour or any other rates acceptable to the Myanmar Fire Services Department. The exhaust shall be direct to the external and shall not be less than 5m from any air intake openings;
- (b) Where such ducts run outside the room they shall either be enclosed in a structure or be constructed to give at least the same fire rating as the room which they serve or that of the room through which they traverse, whichever is higher. The rating shall apply to fire exposure from both internal and external of the duct or structure. Where the duct risers are required to be enclosed in a protected shaft constructed of masonry or drywall complying with Cl.22(i), they shall be compartmented from the rest of the shaft space containing other ducts or services installations;
- (c) No fire damper shall be fitted in either supply or exhaust duct required under this Clause;

- (d) Ducts serving other areas shall not pass through rooms involving use of flammable and explosive substances.

75. Where mechanical ventilation system is required for car parking areas in basements with total floor area exceeding 2000 m<sup>2</sup>, a smoke purging system which is independent of any systems serving other parts of the building shall be provided to give a purging rate of not less than 9 air change per hour.

- (a) The smoke purging system shall be activated automatically by the building fire alarm system. In addition, a remote manual start stop switch shall be located at fire command center, or at main fire alarm panel on first storey (where there is no fire command center in the building). Visual indication of the operation status of the smoke purging system shall also be provided with this remote control.
- (b) Supply air shall be drawn directly from the external and its intake shall not be less than 5m from any exhaust discharge openings. Outlets for the supply air shall be adequately distributed over the car park area.
- (c) Where there is natural ventilation for such basement car park based upon openings equal to not less than 2.5% of the floor area of such storey, such natural ventilation may be considered as a satisfactory substitute for the supply part of the smoke purging system. The openings shall be evenly distributed over the car park areas.
- (d) Exhaust air shall be discharged directly to the external and shall not be less than 5m from any air intake openings.
- (e) Exhaust ducts shall be fabricated from heavy gauge steel (1.2 mm thick) for the basement car park smoke purging system.
- (f) Exhaust fans of the basement car park smoke purging system shall be capable of operating effectively at 250°C for 2 hours.

76. Pressurization system for exit staircases shall be complied with the following:

- (a) In any building of which the habitable height exceeds 24m, any internal exit staircases without adequate provision for natural ventilation shall be pressurized. Where the upper part of the staircase is naturally ventilated, its lower part can be provided with mechanical ventilation or pressurization, whichever is appropriate in accordance with Cl. 7(d)(viii),
- (b) In a building comprising more than 4 basement storeys, exit staircase connected to fire-fighting lobby in basement storeys shall be pressurized.
- (c) Where Purpose Group II staircase storey shelter is provided with mechanical ventilation system or pressurization system for its exit staircase, a manual fire alarm system complying with SS CP 10 shall be installed. The manual call point shall be located at the entrance of each exit staircase at every storey, including the non-residential floors. Activation of any manual call point shall initiate the operation of mechanical ventilation system or pressurization system

77. Pressurization level shall be complied with the following:

- (a) When in operation, the pressurization system shall maintain a pressure differential of not less than 50 Pa between the pressurized exit staircase and the occupied area when all doors are closed.
- (b) Where a smoke-stop lobby is also pressurized, the pressure at the exit staircase shall always be higher.
- (c) The force required to open any door against the combined resistance of the pressurizing air and the automatic door closing mechanism shall not exceed 110 N at the door handle.

78. When in operation, the pressurization system shall maintain an airflow of sufficient velocity through open doors to prevent smoke from entering into the pressurized area. The flow velocity shall be attained when a combination of two doors from any two successive storeys and the main discharge door are fully open. Magnitude

of the velocity averaged over the full area of each door opening shall not be less than 1.0 m/s.

79. Leakages shall be complied with the following:

- (a) The rate of supply of pressurized air to the pressurized areas shall be sufficient to make up for the loss through leakages into the unpressurised surroundings.
- (b) Adequate relief of leaked air out of the occupied area shall be provided to avoid a pressure build up in this area. The relief may be in the form of perimeter leakages or purpose built extraction systems.

80. Distribution of Pressurizing Air shall be complied with the following:

- (a) The number and distribution of injection points for supply of pressurizing air to the exit staircase should ensure an even pressure profile complying with Cl. 77.
- (b) The arrangement of the injection points and the control of the pressurization system shall be such that when opening of doors or other factors cause significant variations in pressure difference, condition in Cl. 77, should be restored as soon as practicable.

81. Pressurization system and equipments shall be installed in the following:

- (a) All the equipment and the relevant controls associated with the pressurization system shall be so designed and installed to ensure satisfactory operation in the event of and during a fire.
- (b) Supply air for pressurization system shall be drawn directly from the external and its intake shall not be less than 5m from any exhaust discharge openings.
- (c) The pressurization system shall be automatically activated by the building fire alarm system. In addition, a remote manual start stop switch shall be made available to firemen at the fire command center, or at the fire alarm

panel where there is no fire command center. Visual indication of the operation status of the pressurization system shall be provided.

82. PRESSURIZATION OF INTERNAL CORRIDORS IN HOTELS: Where internal corridors in hotels are required to be pressurized in compliance with Cl. 11(a)(iii), the pressure within such corridors shall be higher than that in the guest rooms and the pressure within the internal exit staircases higher than that of the corridors.

83. Basement smoke control system shall comply with as follow:

- (a) Where the total aggregate floor area of all basement storeys does not exceed 2000 m<sup>2</sup>, smoke vents in accordance with Cl. 84, shall be provided.
- (b) Where the total aggregate floor area of all basement storeys exceeds 2000 m<sup>2</sup>, engineered smoke control system that complies with the requirements stipulated in Cl. 85 shall be provided for all parts of basement with the following exceptions:
  - (i) Where the basement or a portion of the basement is used as carpark, Cl. 75 can be adopted to the carpark provided it is compartmented from rest of the basement;
  - (ii) Plant/equipment room with floor area not exceeding 250 m<sup>2</sup> and compartmented from rest of the basement, and provided with two doors for better reach in firefighting operation.
  - (iii) Plant/equipment room with floor area exceeding 250 m<sup>2</sup> but not exceeding 2000 m<sup>2</sup>, smoke vents in accordance with Cl. 84 or smoke purging system of at least 9 air-change per hour shall be provided.
  - (iv) Service areas such as storeroom and workshops (restricted to staff only) which are compartmented, smoke venting or smoke purging system of at least 9 air change per hour may be accepted for those areas in lieu of the engineered smoke control system. Automatic fire alarm/ extinguishing system shall be provided where required.

84. Smoke vents shall be complied with the following:

- (a) Smoke vents shall be adequately distributed along perimeter of basement and their outlets shall be easily accessible during firefighting and rescue operations. Installation shall comply with the following requirements:
  - (i) The number and their sizes shall be such that the aggregate effective vent openings shall not be less than 2.5% of the basement floor area served.
  - (ii) The vent outlets if covered under normal conditions shall be openable in case of fire.
  - (iii) Where ducts are required to connect the vent to outlets, the ducts shall either be enclosed in structure or be constructed to give at least 1 hour fire resistance.
  - (iv) Separate ducts and vent outlets shall be provided for each basement storey.

85. Where engineered smoke control system is required, it shall be provided as specified in Cl. 88.

86. Smoke purging systems, where permitted under this Fire Safety Code in buildings for basement occupancies of plant/equipment room and service areas such as storeroom and workshops, shall conform to the following requirements:

- (a) The purge rate shall be at least 9 air changes per hour.
- (b) The smoke purging system shall be activated automatically by the building fire alarm system. In addition, a remote manual start-stop switch shall be located at fire command center, or in the absence of a fire command center in the building, at the main fire alarm panel on the first storey. Visual indication of the operational status of the smoke purging system shall also be provided with this remote control.
- (c) Horizontal ducts shall be fabricated from heavy gauge steel (1.2mm thick).
- (d) The exhaust fan shall be capable of operating effectively at 250°C for 2 hours and supplied from a secondary source of supply.

- (e) Replacement air shall be provided and if it is supplied by a separate mechanical system, such a system shall be connected to a secondary source of power.
87. Smoke control system shall be provided with the following:
- (a) A smoke control system specified in Cl. 88 shall be provided where:
    - (i) The requirements for compartmentation specified in Cl. 16(a) and 16(e) are relaxed under the conditions in Cl. 16(g) for 'Atrium spaces' in a building;
    - (ii) The total floor area of any compartment in a building or part of a building exceeds 5000 m<sup>2</sup>.
88. Engineered smoke system shall be provided with the following:
- (a) The engineered smoke control system shall be in the form of a smoke ventilation system by natural or mechanical extraction designed in accordance with:
    - (i) BR 186 - Design principles for smoke ventilation in enclosed shopping centers; and
    - (ii) BR 258 - Design approaches for smoke control in atrium buildings; or
    - (iii) BR 368 - Design methodologies for smoke and heat exhaust ventilation (BR 368 is published by Construction Research Communications Ltd by permission of Building Research Establishment Ltd); or
    - (iv) Other acceptable standards. (Note: BR 186 and 258 are reports published by the Fire Research Station, Building Research Establishment, Borehamwood, Herts WD62BL).
  - (b) The building to be provided with an engineered smoke control system shall be sprinkler protected.



- (c) Capacity of the engineered smoke control system shall be calculated based on the incidence of a likely maximum fire size for a sprinkler controlled fire as recommended in Table 8.1.
- (d) The capacity of an engineered smoke control system shall be capable of handling the largest demand for smoke exhaust from the worst case scenario.
- (e) The design smoke layer base shall be above the heads of people escaping beneath it. The minimum height shall be 2.5 m.
- (f) Smoke reservoirs to prevent the lateral spread of smoke, and to collect smoke for removal shall be of non-combustible construction capable of withstanding smoke temperatures.
- (g) For cases where smoke is removed from the room of origin the smoke reservoir size for a smoke ventilation system shall not exceed:
  - (i) 2000 m<sup>2</sup> for natural smoke ventilation system.
  - (ii) 2600 m<sup>2</sup> for mechanical smoke ventilation system.
- (h) For cases where smoke is removed from the circulation space or atrium space the smoke reservoir size for a smoke ventilation system shall not exceed:
  - (i) 1000 m<sup>2</sup> for natural smoke ventilation system.
  - (ii) 1300 m<sup>2</sup> for mechanical smoke ventilation system.
- (i) For cases where smoke is removed from the circulation space or atrium space, the rooms discharging smoke into the circulation space/ atrium spaces shall either:
  - (i) have a floor area of not exceeding 1000 m<sup>2</sup> (for natural ventilation system) or 1300 m<sup>2</sup> (for mechanical ventilation system) or
  - (ii) be subdivided such that smoke is vented to the circulation space or atrium only from part of the room with floor area not exceeding 1000 m<sup>2</sup> (for natural ventilation system) or 1300 m<sup>2</sup> (for mechanical ventilation system) that are adjacent to the

circulation space or atrium. However, the remainder of the room needs to be provided with an independent smoke ventilation system(s).

- (j) The maximum length of the smoke reservoir shall not exceed 60 m.
- (k) Adequate arrangement(s) shall be made in each smoke reservoir for the removal of smoke in a way that will prevent the formation of stagnant regions.
- (l) Owing to practical limitation, a smoke ventilation system shall have:
  - (i) a maximum mass flow not exceeding 175 kg/s; and
  - (ii) a minimum smoke layer temperature of 18°C above ambient.
- (m) Replacement air shall be by natural means drawing air directly from the external.
  - (i) The design replacement air discharge velocity shall not exceed 5m/s to prevent the escapees being hindered by the air flow.
  - (ii) Replacement air intake shall be sited at least 5 m away from any exhaust air discharge.
  - (iii) Replacement air shall be discharged at a low level, at least 1.5 m beneath the designed smoke layer, to prevent “fogging” of the lower clear zone.
  - (iv) Where the inlet cannot be sited at least 1.5 m below the smoke layer, a smoke curtain or a barrier shall be used to prevent replacement air distorting the smoke layer.
  - (v) Where replacement air is taken through inlet air ventilators or doorways, devices shall be incorporated to automatically open such inlet ventilators and doors to admit replacement air upon activation of the smoke ventilation system.
  - (vi) Where the automatic roller shutters are used at replacement air inlets in the design and installation of engineered smoke control system, it shall be of perforated type having the required effective

free area for the effective operation of the engineered smoke control system.

- (n) For cases where the smoke reservoir is above the false ceiling, the ceiling shall be of perforated type with at least 25% opening.
- (o) The smoke ventilation system shall be provided with secondary source of power supply.
- (p) The smoke ventilation system shall be activated by smoke detectors located in the smoke control zone. Use of smoke detectors for activation must be carefully designed so that accidental or premature activation of smoke detectors on a non-fire zone due to smoke spills or spread from other areas must be avoided.
- (q) Provision of activating smoke detectors shall comply with acceptable standards.
- (r) A remote manual activation and control switches as well as visual indication of the operation status of the smoke ventilation system shall also be provided at the fire command center and where there is no fire command center, at main fire indicator board.
- (s) Except for ventilation systems in Cl. 36(d) and (h), all other air conditioning and ventilation systems within the areas served shall be shut down automatically upon activation of the smoke ventilation system.
- (t) Either a standby fan or multiple fans with excess capacity shall be provided for each mechanical smoke ventilation system such that in the event the duty fan or the largest capacity fan fails, the designed smoke extraction rate will still be met. The standby fan shall be automatically activated in the event the duty fan fails.
- (u) Fans shall be capable of operating at 250°C for 2 hours.
- (v) The fans and associated smoke control equipment shall be wired in protected circuits designed to ensure continued operation in the event of the fire.

- (w) The electrical supply to the fans shall, in each case, be connected to a sub-main circuit exclusive thereto after the main isolator of the building. The cables shall be of at least 1 hour fire resistance.
- (x) Smoke ventilation ducts (both exhaust and replacement air ducts) shall be of at least 1 hour fire resistance. Where a duct passes through other fire compartment of higher rating, the duct shall be constructed to have the rating as that of the compartment. The rating shall apply to fire exposure from both internal and external of the duct or structure and the duct shall also comply with CL. 67(j).
- (y) Fire damper shall not be fitted in the smoke ventilation system.
- (z) The time taken for the smoke ventilation system within a smoke zone to be fully operational shall not exceed 60 seconds from system activation.
- (1a) For natural smoke ventilation system the natural ventilators shall be:
  - (i) in the “open” position in the event of power/ system failure; and
  - (ii) positioned such that they will not be adversely affected by positive wind pressure.
- (2a) Natural exhaust ventilation shall not be used together with powered smoke exhaust ventilation.
- (3a) All smoke curtains where required, unless permanently fixed in position, shall be brought into position automatically to provide adequate smoke-tightness and effective depth.
- (4a) Smoke curtain or other smoke barrier at any access route forming part of or leading to a means of escape shall not in their operational position obstruct the escape of people through such route.
- (5a) Where glass walls or panels are being used as smoke screens to form a smoke reservoir or as channeling screens, they shall be able to with stand the design highest temperature.

(6a) All smoke control equipment (including smoke curtains) shall be supplied and installed in accordance with the accepted standards.

89. Smoke control system in Auditorium (used or intended for use as cinema, concert hall, PERFORMANCE theatre) shall provide with the following:

- (a) Provision of smoke vents having 2.5% of the floor area shall be provided to auditorium which is not sprinkler protected and to auditorium having floor area more than 500 m<sup>2</sup>, if sprinkler protected. The opening of the smoke vents shall be by automatic device.
- (b) In place of smoke vents, an engineered smoke control system would be considered as acceptable.

Table (8.1) Fire Size

Occupancy (Sprinklered)	Fire Size	
	Heat Output (MW)	Perimeter of Fire (m)
Shops	5	12
Offices	1	14
Hotel Guest Room	0.5	6
Hotel Public Areas	2.5	12
Assembly Occupancy with fixed seating	2.5	12

**Chapter (9)**  
**Other Systems**

90. Exit lighting and exit sign shall be in accordance with the following requirements.
- (a) Exit Lighting requirements are as follow;
    - (i) Exits of all buildings, except for Purpose Group I, shall be provided with artificial lighting facilities.
    - (ii) The minimum illuminance to be provided for all exits and the spacing for luminaires shall be in accordance with the following requirements;
      - (aa) Horizontal illuminance in the centre line of any escape route shall not be less than 0.5 lux, measured at the floor, for minimum duration of 1 hour. The positioning of lighting shall be so arranged that the failure of any single lighting unit, such as the burning out of a bulb, will not leave any area in darkness.
      - (bb) Exit areas, such as exit staircases, internal and external exit passageways, are critical areas, there shall be no interruption of illumination exceeding 1 second during the change over from one energy source to another.
      - (cc) The delay between the failure of the electrical supply to normal lighting and the energization of the exit lighting shall not exceed 1 second.
  - (b) Emergency Lighting for Corridors and Lobbies shall be managed in following;
    - (i) Emergency lighting shall be provided in all corridors and lobbies of all buildings except Purpose Group I.
    - (ii) The minimum level of illuminance, the spacing of luminaires and the maximum delay for emergency lighting required in this Clause shall be the same as that for the exit lighting.

- (c) Emergency Lighting for Occupied Areas shall be managed in following;
- (i) For all buildings except Purpose Group I or II, emergency lighting shall be provided in the occupied are as following the guidelines below:
    - (aa) along paths leading to corridors, lobbies and exits in all occupied areas where the direct distance from the entry point of the corridor, lobby or exit to the furthest point in the area concerned exceeds 13 m; or
    - (bb) over the whole of such area if there are no explicit paths leading to corridors, lobbies and exits.
  - (ii) Notwithstanding the requirements in Cl.90 (c) (i) above, emergency lighting shall be provided in the following locations:
    - (aa) Lift cars as stipulated in this Fire Safety Code;
    - (bb) Fire command centres;
    - (cc) Generator rooms;
    - (dd) Basement car parks;
    - (ee) Fire pump rooms;
    - (ff) Areas of refuge within the same building.
  - (iii) The minimum level of illuminance shall comply with the requirements in SS 563.
  - (iv) The delay between the failure of the electrical supply to normal lighting and the energization of the emergency lighting for occupied areas shall not exceed 15 seconds.
- (d) Emergency lighting for fire-fighting facilities are as follows;
- (i) Fire alarm panels, fire alarm call points and fire-fighting equipment shall be adequately illuminated at all times so that they can be readily located.
  - (ii) The minimum level of illuminance shall comply with the requirements in SS 563.



- (iii) The delay between the failure of the electrical supply to normal lighting and the energization of the emergency lighting for fire-fighting facilities shall not exceed 15 seconds.
- (e) Secondary source of power supply shall be managed as follows;
  - (i) The delay for energization of the exit and emergency lighting systems between normal supply and the secondary source shall be as stipulated in the relevant clauses.
  - (ii) Duration of the secondary source of power supply shall comply with the requirements in SS 563.
  - (iii) Location, arrangement and control, installation of electrical wiring of the secondary source of supply, be it in the form of battery, standby generator, inverter or other accepted equipment, shall comply with the requirements in SS 563.
- (f) Luminaire- All exit and emergency luminaires required by this Fire Safety Code shall be of approved type as specified in SS 563.
- (g) Exit and directional signs requirements are as follows;
  - (i) In all buildings, except for purpose group I, exit signs placed over the exit door on every floor then such signs shall be clearly visible at all times. Exit sign shall also be provided for rooms that require it (see Appendix 24).
  - (ii) In long corridors, in open floor areas, and in all situations where the location of the exits may not be readily visible, directional signs shall be provided to serve as guides from all portions of the corridors or floors.
  - (iii) Directional signs and exit signs shall be provided in hotel accommodation floors including boarding houses.
  - (iv) Upper storey staircase to be continuous with that serving the basement, appropriate sign ages, including pictorials shall be placed at strategic location inside the staircase to direct occupants out of the building in times of emergency.

- (v) The legends, dimensions, design and installation of the exit signs and directional signs shall comply with SS 563.
- (vi) Self-illuminating exit and directional signs with letters in green and powered by radioactive material are allowed for use in buildings. With respect to the design of signage, either graphic or text is acceptable.
- (vii) Where the direction of travel to exit discharge is upward, the staircase signage required under Cl.7 (b) shall comply with SS 508 – Specification for Fire Safety Signs.

91. System Requirements for voice communication system and fire command center are as follows;

- (a) One-way emergency communication system and a fire command centre shall be provided as follows:
  - (i) For all large buildings under Purpose Groups III (not applicable to primary school, secondary school and junior colleges), IV, V, VI, VII & VIII with gross floor area greater than 5000 m<sup>2</sup> or having a total occupant load exceeding 1000 persons; or
  - (ii) For all buildings belonging to Purpose Groups III, IV, V, VI, VII, and VIII of more than 24 m in habitable height.

Note; Above the building with mixed commercial and residential usage, the habitable height shall be measured in following;

- (aa) where the commercial component of the building occupies only the lower portion of the building and is separated from the residential occupancies, then for the purpose of compliance with the said requirements, the measurement of habitable height shall be taken to that part of the commercial component of the building
- (bb) where a commercial component of the building is located above any residential occupancies, the measurement of

habitable height shall be taken to that part of the commercial component of the building

- (iii) Exception For hotel or health care buildings of less than 24 m in habitable height, gross floor area not greater than 5000 m<sup>2</sup> and total occupant load not exceeding 1,000 persons, an ordinary public address system shall be provided. However, Fire Command Centre is not required. Loudspeakers for the ordinary public address system shall be provided in every lift lobby, staircase enclosure and other strategic positions within audible distance. It shall be provided in all parts of all storeys throughout the building.
- (b) Two-way emergency communication system shall be provided between the Fire Command Centre and under the following area:
  - (i) every fire-fighting lobby, including 1st storey;
  - (ii) all fire-fighting related mechanical equipment rooms inclusive of sprinkler pump room, wet rising main pump room, hose reel pump room, switch rooms and generator rooms;
  - (iii) all rooms housing smoke control equipment;
  - (iv) all lift machine rooms;
  - (v) fire lift; Where the lift car is equipped with built-in intercom system two-way communication system can be exempted.
  - (vi) each area of refuge; and
  - (vii) air-handling control rooms.

If it is complete with the following factors, the two way communication system can be exempted in air handling control room;

- (aa) Where AHU can be remotely monitored and controlled at the Fire Command Centre and cannot be by-passed locally,
- (bb) the electrical cabling between AHU rooms and FCC are fire rated.

- (c) Where a one-way or two-way emergency communication system is required by this Fire Safety Code, it shall comply with the requirements stipulated in approved / acceptable Code of Practice for Emergency Voice Communication Systems in Buildings (e.g.SS 546:).
- (d) If one of following these systems shall install in any building, fire command center shall be placed.
  - (i) fire lift;
  - (ii) emergency voice communication system; and
  - (iii) engineered smoke control system.

The exception of buildings under Purpose Groups I & II (Purpose Group II building having not more than two basement storeys used solely for car parking),

- (e) A Fire Command Centre shall be of adequate size to house all the terminals and supervisory/control equipment, etc of the building's fire protection/detection systems and a free working space of at least 6 m<sup>2</sup>.
- (f) The location of fire command center shall be managed in following;
  - (i) The Fire Command Centre shall be located at the same level as the fire engine accessway or access road and in the following order of priority:
    - (aa) immediately adjacent to the fire-fighting lobby at the designated storey of the building;
    - (bb) in the case where there is no fire-fighting lobby, it shall be located within vicinity of the fire engine accessway or access road and adjacent to one of the protected stairs serving all storeys of the development.
    - (cc) at any other location as may be designated by the Myanmar Fire Services Department.
  - (ii) In the case of a site consisting of more than one building, there shall be more than one Fire Command Centre. For such cases, the Myanmar Fire Services Department shall be consulted.

- (g) The construction of enclosure, facilities and lighting of a Fire Command Centre shall comply with the SS 546: Code of Practice for Emergency Voice Communication Systems in Buildings.
- (h) Air conditioning or Mechanical ventilation where required for the Fire Command Centre shall be provided with secondary power supply and shall have ductworks independent of any other ductwork serving other parts of the building.
- (i) All multi-level basements of buildings under Purpose Group II to VIII are required to be provided with two-way emergency communication system between the Fire Command Centre and the following areas:
  - (i) Every fire-fighting lobby, including 1<sup>st</sup> storey. In building comprising 2, 3 or 4 basements shall be placed smoke-stop lobby. One of the smoke-stop lobbies shall be designated as a fire-fighting lobby;
  - (ii) All fire-fighting related mechanical equipment rooms, inclusive of sprinkler pump room, wet rising main pump room, hosereel pump, switch rooms, generator rooms, and lift machine room;
  - (iii) All rooms housing smoke control equipment;
  - (iv) Fire lift; Where the lift car is equipped with built-in intercom system that complies with clause 9 of SS 546, the two-way communication system can be exempted.
  - (v) Each area of refuge; and
  - (vi) Air-handling control rooms.

If it is complete with the following factors, the two way communication system can be exempted in air handling control room;

- (aa) Where AHU can be remotely monitored and controlled at the Fire Command Centre, and cannot be by-passed locally.
- (bb) the electrical cabling between AHU rooms and FCC are fire rated, the two-way communication system can be exempted.

- (vii) In following conditions two-way communication system can be exempted in basements.
- (aa) Single-level basement, irrespective of its usage of building under Purpose Groups II to VIII and basements of building of Purpose Group I are not required to be provided with two-way emergency communication.
  - (bb) Multi-level basements of building under Purpose Group II are not required to be provided with two-way emergency communication system, provided the basements are used solely for car parking and not exceeding two basement storeys in depth.

## Chapter (10)

### Inspection on Fire Safety

92. While the relevant owner or manager perform the business which is included in the Myanmar Fire Force Law – section (17), Fire safety procedure as well as fire safety installation, maintenance and testing shall be compiled with the following standards and codes of practices.

#### Approved Codes and Standards by Table 10.1

Code and Standards		
Code Name	Descriptions	Remarks
<b>Singapore Standards</b>		
SS CP 5	CoP for Electrical Installation	
SS CP 10	CoP for Installation and Servicing of Electrical Fire Alarm System	
SS CP 16	CoP for Earthing	
SS CP 51	CoP for Manufactured gas Pipe Installation	
SS CP 52	CoP for Automatic Fire Sprinkler	
SS 299	Specification For Fire Resistance Cables	
SS 550	CoP for Installation, Operation and Maintenance of Electric Passenger and Good Lifts	
SS 535	CoP for Installation, Operation, Maintenance, Performance and Construction Requirements of Mains Failure Standby Generating Systems	
SS 546	CoP for Emergency Voice Communication System in Building	
SS 563	CoP for the Design, Installation and Maintenance of Emergency Lighting and Power Supply Systems in Buildings	

<b>Code and Standards</b>		
<b>Code Name</b>	<b>Descriptions</b>	<b>Remarks</b>
<b>Singapore Standards</b>		
SS 575	CoP for Fire Hydrant, Rising Mains and Hose Reel System	
SS 578	CoP for Use and Maintenance of Portable Fire Extinguisher	
SS 489	Specification for Fire Shutters	
SS 547	Cop For Temporary Housing Quarters On Construction Sites	
SS 572	CoP for the use of timber in buildings	
SS 508	Graphical symbols – safety colours & safety signs	
SS 553	CoP for air-conditioning and mechanical ventilation in buildings	
SS 333	Specification for fire dampers	
SS EN 3 - 7	Portable Fire Extinguishers - Part 7 : Characteristics, performance requirements and test methods	
SS EN 3 - 8	Portable Fire Extinguishers - Part 8 : Additional requirements to SS EN 3-7 for the construction, resistance to pressure and mechanical tests for extinguishers with a maximum allowable pressure equal to or lower than 30 bar	
SS EN 3 - 9	Portable Fire Extinguishers - Part 9 : Additional requirements to SS EN 3-7 for pressure resistance if CO <sub>2</sub> extinguishers	
SS EN 3 - 10	Portable Fire Extinguishers - Part 10 : Provisions for evaluating the conformity of a portable fire extinguisher to SS EN 3-7	



<b>Code and Standards</b>		
<b>Code Name</b>	<b>Descriptions</b>	<b>Remarks</b>
<b>British standards</b>		
BS 476	Fire tests on building materials and structures	
Pt 4	Non-combustibility test for materials	
Pt 5	Method of test for ignitability	
Pt 6	Method of test for fire propagation for products	
Pt 7	Method of test to determine the classification of the surface spread of flame of products	
Pt 11	Fire tests for assessing the heat emission from building materials	
Pt 20	Method for determination of the fire resistance of elements of construction (general principles)	
Pt 21	Methods for determination of the fire resistance of load-bearing elements of construction	
Pt 22	Method for determination of the fire resistance of non-load-bearing elements of construction	
Pt 23	Method for determination of the contribution of components to the fire resistance of a structure	
Pt 24	Method for determination of the fire resistance of ventilation ducts	
BS 1105	Specification for wood wool cement slabs up to 125mm thick	
BS 4514	Specification for unplasticized PVC soil and ventilation pipes, fittings and accessories	

<b>Code and Standards</b>		
<b>Code Name</b>	<b>Descriptions</b>	<b>Remarks</b>
<b>British standards</b>		
BS 5234 Pt 2	Partitions (including matching linings)- Specification for performance requirements for strength and robustness including methods of test	
BS 5499 Pt 2	Fire safety signs, notices and graphic symbols- Specification for self-luminous fire safety signs	
BS 5588 Pt 5	Fire precautions in the design, construction and use of buildings- access and facilities for fire-fighting	
BS 5950 Pt 8	CoP for fire resistant design	
BS 6206	Specification for impact performance requirements for flat safety glass and safety plastic for use in buildings	
BS 6391	Specification for non-percolating layflat delivery hoses and hose assemblies for fire-fighting purposes	
BS 7346	Components for smoke and heat control systems	
BS 8202 Pt 2	Coatings for fire protection of building elements- CoP for the use of intumescent coating systems to metallic substrates for providing fire resistance	
BS EN 520	Gypsum plasterboards- definitions, requirements and test methods	
BS EN 694	Fire-fighting hoses. semi-rigid hoses for fixed systems	
BS EN 13501	Fire classification of construction products and building elements	

<b>Code and Standards</b>		
<b>Code Name</b>	<b>Descriptions</b>	<b>Remarks</b>
<b>American standards</b>		
NFPA 33	Standard for spray application using flammable or combustible materials	
NFPA 45	Standard on fire protection for laboratories using chemicals	
NFPA 750	Standard on water mist fire protection systems	
NFPA 262	Standard methods of tests for flame travel and smoke of wires and cables for use in air-handling spaces	
<b>Australian standards</b>		
AS 2208	Safety glazing materials in buildings	
AS 4587	Water mist fire protection systems- system design, installation and commissioning	

## Chapter (11)

### Penalties

93. The head of Township Fire Services Department shall issue the provisions of this Fire Safety Code as the directives for the matters described in section (17) of Myanmar Fire Force Law in order to avoid the losses by the fire incidents.
94. Fire Services Department shall issue the directives for the relevant owner or manager of the places described in section (25) of Myanmar Fire Force Law, not to fail to provide fire safety equipment required by this Fire Safety Code.
95. For the purpose of reducing the frequency of fires and avoiding the cases of injury and fatality caused by fire, when the relevant governmental department and organizations grant the permissive license for accommodation, usage and running business, it shall be complied with notification no. 506 (165)/ 12/ of President office dated on 25<sup>th</sup> April 2017, getting the Fire Safety Certificate of FSD.
96. While the applications for the fire safety certificate of the factories or buildings are submitted, the relevant registered engineers themselves must sign in and submit to the fire services department, declaring that the fire safety system installed are complied with this Fire Safety Code.
97. No one must fail to comply with the instructions published in Cl 93, 94, 95 and 96.
98. If it is found out that the relevant owner or manager failed to comply with the instructions, the relevant fire safety inspecting officer must present to the fire services department
99. If the submission according to Cl 98 is received, fire services department shall inform the relevant governmental department and organization so that the relevant owner or manager are to be taken charge and penalized according to managerial rules.
100. Fire Services Department shall take action the owner or manager who fails to comply with the requirements of this Code in line with the Myanmar Fire Force Law 2015, Bye laws, notifications and procedures.

## Chapter (12)

### Miscellaneous

101. While the relevant owner or manager constructs, applies the license, or runs the business in line with the requirement of this Code, the Relevant City Development Committee Law, Myanmar Investment Law, other Existing Laws, Bye laws, Rules and Regulations, Procedures, Orders, Directives and so forth shall be complied.
102. If it is discovered that any member of the fire force, the relevant fire officer or any member of fire safety inspection team assigned by this Fire Safety Code abuse the authority, he or she shall be punished according to the existing laws.
103. When the Fire Safety related matters are carried out for the purpose groups of Chapter 1, table (1.4), Foreign Investment Enterprises and Special Economic Zones, it shall be complied with the requirements in this Fire Safety Code.
104. In buildings and enterprises which need to appoint the fire safety manager, the certificate holder of fire safety manager training course conducted by the Fire Services Department, Ministry of Home Affairs, must be assigned.
105. In order to implement the provisions of this Fire Safety Code, Fire Services Department may issue the required orders and directives.



Myat Thu  
Director General  
Fire Services Department  
Ministry of Home Affairs

The Republic of the Union of Myanmar  
Ministry of Home Affairs  
Fire Services Department



# Myanmar Fire Safety Code 2020

## Appendices



## Contents

Sr.No	Descriptions	Page	
		From	To
1	2	3(a)	3(b)
1	APPENDIX-1 FIRE SAFETY REQUIREMENTS FOR CHEMICAL/HAZMAT WAREHOUSES	1	10
2	APPENDIX-2 FIRE SAFETY REQUIREMENTS FOR GENERAL WAREHOUSES	11	17
3	APPENDIX-3 FIRE SAFETY REQUIREMENTS FOR FULLY AUTOMATED MECHANISED CAR PARK	18	27
4	APPENDIX-4 REQUIREMENTS ON THE USE OF INTUMESCENT PAINTS FOR PROTECTION TO STRUCTURAL STEEL MEMBERS OF BUILDINGS	28	32
5	APPENDIX-5 STRUCTURAL LOADING OF FIRE ENGINE ON ACCESSWAY	33	34
6	APPENDIX-6 FIRE SAFETY REQUIREMENTS FOR PETROLEUM SERVICE STATION	35	46
7	APPENDIX-7 FIRE SAFETY REQUIREMENTS FOR HIGH CONTAINMENT FACILITY (BIO-SAFETY LEVEL 3 / 4)	47	48
8	APPENDIX-8 FIRE SAFETY REQUIREMENTS FOR LIQUEFIED PETROLEUM GAS (LPG) CYLINDER INSTALLATIONS	49	72

## Contents

Sr.No	Descriptions	Page	
		From	To
<b>1</b>	<b>2</b>	<b>3(a)</b>	<b>3(b)</b>
9	APPENDIX-9 FIRE SAFETY REQUIREMENTS FOR TEMPORARY WORKERS' QUARTERS IN UNCOMPLETED PERMANENT BUILDINGS ON CONSTRUCTION SITES	73	77
10	APPENDIX-10 DUCTLESS JET FANS SYSTEM IN CAR PARKS	78	84
11	APPENDIX-11 FIRE SAFETY REQUIREMENTS FOR LIFT RESCUE	85	89
12	APPENDIX-12 FIRE SAFETY REQUIREMENTS FOR PERSONS WITH DISABILITIES	90	96
13	APPENDIX-13 REQUIREMENTS ON THE USE OF LIFTS FOR EVACUATION OF BUILDING OCCUPANTS DURING EMERGENCY	97	99
14	APPENDIX-14 PROVISION OF EXIT SIGNS FOR ROOM	100	100
15	APPENDIX-15 FIRE SAFETY FOR TRANSFORMER INSTALLATIONS	101	111



## APPENDIX-1

### FIRE SAFETY REQUIREMENTS FOR CHEMICAL/HAZMAT WAREHOUSES

1. The types of chemical and related substances shall be classified as follows;

**Table (1.1) Classification of Hazardous Materials (HAZMAT)**

Class	Type of Hazmat
1	Explosives (1.1 to 1.6)
2.1	Flammable gas
2.2	Non-flammable compressed gas
2.3	Poisonous gas
3	Flammable and combustible liquid
4.1	Flammable solid
4.2	Substance liable to spontaneous combustion
4.3	Substance which, dangerous when contact with water
5.1	Oxidizer
5.2	Organic peroxide
6.1	Poisonous substance
6.2	Infectious substance (etiologic agent)
7	Radioactive material Category I
	Radioactive material Category II
	Radioactive material Category III
8	Corrosive material
9	Miscellaneous hazardous material (dangerous sub-substance)

**2. The size limitation shall be complied as follows;**

- (a) For chemical/hazmat warehouses storing Class 3, 4 & 5 hazardous materials, the maximum floor area per compartment and type of fire protection system shall as follows:

**Table (1.2) Fire Compartment Size**

Hazard Grade	Maximum Fire Compartment Size (m <sup>2</sup> )			
	K1	K2	K3	K4
3 & 4	≤ 50 m <sup>2</sup>	≤ 200 m <sup>2</sup>	≤ 600 m <sup>2</sup>	≤ 900 m <sup>2</sup>
2	≤ 100 m <sup>2</sup>	≤ 400 m <sup>2</sup>	≤ 2,400 m <sup>2</sup>	≤ 3,600 m <sup>2</sup>
1	≤ 400 m <sup>2</sup>	≤ 2,000 m <sup>2</sup>	**	**

**Table (1.3) Fire Protection System**

Type	Provision of Fire Protection System	
K1	Relatively small structure & low fire risk	Manual fire alarm
K2	Automatic surveillance	Automatic fire detection
K3	Automatic fire suppression system	Automatic sprinkler
K4	Automatic extinguishing system (foam system)	Automatic foam sprinkler

- (b) Refer to Table 1.1 for hazard grade classification;
- (c) The fire rating of the fire compartment wall shall be minimum 2 hours regardless of the type of fire protection system. For Class 3 hazmat storage, it shall be masonry construction except the ceiling (all floor element above

such hazmat storage shall be masonry construction with minimum of 2 hours rating) may use fire rated board but to comply fully with the M&E riser shaft requirements;

- (d) Different classes and incompatible hazmat shall be stored in separate fire compartment with minimum 2 hours fire rating;
- (e) No basement floor is allow to store Hazardous materials;
- (f) The compartment size limit and type of fire protection system for Class 2 Hazmat shall follow Hazard Grade 1 requirements;
- (g) Fire rated roller shutter is not allowed for the purpose to limit the compartment size control; any fire rated roller shutter at the access opening shall be activated by either local automatic smoke detection system or/and the general building automatic fire alarm system;

3. Storage of compressed gases (Class 2) , flammable liquid (Class 3), flammable solid (Class 4.2 & 4.3), oxidizing agent (Class 5.1) and organic peroxide (Class 5.2) shall be located only at the ground floor with at least one external wall facing directly to a exterior open safe space unless otherwise stipulated.

4. Solid materials (Class 4.1) is allowed to be stored at aboveground floors of habitable height not more than 24m and the storage quantity shall be limited to 1,200kg/m<sup>2</sup> of floor area.

5. Compressed gas cylinders (Class 2) are allowed to be stored at aboveground floors of habitable height not more than 24m provided that a vehicular ramp (with turning facility) suitable for 24 ton fire engine is erected for direct access to the storage area.

6. For Class 2 hazardous materials, no stacking is allowed. The hazardous materials shall be laid directly on the floor.

7. Storage, use and handling of compressed gases (Class 2) shall be in compliance with NFPA 55 and it may allow be located at above ground floor.
8. For sprinkler protected warehouse, the storage height shall be limited to 18m for single storey warehouse and 15m for warehouse that is located at ground floor of a multiple-storey building. For non-sprinkler protected warehouse storing Class 3 hazardous materials, the storage height shall be in compliance with NFPA 30 , subject to a maximum height of 3.6m.
9. Storage of oxidizers (Class 5.1, solid or liquid) shall be in compliance with NFPA 430 or AS 4326.
10. Storage of organic peroxide (Class 5.2) shall be in compliance with NFPA 432 or AS 2714.
11. No compartment in the chemical/hazmat warehouse shall comprise more than one storey.
12. An approved layout plan with such hazmat warehouse/storage clearly highlighted shall be kept within the premises to facilitate the inspection and emergency operation procedures.
13. **PROVISION OF ACCESSWAY**  
Fire engine accessway shall be provided for fire fighting appliances. The length of the accessway, based on the gross cubical extent of the entire warehouse space, shall be as follows;

**Table (1.4) Non-Sprinkler Protected**

<b>Cubicle Extent</b>	<b>Length of Accessway</b>
< 7,000 m <sup>3</sup>	1/6 perimeter (min 15m)
< 14,200 m <sup>3</sup>	1/4 perimeter
< 28,400 m <sup>3</sup>	1/2 perimeter
< 42,400 m <sup>3</sup>	3/4 perimeter
> 42,400 m <sup>3</sup>	Island site access

**Table (1.5) Sprinkler Protected**

<b>Cubicle Extent</b>	<b>Length of Accessway</b>
< 14,200 m <sup>3</sup>	1/6 perimeter (min 15m)
< 28,400 m <sup>3</sup>	1/4 perimeter
< 42,400 m <sup>3</sup>	1/2 perimeter
< 56,800 m <sup>3</sup>	3/4 perimeter
> 56,800 m <sup>3</sup>	Island site access

- (a) At least one external wall of the warehouse shall be directly fronting an empty space (such as turf area) of minimum width 2m. One of the access doors provided along this external wall shall be placed not more than 30m (for type K1) or 15m (for type K2) from the fire engine access road or accessway for ease of fire-fighting.
- (b) For K3 and K4 compartment, at least one external wall shall be directly fronting an engine access road or accessway. At least two exit access doors (minimum 15m apart) shall be provided along this external wall for ease of fire-fighting.

14. The loading and unloading (the area may be roofed over) shall be carried out directly from the exterior open space for type K2, K3 and K4 compartments.

15. For type K1 compartment, the distance from the external loading/unloading area (may be roofed over) to the access door of the compartment shall not be more than 10m for non-sprinkler protection building and 15m for sprinkler protection building. For Class 3 hazardous materials, the maximum volume of hazardous liquid shall be limited to 3,000L or 5,000L for non-sprinkler and sprinkler protected compartment respectively.

16. For storage of Class 4.1 hazardous materials above ground level, fire engine accessway and the associated FAPs shall be provided for the full stretch of the external wall of the storage area.

17. The water supply requirement from fire Hydrant for chemical and related substances warehouse shall comply with the Table 5.1 of the Myanmar Fire Safety Code with minimum running pressure of 3.5 bars.

18. The mechanical ventilation system for chemical and related substances warehouse shall be complied as follows;

- (a) The ventilation systems for warehouse storing Class 3 hazardous materials shall comply with the Myanmar Fire Safety Code in Chapter 8 and the smoke control system shall comply with the requirements for general warehouse.
- (b) The ventilation system for Class 2 shall comply with NFPA 55;
- (c) Mechanical ventilation system for removal of vapour shall be interlocked with the smoke control system to ensure that both systems will not be affecting one another.
- (d) The ventilation system shall be designed to provide air-movement across all portions of the room and to prevent the accumulation of vapours. Short-circuiting of the mechanical ventilation system shall be avoided.
- (e) Fresh air inlets and exhaust outlets shall be properly located according to the type of gases or vapours to be exhausted.
- (f) The air-conditioning system and M/V system for the storage area of hazmat shall not be shared with other occupied area.

19. The installation of fire extinguisher in chemical and related substances warehouse shall be as follows;

- (a) Fire extinguisher shall be provided complying with the Myanmar Fire Safety Code in Chapter 7 and other related standards.
- (b) Additional mobile type 50kg ABC (foam or chemical powder) fire extinguishers having minimum 6m throw and the discharge hose length of minimum 6m shall be provided to cover the loading and unloading area for K2, K3 and K4 compartment under hazard grade 2, 3 & 4. The access from any remote point of the loading / unloading area (including the parking lots area) to the 50kg fire extinguishers shall not be more than 15m.
- (c) For K1 compartment size, mobile type 50kg fire extinguisher shall only be required when the overall Hazmat storage area is more than 100m<sup>2</sup>.

20. The determination of travel distance in chemical/hazmat warehouse shall be in compliance with Table 3.5 of Chapter 3 for high hazard occupancy, 10m/20m for non-sprinkler building and 20m/35m for sprinkler protected building.

21. All exit and access doors shall be provided with the proper hazard and warning sign on both sides of these doors.
22. The following standards and codes of practices shall be complied with for the proposed chemical/hazmat warehouse:
  - (a) Chapter 7 : Code of Practice for the Installation and Servicing of Electrical Fire Alarm System
  - (b) Chapter 7: Code of Practice for Fire Hydrant Systems and Hose Reels
  - (c) Chapter 7: Code of Practice for Automatic Fire Sprinkler System
  - (d) Chapter 7: Code of Practice for Use and Maintenance of Portable Fire Extinguishers
  - (e) SS 98 : Preparation and use of Material Safety Data Sheets (MSDS)
  - (f) SS 254: Electrical Apparatus for explosive Gas Atmosphere
  - (g) SS 286 :Classification and class labels for hazardous substances
  - (h) SS 532 : Storage of Flammable and Combustible Liquids
  - (i) NFPA 16A : Foam-Water Sprinkler and Spray Systems
  - (j) NFPA 45 : Fire Protection for Laboratories Using Chemicals (refer to Table 2 & 3 for the MAQ)
  - (k) NFPA 55 : Compressed Gases & Cryogenic Fluids
  - (l) NFPA 70 : National Electrical Code
  - (m) NFPA 430 : Liquid and Solid Oxidizers
  - (n) NFPA 432 : Storage of Organic Peroxide
  - (o) NFPA 495 : Explosive Materials Code
  - (p) NFPA 704 : Identification of the Hazards of Materials
  - (q) AS 2714 : The storage and handling of hazardous chemical materials – Class 5.2 substances (organic peroxides)
  - (r) AS 4326 : The storage and handling of oxidizing agents

**Table (1.6) Hazard Grade Classification**

Hazard Classification		Hazard Grade				
		4	3	2	1	0
Liquids	Class3	Category 1 & 2 Flash point <23°C	Category 3 Flash point 23-60°C	Category 3 Flash point Between 60-150°C	Flash point >150°C	Only burns with supporting fire
Solid Materials	Class4	Ignites very easily and burns rapidly	Ignites and burns rapidly	Readily combustible	Moderately combustible	Combustible only with supporting fire
Oxidizing Agent	Class5.1	Class4 Vary strong oxidizing agent(may classified under explosive substance)	Class3 Strong oxidizing agent	Class2 Weak oxidizing agent	-	-
Oxidizing Peroxide	Class5.2	Class I	Class II	Class III	Class IV	Class V

- Note: (i) For flammable gases (Class 2), the LFL (or LEL) is less than 13% or the flammability range is greater than 12
- (ii) Classification and the respective hazard grades may subject to change in accordance with the international standards such as ISO, UN or GHS (Globally Harmonized System of Classification & Labelling of chemicals).

**Table (1.7) Maximum Allowable Quantities (MAQ) in Laboratory for Liquid**

Lab Unit	Excluding Qty in Cabinet	Including Qty in Cabinet
	Max Qty (L,litres per Lab Unit floor area)	Max Qty (L,litres per Lab Unit floor area)
Laboratory	(i) 50L or (ii) 1.6L/m <sup>2</sup> and not more than 350L {500L} Should portion of liquid stored/ used is cat 1&2, it shall be limited to (i) 20L or (ii) 0.8L/m <sup>2</sup> and not more than 250L {350L}	(i) - (ii) 3.2L/m <sup>2</sup> and not more than 750L {1000L} Should portion of liquid stored/ used is cat 1&2, it shall be limited to (i) - (ii) 1.6L/m <sup>2</sup> and not more than 500L {750L}
Laboratory	(i) 10L or	(i) -



Lab Unit	Excluding Qty in Cabinet	Including Qty in Cabinet
	Max Qty (L,litres per Lab Unit floor area)	Max Qty (L,litres per Lab Unit floor area)
(in hospital and health care occupancy)	(ii) 0.4L/m <sup>2</sup> and not more than 150L (250L) Should portion of liquid stored/ used is cat 1&2, it shall be limited to (i) 5L or (ii) 0.4L/m <sup>2</sup> and not more than 150L (250L)	(ii) 0.8L/m <sup>2</sup> and not more than 250L {500L} Should portion of liquid stored/ used is cat 1&2, it shall be limited to (i) - (ii) 0.8L/m <sup>2</sup> and not more than 250L {500L}

- Note: (i) Individual lab unit shall be a fire compartment;
- (ii) Each safety cabinet is still restricted to max of 250L;
- (iii) { } is referring to the maximum allowable quantities for sprinkler protected building;
- (iv) Laboratory operators are strongly advised and encouraged to minimize their amount of flammable liquids on benches by returning them to chemical store or safety cabinets (UL, FM or PSB listed product) when the liquid are not needed for the day. The quantity of these liquid placed on benches and fume cupboards shall not exceed 10% of the total allowable storage capacity within the lab unit. Liquids used for running and operating laboratory instruments or other work-in-progress which may require some quantities of solvents to operate are exempted from the 10% limit.

**Table (1.8) Maximum Allowable Quantities (MAQ) in Laboratory for Gases**

Item	Types of Gases	MAQ ( L,litres per Lab Work Floor Area with sprinkler protection)
1	Flammable gases	(i) 170 L or (ii) 3.4 L/m <sup>2</sup> per cluster
2	Oxidizing gases	(i) 170 L or (ii) 3.4 L/m <sup>2</sup> per cluster
3	Liquefied flammable gases	(i) 30 L or (ii) 0.6 L/m <sup>2</sup> per cluster
4	Toxic gases	(i) 8 L or (ii) 0.16 L/m <sup>2</sup> per cluster

- Note: (i) The capacity in litres (L) is referred to the internal volume (water capacity) of the gas cylinder.
- (ii) Lab Work Area is not necessary be individual fire compartment but shall be housed within a lab unit;
- (iii) For item 1 to 3, the MAQ shall be halved for those building which is not protected with sprinkler system;
- (iv) Item 1 to 4 may be accommodated in a single cluster and be spaced at least 3 m apart from each cluster (6 m for building without sprinkler protection);
- (v) The provision of sprinkler system shall be designed under the Ordinary Hazard Group 3 Special (CP52);
- (vi) No combustible materials shall be placed within 3m buffer range of the gas cylinder;
- (vii) No flammable or combustible liquid shall be placed within 6m buffer range of the gas cylinder;
- (viii) The air-conditioning system and M/V system for laboratory unit shall not be shared with other occupied area. For LPG cylinders, only 2 x 4.5kg cylinders are allow for each lab unit.

## APPENDIX-2

### FIRE SAFETY REQUIREMENTS FOR GENERAL WAREHOUSES

1. The scope of these guidelines covers the fire safety requirements for general warehouses which include single-storey single-user warehouses, single-storey multi-user warehouses, underground warehouses, multi-storey warehouses with or without basements and warehouse within other non-industrial buildings.
2. General warehouse is defined as space used for storing various types of goods or materials. It also includes warehouses for storing chemicals, fresh/perishable food products (cold room), etc. Those departmental stores, supermarkets and the likes having displayed storage height more than 4m (with sprinkler protection) or 2.5m (without sprinkler protection) shall comply with this Guidelines and the fire safety requirements stipulated in Myanmar Fire Safety Code for Purpose Group V (as retail shop). Store having floor area more than 100m<sup>2</sup> shall be classified as warehouse (Purpose Group VIII) usage and subject to comply with this Guidelines.
3. The compartmentation for general warehouses shall be as follows;
  - (a) The size of compartment shall not exceed the maximum allowable dimensions shown in the Table (2.1) of this Appendix 2, depending on the type of fire protection and location of the warehouse.
  - (b) Compartmentation, in respect of size limitation, may be achieved by using fire-rated roller shutter. Localized smoke detector shall be installed to activate the roller shutter. The roller shutter shall also be linked to the building automatic fire alarm system which shall act as a backup for the activation of the shutter.
  - (c) Compartmentation between the warehouse and loading/unloading (or staging) area shall be provided (to comply with Clause 16 of Myanmar Fire Safety Code), except where
    - (i) the warehouse is a single-storey single-user or multi-storey single-user per storey type, with the loading/ unloading area abutting external space; or

- (ii) the roof over the loading/ unloading (or staging) area abutting external space is not more than 3m.
  - (iii) Down-stand fire wall of minimum depth 1m hanging from the ceiling shall be provided [except for Clause 17(a)(ii) of Myanmar Fire Safety Code] between the loading/unloading area and the warehouse storage area.
- (d) The compartment size limit stipulated in Table (2.1) of this Appendix 2 shall include the loading/unloading (or staging) area if it is not fire compartmented from the warehouse area, unless the entire warehouse including the loading/unloading and driveway area is sprinkler protected and is provided with smoke control system. This sub-clause is not applicable to warehouse with roof over the loading/unloading (or staging) area abutting external space not more than 3m.
4. The installation of automatic fire sprinkler system for general warehouses shall be as follows;
- (a) Automatic sprinkler system shall be provided if the compartment size of the warehouse exceeds the maximum allowable size shown in the Table (2.1) of this Appendix 2.
  - (b) Sprinkler coverage shall be extended to the areas shielded by access platforms in the high rack storage warehouse. The supporting structures of the platforms shall have the same fire resistant rating as the element of structure of the warehouse.
5. The storage height control for general warehouses shall be as follows;
- (a) Signage shall be provided on the walls of the warehouse (including the loading/ unloading or staging area) to control the maximum allowable

storage height and to maintain the minimum clearance below the sprinkler heads in accordance with Chapter 7.

- (b) A 50 mm wide red line shall be drawn around the wall with signage indicated as “No Storage Above This Line”. This sign shall be provided at no more than 30m interval along the red line.
- (c) The lettering of the sign shall not be less than 100mm.
- (d) The storage height limitations shall be clearly indicated on plans.
- (e) For those non-sprinkler protected warehouse, the storage height shall be limited to 2.5m.

6. The provision of smoke control shall be in accordance with Table (2.2) of this Appendix 2, either in a form of smoke vent, smoke purging or engineered smoke control system depending on the fire compartment size and type of fire protection system.

7. The installation of smoke vents for general warehouses shall be as follows;

- (a) Smoke vents shall be of permanent open type and the effective opening shall be either comply with Table (2.2) or (2.5) of this Appendix 2. The use of glass blocks or panels as smoke vents shall not be considered unless they are designed to be activated automatically.
- (b) The minimum dimensions of vertical smoke vent shall be 400mm (length) X 600mm (height) and horizontal smoke vent (roof or ceiling) shall be 0.25m<sup>2</sup> in area.
- (c) No area in the warehouse shall be more than the stipulated distance (refer to either Table (2.2) or (2.5) of this Appendix 2 measured horizontally away from any vertical or horizontal smoke vent.
- (d) All smoke vents shall be located at the highest unobstructed level along the perimeter walls of the warehouse.

8. Replacement of smoke vents by smoke purging system is allowed provided that the warehouse is sprinkler protected. The smoke purging system shall comply with clause 75 of Chapter 8 in Myanmar Fire Safety Code.
9. Engineered smoke control system shall be provided if the floor area of the compartment is more than 5,000m<sup>2</sup> or 2,000m<sup>2</sup> for above ground or below ground warehouses respectively. The system shall be designed and installed in accordance with the requirements stipulated in Myanmar Fire Safety Code.
10. The fire extinguisher for general warehouses shall be provided in accordance with the Myanmar Fire Safety Code in Chapter 7.
11. Other fire safety requirements, namely means of escape, structural fire precautions, external fire fighting provisions, rising mains, hose reel system, electrical fire alarm, exit lighting, exit signs, emergency voice communication system, fire command centre, fireman lift and emergency power supplies etc. shall be provided as stipulated in the Myanmar Fire Safety Code.

**Table (2.1) Compartment Size & Storage Height for General Warehouse**

Location of Warehouse	Item	With Sprinkler Protection	Without Sprinkler Protection*	
		Storage Hazard	Storage Hazard	
		All	Normal	High
Single storey warehouse	Max;Floor Area per Compartment	12000 m <sup>2</sup>	3000 m <sup>2</sup>	2000 m <sup>2</sup>
	Max;Cubical Extent per compartment	NC	12000 m <sup>3</sup>	7500 m <sup>3</sup>
	Max;Storage Height	18 m	*Ref Table 21(A)&(B) of CP 52	12 m
Warehouse located on 1* storey of multi-	Max;Floor Area per Compartment	12000 m <sup>2</sup>	3000 m <sup>2</sup>	2000 m <sup>2</sup>

Location of Warehouse	Item	With Sprinkler Protection	Without Sprinkler Protection*	
		Storage Hazard	Storage Hazard	
		All	Normal	High
storey warehouse	Max;Cubical Extent per compartment	NC	12000 m <sup>3</sup>	7500 m <sup>3</sup>
	Max;Storage Height	15 m	*Ref Table 21(A)&(B) of CP 52	12 m
	Max;Floor Area per Compartment	9000 m <sup>2</sup>	3000 m <sup>2</sup>	2000 m <sup>2</sup>
Multi-storey warehouse with vehicle ramp(min, loading 24 tons with dry rising mains)	Max;Cubical Extent per compartment	NC	12000 m <sup>3</sup>	7500 m <sup>3</sup>
	Max;Storage Height	15 m	*Ref Table 21(A)&(B) of CP 52	12 m
	Max;Floor Area per Compartment	6000 m <sup>2</sup>	3000 m <sup>2</sup>	2000 m <sup>2</sup>
Multi-storey warehouse without vehicular ramp	Max;Cubical Extent per compartment	NC	12000 m <sup>3</sup>	7500 m <sup>3</sup>
	Max;Storage Height	15 m	*Ref Table 21(A)&(B) of CP 52	12 m
	Max;Floor Area per Compartment	3000 m <sup>2</sup>	NP	NP
Warehouse located in basement	Max;Cubical Extent per compartment	12000 m <sup>3</sup>	NP	NP
	Max;Storage Height	12 m	NP	NP
	Max;Floor Area per Compartment	3000 m <sup>2</sup>	NP	NP

**Table (2.2) Smoke Control Requirements for General Warehouse**

Location of Warehouse	Compartment Size	Provision of Sprinkler System	Smoke Control Requirement
Above ground level	$\leq 100\text{m}^2$	No	NR
	$>100\text{m}^2$ and $\leq 400\text{m}^2$	No	<sup>a</sup> Smoke vent (min % openings follow Table

Location of Warehouse	Compartment Size	Provision of Sprinkler System	Smoke Control Requirement
			2A)
	>400m <sup>2</sup> to size limit of Table1	No	<sup>b</sup> Smoke vent (20% /12m)
	<= 700m <sup>2</sup>	Yes	NR
	>700m <sup>2</sup> and <= 5000m <sup>2</sup>	Yes	<sup>c</sup> Smoke vent or <sup>+</sup> purging system
	> 5000 m <sup>2</sup>	Yes	Engineered smoke control system
Below ground level (*Basement)	<= 2000m <sup>2</sup>	Yes	<sup>c</sup> Smoke vent or <sup>+</sup> purging system
	>2000m <sup>2</sup>	Yes	Engineered smoke control system

**Table (2.3) [Extract from Table 21(A) of CP52]**

Category of storage	Overall stack height (m)	
	Non-encapsulated storage	Encapsulated storage
1	4.0	3.00
2	3.0	2.25
3	2.1	1.60
4	1.2	0.90
The term “store” or “storage” includes the warehousing or the temporary depositing of goods or materials while undergoing process		



**Table (2.4) [Extract from Table 21(B) of CP52]**

Category of storage	Overall stack height (m)	
	Non-encapsulated storage	Encapsulated storage
1	3.5	2.7
2	2.6	2.0
3	1.7	1.3
4	1.2	0.9
The term “store” or “storage” includes the warehousing or the temporary depositing of goods or materials while undergoing process		

**Table (2.5) (Smoke vent requirements for non-sprinkler protected building)**

Min opening of smoke vent based on the floor area	No area in the warehouse shall be more than the following distance measured horizontally away from any vehicle or horizontal smoke vent
2.5%	12 m
5.0%	15 m
10.0%	18 m
15.0%	21 m
20.0%	24 m

## APPENDIX-3

### FIRE SAFETY REQUIREMENTS FOR FULLY AUTOMATED MECHANISED CAR PARK

1. The purpose of this Appendix is to stipulate the fire safety requirements for the Fully Automated Mechanised Car Park (FAMCP). These requirements will assist the certificated person when making plans submission pertaining to the design, construction, protection, location and arrangement of the various fire safety provisions.
2. The FAMCP is defined as a building or part of a building that is intended for the storage/parking of vehicles (passenger car) employing fully automated mechanical facilities to move the vehicle from the point of entry to the parking lot and vice-versa. The parking area would be accessible by trained staff when carrying out maintenance works only. The parking system is to cease during the maintenance operations.
3. The height of the FAMCP shall be measured from the average level of the ground adjoining the outside of the external walls of the building to the highest/lowest car parking level.
4. The building height as defined in the Myanmar Fire Safety Code shall be used to calculate the cubical extent for all the car park types.
5. The FAMCP shall be complied with the following standards and codes:-
  - (a) SSEN3: Specifications for Portable Fire Extinguishers.
  - (b) Chapter 6: Installation, Operation and Maintenance of Electrical Passenger and Goods Lifts
  - (c) Chapter 6: ELECTRICAL POWER SUPPLIES
  - (d) Chapter7: Installation and Servicing of Electrical Fire Alarm Systems
  - (e) Chapter8: Mechanical Ventilation and air-conditioning in Buildings.
  - (f) Chapter9: The Installation and Maintenance of Emergency Evacuation Lighting and Power Supply Systems in Buildings.
  - (g) Chapter 9: Emergency Voice Communication System in Buildings.
  - (h) Chapter 7: Fire Hydrant Systems and Hose Reels

- (i) Chapter 7: Automatic Fire Sprinkler System
- (j) Chapter 7: Use and Maintenance of Portable Fire Extinguishers

6. The FAMCP shall be sub-divided into three categories as follows: -

- (a) Category 1(a): Small Above ground

This type of FAMCP refers to those small sizes, above ground structure and having the following sizes:

Maximum floor area : 200m<sup>2</sup>

Maximum cubical extent: 1400m<sup>3</sup>

Maximum parking height : 10m.

Minimum side openings : 50% of perimeter walls

- (b) Category 1(b): Small Above ground with Decks Sunken

This type of FAMCP refers to those small sizes, above ground structure without more than 2 car parking level sunken below the ground level and having the following sizes:

Maximum floor area : 200m<sup>2</sup>

Maximum cubical extent : 1400m<sup>3</sup>

Maximum parking height: 14m. (subject to maximum parking height of 10m above the ground level)

Minimum side openings : 50% of perimeter walls

- (c) Category 2: Above ground

Any FAMCP that is above ground level and do not fall under category 1.

- (d) Category 3: Underground

Any FAMCP that is below ground level and do not fall under category 1.

7. The fire safety requirements that are applicable to all three categories of car parks are as follows:-

- (a) Accessibility

Areas within the car park building shall not be accessible to the public.

(b) Designation of Purpose Group

The car park building shall be classified as Purpose Group VIII (storage) as per Table 1.4 of Myanmar Fire Safety Code.

(c) Means of Escape

Means of escape shall be provided where there are areas that are accessible by the public and these shall be in accordance with the requirements as for Purpose Group VIII.

(d) Separation from Other Usage

Where a separation wall or floor is required, a minimum 2-hour fire resistance rating wall or floor subject to compliance with the requirements of the elements of structure for Purpose Group VIII shall be provided to separate the car park from other usage.

(e) External Wall

Where an external wall is required as in Cl.19, a minimum 1-hour fire resistance rating floor subject to compliance with the requirements of the elements of structure for Purpose Group VIII shall be provided.

(f) Portable Fire Extinguisher

Extinguishers having a minimum fire rating of 70B, shall be provided at every entrance and exit of the car park.

(g) Hose Reels

Hose reel coverage shall be provided for every entrance and exit of the car park.

(h) Power Supply

Where any such installation is required, its primary and secondary source of power supplies shall be in accordance with Chapter 6 of Myanmar Fire Safety Code.

(i) Fire Engine Accessway

Accessway for all the FAMCP shall comply with Cl 30 of Myanmar Fire Safety Code.

8. The specific fire safety requirements for the small above ground fully automated mechanised car park (SA-FAMCP)(**Category 1**) shall be as follows: -

- (a) The small above ground fully automated mechanised car park (SA-FAMCP) shall not exceed the following compartment limits as indicated in the table below.

<b>Compartment</b>	<b>Maximum Floor Area</b>	<b>Maximum Cubical Extent</b>
Compartment between average ground level and a height of 10m.	200m <sup>2</sup>	1400m <sup>3</sup>

- (b) Structural design

The SA-FAMCP shall be constructed of structural steel construction.

- (c) Vertical Deck Separation

For SA-FAMCP having multi-car parking level, vertical fire separation between the upper and lower decks by using a non-perforated and non-combustible materials (structural steel plate) shall be provided. This is to minimise direct impingement of flame to the car in the upper deck and also to prevent dripping of any possible leaking fuel to the lower deck.

- (d) Fire Engine Accessway

Accessway shall be provided for the fire engine to gain access to the car park entrance and exit.

- (e) Private Fire Hydrant

Private fire hydrants if required shall be provided in accordance with Cl.33,Chapter 5 of Myanmar Fire Safety Code.

- (f) Natural Ventilation

Each car parking deck shall be provided with at least 50% external ventilation openings of the perimeter wall areas and uniformly distributed.

9. The specific fire safety requirements for the above ground fully automated mechanised car park (A-FAMCP)(Category 2) shall be as follows: -

(a) Compartmentation

The car park shall not exceed the following dimension: If exceeded, sprinkler protection shall be provided.

Maximum Parking Height	Maximum Floor Area	Maximum Cubical Extent
24m	1000m <sup>2</sup>	3500m <sup>3</sup>

(b) Elements of Structure

The minimum period of fire resistance for the elements of structure shall be as follows:

Maximum dimensions			Min fire resistance rating (in hours)
Height (in m)	Floor area (in m <sup>2</sup> )	Cubical Extent (in m <sup>3</sup> )	Above ground storey
7.5	150	NL	½
15	NL	1,700	1
28	NL	7,000	2
28	NL	21,000	4
Over 28	1,000	NL	4

(c) Vertical Fire Separation

Each car park deck shall be constructed with minimum 1-hour fire resistance. Where such building or compartment is fitted throughout with an automatic sprinkler system, a non-combustible, non-perforated deck will suffice.

10. The A-FAMCP(Category 2) shall be provided with the fire fighting appliances and systems subject to the following standards.

- (a) The car park height exceeding 10m, fire fighting staircase shall be complied with the following provisions: -
  - (i) All fire fighting staircases shall conform to the requirements of Clause 7(d),Chapter 3 of Myanmar Fire Safety Code.
  - (ii) Smoke free approach as stated in Clauses 6(m) and 6(n) of Myanmar Fire Safety Code.
  - (iii) Fire doors of 1-hour fire resistance rating for the access of fire fighters via the staircase into the car park. The fire door shall be of at least 850mm wide by 1000mm high with a visual glass panel. Wordings of “For smoke venting, do no enter” shall be posted on the external side of the door. The wordings shall be of at least 25mm in height.
  - (iv) The number of staircases provided shall depend on the number of rising mains. Each rising main serving every car parking level shall be within 8m coverage measured from the staircase door to the most remote part of the car parking lot:
  - (v) Breaching inlet serving rising main shall be located within 18m of the accessway.
  - (vi) Dry rising main shall be provided for height exceeding 10m and up to 24m. When the height exceeds 24m, wet rising main shall be provided. The breaching inlet shall be located at the foot of the riser stack. One standby fire hose of length 15m shall be provided at the ground level of each staircase provided.
  - (vii) Fire lift shall be provided for height exceeding 24m.
  - (viii) Where fire lift is required, a two way voice communication system shall be provided between the Fire Command Centre and the following areas:
    - (i) Every fire-fighting lobby, including ground storey.
    - (ii) All fire-fighting related mechanical equipment rooms inclusive of sprinkler pump room, wet riser pump room etc.

- (ix) Fire Command Centre shall be provided in accordance with Clause 91 of Myanmar Fire Safety Code.
  - (b) The access openings shall be complied with the following standards;
    - (i) The car parking height shall not exceed 40m
    - (ii) Access openings shall be provided at every car parking level.
    - (iii) The access openings shall be not less than 850mm wide by 1000mm high.
    - (iv) There shall be one access opening to every 100m<sup>2</sup> of gross floor area or each side of the car parking level.
    - (v) Access openings shall be remote from each other and located along more than one side of the building. Such access openings shall be placed not more than 10m apart measured along the external wall from centre to centre of the access openings.
    - (vi) Accessway shall be provided in accordance with Clause 30, Chapter 5 of Myanmar Fire Safety Code and allow for island site access.
  - (c) Private Fire Hydrant  
Private fire hydrant where required shall be provided in accordance with Clause 33, Chapter 5 of Myanmar Fire Safety Code.
  - (d) Sprinkler System  
Where sprinkler protection is required, it shall be in accordance with Chapter 7 of Myanmar Fire Safety Code.
  - (e) Smoke Vents  
Ventilation openings (with exhaust air outlet sited at high level and fresh air inlet sited at low level) of at least 2.5% of the largest floor area of any car parking level shall be provided. It shall be operated automatically by activation of smoke detector, if such openings are not naturally ventilated.
11. The fire safety requirements for underground fully automated mechanised car park (U-FAMCP) (Category 3) shall be complied with the following standards;
- (a) Compartmentation  
The underground fully automated mechanised car park (U-FAMP) shall not exceed the following sizes:-



Maximum Parking Depth	Maximum Floor Area	Maximum Cubical Extent
28m	2000 m <sup>2</sup>	7000 m <sup>3</sup>

## (b) Elements of Structure

The minimum period of fire resistance for the elements of structure shall be as follows: -

Maximum dimensions			Min fire resistance rating (in hours)
Height (in m)	Floor area (in m <sup>2</sup> )	Cubical Extent (in m <sup>3</sup> )	Basement storey
7.5	150	NL	1
15	NL	1,700	1
15	NL	3,500	2
28	2,000	7,000	4

## (c) Vertical Fire Separation

Each car park deck shall be constructed with minimum 1-hour fire resistance.

## (d) Fire-Fighting Staircase

- (i) All fire-fighting staircases shall conform to the requirements of Clause 7(d), Chapter 3 of Myanmar Fire Safety Code.
- (ii) Smoke free approach as stated in Clauses 6 (m) and 6(n), Chapter 3 of Myanmar Fire Safety Code.

- (iii) Fire doors of 1-hour fire resistance rating for the access of fire fighters via the staircase into the car park; and
- (iv) The number of staircases provided shall depend on the number of rising mains. Each rising main serving every car parking level shall provide the following coverage:
  - (a) Where internal access to every car parking lot is provided:
    - (i) An access of minimum width of 0.9m shall be provided.
    - (ii) No part of any car parking lot shall exceed 28m.
  - (b) Where no internal access to every car parking lot is provided:
    - (i) The maximum distance measured from the staircase door to the most remote part of the car parking lot shall not exceed 8m.
- (v) Breeching inlet serving rising main shall be located within 18m of the accessway.
- (vi) Dry rising main shall be provided for all basement depth and the breeching inlet shall be located near the riser stack. One standby fire hose of length 15m shall be provided at the ground level of each staircase.
- (vii) Fire lift shall be provided for basement depth exceeding 9m.
- (viii) Where fire lift is required, a two-way voice communication system shall be provided between the Fire Command Centre and the following areas:
  - (a) Every fire-fighting lobby, including ground storey.
  - (b) All fire-fighting related mechanical equipment rooms inclusive of sprinkler pump room, wet riser pump room etc
- (ix) Fire Command Centre shall be provided in accordance with Clause 91 of Myanmar Fire Safety Code.

- (x) Basement levels shall be provided with two-way voice communication system in accordance with Clause 91 of Myanmar Fire Safety Code.
- (e) Fire Engine Accessway  
Accessway shall be provided for fire engine to gain access to the fire fighting staircases.
- (f) Private Fire Hydrant  
Where required, private fire hydrant shall be provided in accordance with Clause 33, Chapter 5 of Myanmar Fire Safety Code.
- (g) Sprinkler Protection  
Sprinkler protection shall be provided in accordance with Chapter 7 of Myanmar Fire Safety Code.
- (h) Smoke Vents  
Smoke vents of at least 2.5% of the basement floor area shall be provided in accordance with Cl.84. This requirement shall apply to basement not exceeding 1000m<sup>2</sup> in floor area and 5m in depth measured from the ground level area to the lowest floor level. If these limits are exceeded, smoke purging system shall be provided.
- (i) Foam Installation  
Where fire lift is required, foam inlets in accordance with Clause 47, Chapter 7 of Myanmar Fire Safety Code shall be provided.

## APPENDIX-4

### REQUIREMENTS ON THE USE OF INTUMESCENT PAINTS FOR PROTECTION TO STRUCTURAL STEEL MEMBERS OF BUILDINGS

1. Fire Rated Paint which are internationally recognized are allowed to be used to protect the structural steel members of buildings.

#### Standards of Intumescent Paint

2. The Intumescent paint shall be subjected to the fire resistance test as detailed in this Appendix 4, BS 476 Part 20/21 or its equivalent.

3. The Intumescent paint shall also be subjected to weathering tests as detailed in BS 8202: Part 2.

4. The intumescent paint shall be listed under the Product Listing Scheme, administered by certification bodies accredited by Internationally Recognizable Organization's Endorsement and Myanmar Fire Services Department.

5. The intumescent paint shall be complied as follows:

- (a) The fire resistance period of the intumescent paint shall be complied with the requirement of table (4.2) In Chapter-4 of Myanmar Fire Safety Code.
- (b) Shall submit the thickness table of the intumescent paint which shall be designed with BS 476: Part 20/21 (Designed Temperature) according to steel member.
- (c) Shall submit the drawing which specified the intumescent paint thickness with colours for the steel member.
- (d) The intumescent paint painting procedure of Internal/Indoor system shall be submitted.
- (e) The thickness inspection form of the Intumescent paint.

6. The specifications of the intumescent paint manufacturer and the applicator shall be as follows;

- (a) The Intumescent paint's brand, manufacture country (material catalog/data sheet) shall be submitted.
- (b) The ISO certificate of the Intumescent paint manufacturer.
- (c) The Myanmar Fire Service Department Certificate of the Intumescent paint.
- (d) The Myanmar company legal registration certificate of the intumescent paint applicator.
- (e) The authorized certificate issued by the intumescent paint manufacturer to the applicator.
- (f) The intumescent paint certificate of conformity issued by the manufacturer.

7. The test report for the intumescent paint shall be included as follows:

- (a) The intumescent paint shall be subjected to the fire resistance test as detailed in BS 476: Part 20/21.
- (b) The intumescent paint shall also be subjected to (Internal/Indoor) weathering tests as detailed in BS 8202: Part 2:
- (c) The certificate of asbestos free test report for the intumescent paint.

#### Standards of Vermiculite Paint

8. The vermiculite paint shall be complied as follows:

- (a) The fire resistance period of the vermiculite paint shall be complied with the requirement of table (4.2) In Chapter-4.
- (b) Shall submit the thickness table of the vermiculite paint which shall be designed with BS 476: Part 20/21 (Designed Temperature) according to steel member.

- (c) Shall submit the drawing which specified the vermiculite paint thickness with colours for the steel member.
- (d) A Guarantee letter that adding the chemical (Accelerator / Quick Setting Admixture) is prohibited when mixing the vermiculite.
- (e) The thickness inspection form of the vermiculite paint.

9. The specifications of the vermiculite paint manufacturer and the applicator shall be complied with the requirement of Clause 6 of this Appendix 4.

10. The test report for the vermiculite paint shall be included as follows:

- (a) The vermiculite paint shall be subjected to the fire resistance test as detailed in BS 476: Part 20/21.
- (b) The density of the vermiculite paint.
- (c) The adhesion of the vermiculite paint.
- (d) The compressive strength of the vermiculite paint.
- (e) The certificate of asbestos free test report for the vermiculite paint.

11. The fire rated pain installation company shall submit a separate set of plans indicating the locations of the structural steel members that are/will be coated with intumescent paint.

12. If the building exceeds 24m in habitable height, a fire safety report shall be submitted together with the plan.

13. The documents shall be submitted after spraying the fire rated paint as follows;

- (a) The fire rated paint shall be applied according to the painting procedure and the photo records of applying.
- (b) The fire rated paint shall be applied to meet the submitted drawing requirements and the photo records of thickness check.

- (c) The hand over document from the fire rated paint applicator shall be submitted which described the painting work is constructed and completed meet the submitted drawing requirements.
- (d) The fireproof certificate issued by the fire rated paint manufacturer.

14. A signage depicting the following minimum information shall be fixed at a conspicuous location:

- (a) Name of supplier
- (b) Fire resistance rating of the intumescent paint and Vermiculite
- (c) Date of painting
- (d) Expected date of re-painting.
- (e) Caution note: "Caution: No other paint/coating shall be applied to the surfaces of the structural steel members protected by the intumescent paint and Vermiculite system".

15. The Fire Safety Manager, if any, shall carry out regular inspection checks to ensure that the intumescent paint and Vermiculite coatings are not damaged or tempered with. Records of inspection shall be properly kept.

16. Annual renewal of the Fire Safety Certificate, where applicable, shall also include the inspection of the columns and beams coated with intumescent paint and Vermiculite.

17. For addition/alteration works in a building where structural steel members are protected by intumescent paint and Vermiculite, the following requirements must be complied with:

- (a) The owner or tenant, assisted by Fire Safety Manager (FSM), shall engage a QP who shall submit building plans to MFSD. The building plans shall be accompanied by the QP's declaration as to whether the existing columns beams coated with intumescent paint and Vermiculite are/will be affected.

(b) The fire safety report shall be updated accordingly.

18. There shall be no highly flammable/combustible materials stored within the vicinity of any structural steel members protected by intumescent paint and Vermiculite.

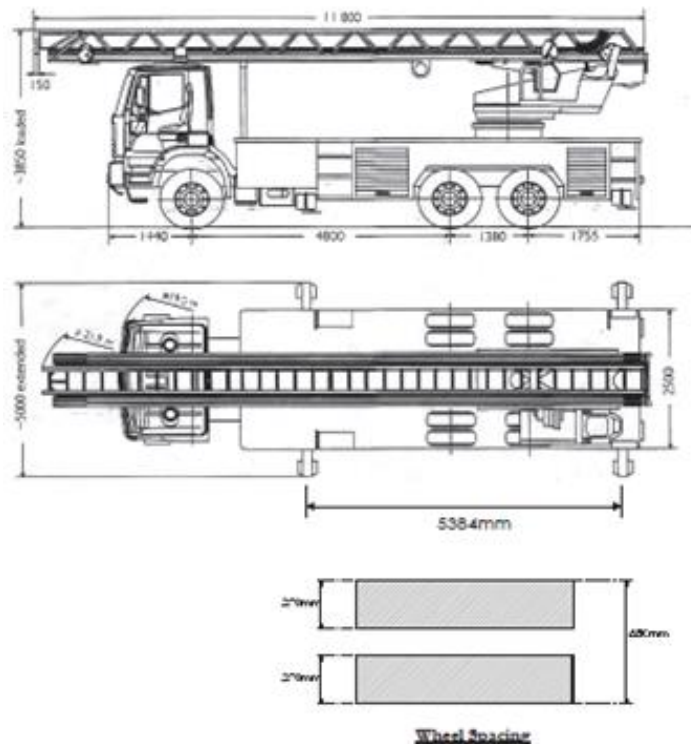


## APPENDIX-5

### STRUCTURAL LOADING OF FIRE ENGINE ON ACCESSWAY

1. The minimum width of the accessway shall be 6m wide and the minimum length shall be 15m long. The relationship between the accessway and parked fire engine with its front and rear jacks extended is shown by the following diagram.

**Figure (5.1) ACCESSWAY (WHEELS & JACKS LAYOUT)**



2. Accessway shall be on;

- (a) suspended slabs, or
- (b) on metalled or paved ground, or
- (c) ground laid with strengthened perforated slabs or
- (d) approved materials to withstand the loading requirements of fire engine.

3. The accessway required to serve building shall be constructed to sustain the load of a 40 tonnes fire engine. The wheel load shall be considered separately with the jack loads for both global and local effects.

4. Axles load for accessway shall be as follows :

<b>Front Axle</b>	<b>7500kg</b>	<b>2 wheels</b>
<b>Rear Axle</b>	<b>21,000kg</b>	<b>8 wheels</b>

5. The jack load shall be assumed to be uniformly distributed over a rectangular contact area of 923 cm<sup>2</sup> for both local and global analysis.

6. The maximum pressure on one jack, even in the worst case, will not exceed 80 N/cm<sup>2</sup>.

7. In the absence of more exact calculations, live load surcharge for accessway on suitable material properly consolidated may be assumed to be at least 10 KN/m<sup>2</sup>.

## APPENDIX-6

### FIRE SAFETY REQUIREMENTS FOR PETROLEUM SERVICE STATION

1. Petroleum service stations shall be sited away from any places of public assembly where there is large number of people, such as town centres, neighbourhood centres, important buildings and key installations. Examples of places of public assembly are shown in following table.

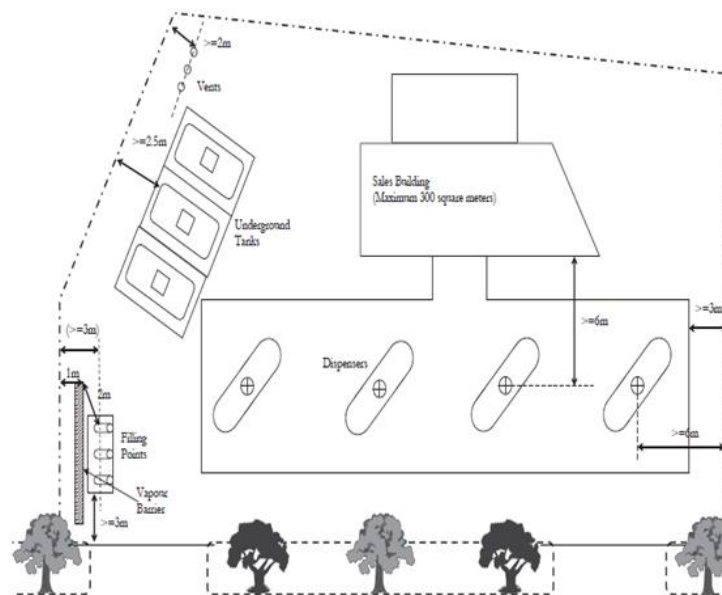
**Table (6.1) Places Of Public Assembly**

<b>No</b>	<b>PLACES OF PUBLIC ASSEMBLY</b>
(1)	Places of worship.
(2)	Schools.
(3)	Hospitals.
(4)	Shopping Centre / Malls.
(5)	Hotels.
(6)	Offices.
(7)	Town Centre.
(8)	Neighborhood Centre.
(9)	Cinemas / Theatres.
(10)	Bus Interchanges.
(11)	Circular Town Train Stations.
(12)	Community Club / Centre.
(13)	Highway Stations.
(14)	Airport.
(15)	Convention Centre.
(16)	Exhibition Centre.
(17)	Restaurants / Fast Food Centre /Discotheques / Night Clubs.
(18)	Galleries / Museum.
(19)	Stadiums.
(20)	Swimming Complex.

No	PLACES OF PUBLIC ASSEMBLY
(21)	Custom Check Points.
(22)	Amusement Centre.
(23)	Recreational premises.
(24)	Public places of assembly for persons admitted thereto by ticket (e.g. Zoo, Bird Park, Amusement Parks, etc.)

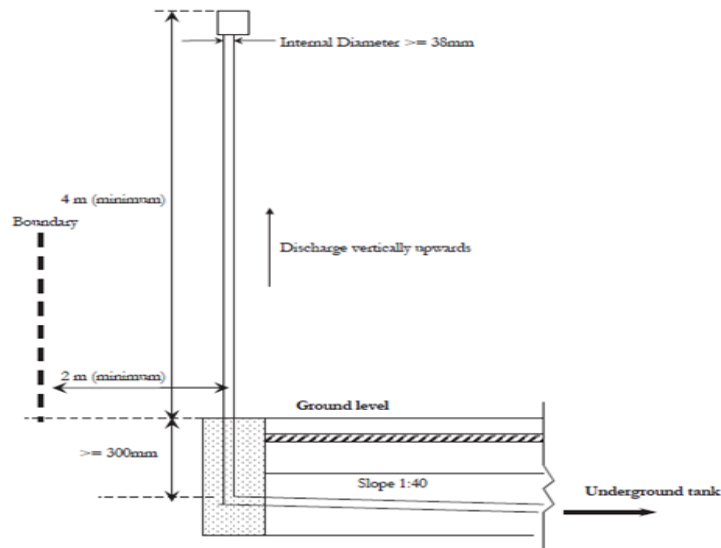
2. If the distances from the boundary line of the petroleum service stations to any residential buildings and places of public assembly are within the following dimensions.
  - (a) Residential buildings - 50 meters
  - (b) Places of public assembly - 90 meters
3. The route for tank vehicles leading to petroleum service stations should not pass through or be near to the kind of places mentioned in Table (6.1) of this Appendix 6.
4. Service station shall be stand-alone type and dispensing of petrol shall be restricted to the ground level only.
5. Convenience stores integrated with the petroleum service station is limited to 150 square meters.
6. Consultation and approval with regards to petroleum service station shall be sought from Myanmar Fire Services Department.
7. Tanks for all classes of petroleum in a Petroleum Service Station shall be installed underground.
8. All underground tanks shall have a water capacity not more than 12000 gal each.
9. The tank shall be designed, constructed, installed and tested to meet any of the following or other equivalent standards:
  - (a) British Standards (BS 2594): Carbon Steel Welded Horizontal Cylindrical Storage Tanks.

- (b) Underwriters Laboratories (UL 58): Steel Underground Tanks for Flammable and Combustible Liquids.
  - (c) Standards Association of Australia (1962): Steel Tanks for the Storage of Flammable and Combustible Liquids.
  - (d) NFPA 30: Flammable and Combustible Liquids Code.
10. All underground tanks shall be in accordance with the following requirements:
- (a) The road surface above the underground tanks shall be of reinforced concrete of the thickness necessary to support itself and any superimposed loads, but not less than 150mm.
  - (b) The depth from the road surface to the top of the tank shall be not less than 450mm.
  - (c) Each access pit shall be fitted with a cover that is water tight or raised above the level of the surrounding ground to prevent the entry of surface water and of strength sufficient to withstand any superimposed loads.
11. The distance of the underground tank to any property boundaries and foundations shall be not less than 2.5m and 1m respectively.



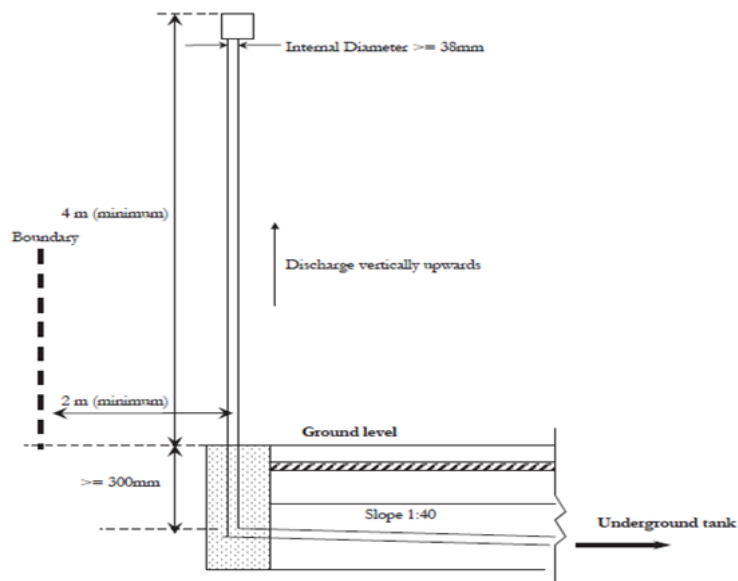
**Figure (6.1)**

12. Any underground tank and its associated piping shall be protected from corrosion by one or more of the following methods:
  - (a) Protective coating or wrappings
  - (b) Cathode protection
  - (c) Corrosion-resistant materials of construction
13. Each tank shall incorporate a vent to atmosphere for the vapor space above the liquid.
14. The size of any vent shall have a minimum internal diameter of 38mm.
15. Any vent piping between the tank vent connection and the discharge point shall comply with the following requirements:
  - (a) The vent pipes shall fall consistently back to the tank at a slope not less than 1 in 40.
  - (b) A vent pipe shall not pass through building foundations but may be embedded in concrete, which is part of other building construction.
  - (c) A vent pipe may be either embedded in a concrete slab or laid in the earth. If the vent pipe is laid in the earth, it shall be:
    - (i) Located not less than 300mm below ground level;
    - (ii) Surrounded by clean washed sand, or provided with equivalent corrosion protection; and
    - (iii) Suitably protected if the area is subject to vehicular traffic.
  - (d) The vent pipe and terminal shall be located or protected so that they are not liable to damage resulting from normal activities.
  - (e) The vent pipe shall be vapour-tight throughout its length.
  - (f) All underground tanks or compartment in a tank shall have a separate individual vent pipe.



**Figure (6.2)**

16. The discharge point of a vent shall comply with the following requirements:
- The location, direction and velocity of discharge shall be such that venting vapour will not cause danger to the surrounding.
  - The vent discharge point shall be not less than 5.0m from any boundary and opening in a building e.g. Window, door, ventilator, air conditioner and forced air intake.
  - The vent shall discharge into open air and vent discharge point shall be located not less than 4m above ground level (see the diagram).



**Figure (6.3)**

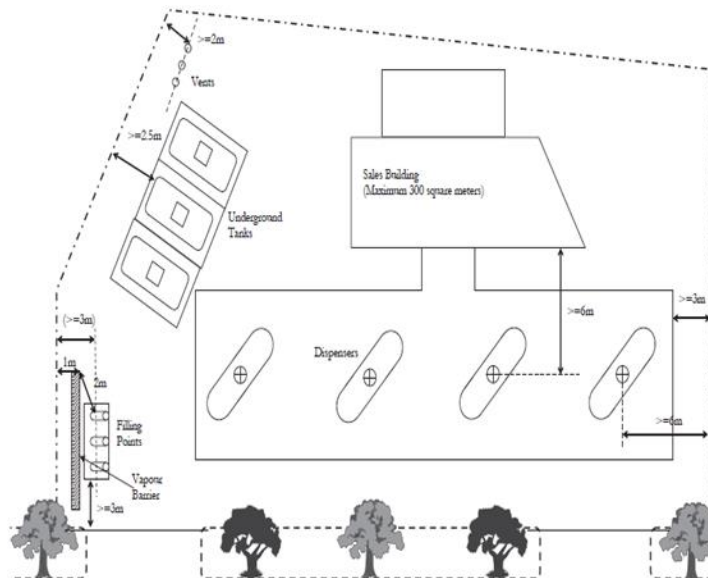
17. The discharge end of a vent shall be protected from the ingress of foreign material by a protective cage of fitting and shall discharge only vertically upward in order to disperse vapours. A vent provision shall be connected to a vapor recovery or collection system.

18. The filling connection to a storage tank, which is filled from a tank vehicle, shall incorporate a vapor-tight connection. A cap or cover with lock shall be provided for the filling point.

19. The location of the filling point for any storage tank intended to be filled from a tank vehicle shall comply with the following requirements :

- (a) The length of any hose required to connect a tank vehicle to the filling point shall not exceed 5m.
- (b) The filling point shall be protected from accidental or physical damage. Guardrails or any necessary measures shall be installed to prevent damage by collision.
- (c) The filling point for any tank containing a Class I, Class II and Class III petroleum shall be in open air at least 3.0m from any opening into a building and boundary. If a distance of 3.0m cannot be complied, a vapour barrier made of non-combustible material shall be used and shall not be less than 500mm high above the center of the filling point inlet. The vapor barrier must be at least 1m from the boundary line. The distance measured in a horizontal plane around the end of any vapour barrier must be 3m from the center of the outer most filling point inlet to the building and boundary. See Annex B for details.
- (d) The edge of the tank vehicle designated parking area for refilling shall be at least 3m from any opening into any building and boundary.
- (e) The filling point for the underground tank shall be located in such a way that there are no obstructions for the tank vehicle to have a clear access from the entry to the exit of the service station.





**Figure (6.4)**

20. The design, fabrication, assembly, test and inspection of piping shall be suitable for the expected working pressure temperatures and structural stresses and shall comply with relevant international standard.

21. Any material used in the construction or installation of piping shall be suitable for the following conditions of use, and in particular:

- (a) It shall be compatible with the particular petroleum or any other component with which it may be in contact;
- (b) It shall be resistant to any heat to which it may be exposed; and
- (c) Where subject to corrosion, it shall be sufficiently resistant to ensure an acceptable life.

22. Flexible tubing, piping or hose may be used only on condition that:

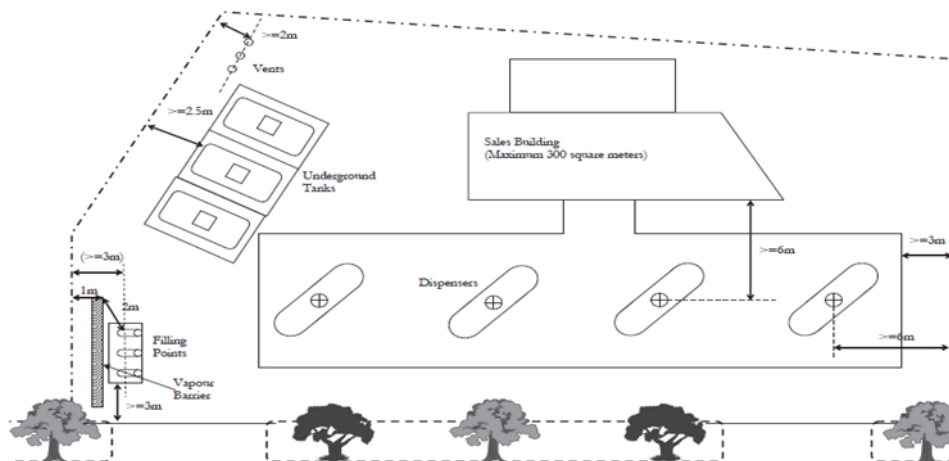
- (a) The use of such tubing is unavoidable because of the need to provide for movement or to reduce the effect of vibration;
- (b) The tubing is of flexibility metallic, metal-reinforced, armored or other construction suitable for the working pressure, temperature and the liquid being handled.

23. The following design consideration shall be taken into account when designing or installing any piping:

- (a) The layout shall take into account of the needs for all operating access and shall ensure that any accessway are not impeded.
- (b) Provision shall be made wherever necessary, for the expansion or contraction of the piping and its contents;
- (c) Any buried piping shall be protected from superimposed loads, ground settlement etc.
- (d) Any necessary electrical bonding and earthing shall be provided.

24. Any motor or engine that drives a pump for use with any classes of petroleum shall be of the type specifically approved for such use.

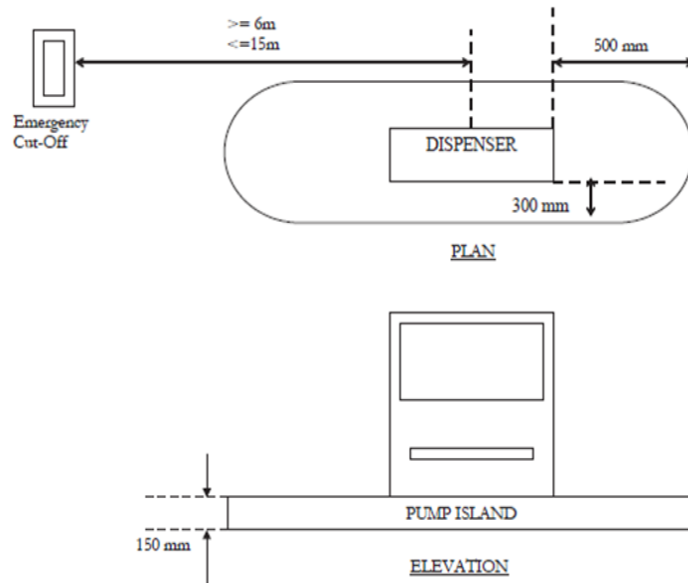
25. Dispensing units at a service station shall be located in the open air where they will be adequately ventilated. These shall be located such that all parts of the vehicle being served will be on the premises of the service station and shall be sited not less than 6m away from any building, public roadway or boundary.



**Figure (6.5)**

26. A clearly identified and easily accessible switch or circuit breaker shall be provided at a location remote from the dispensing devices, including remote pumping systems, to shut off the power to all dispensing devices in the event of an emergency and shall not be less than 6m or more than 15m from the dispenser. A sign

incorporating the wordings "EMERGENCY CUT-OFF" shall be provided in the vicinity of the cut-off switch.

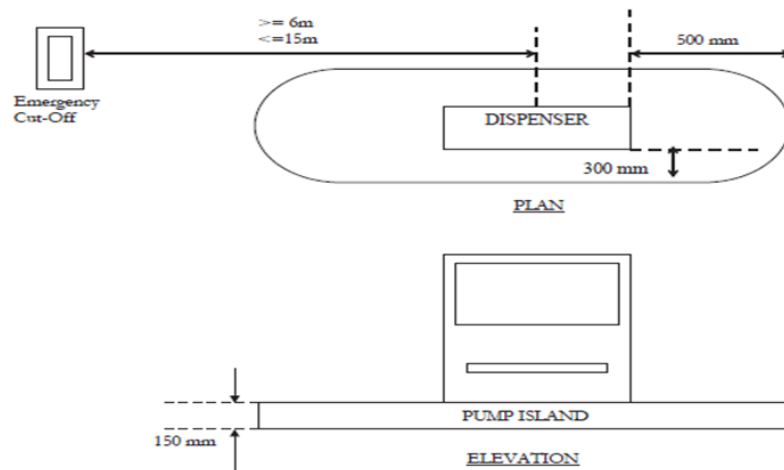


**Figure (6.6)**

27. Petroleum shall be transferred from underground tanks by means of fixed pumps designed and equipped to allow control of the flow and prevent leakage or accidental discharge.

28. A control shall be provided such that the pump will operate only when a dispensing nozzle is removed from its bracket or normal position with respect to the dispensing unit and the switch on this dispensing unit is manually activated. This control shall also stop the pump when all nozzles have been returned, either to their bracket or to the normal non-dispensing position.

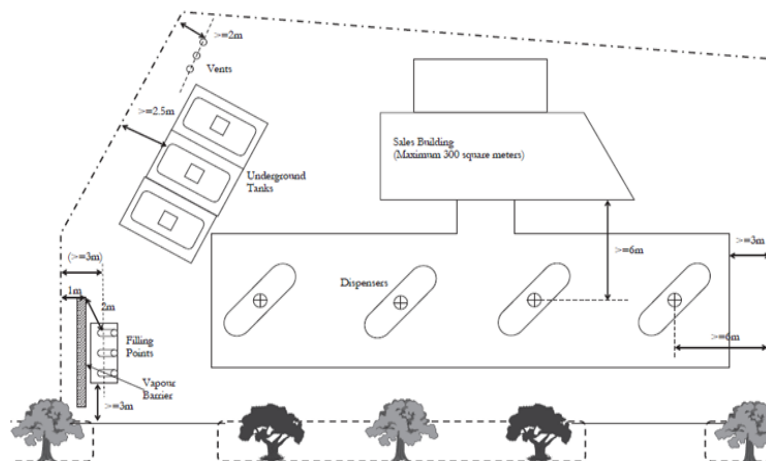
29. The dispensing unit and its piping shall be mounted on a concrete island. Each island shall rise not less than 150mm above the surrounding ground level and shall extend not less than 300mm on both sides of the dispensing units and at least 500mm from the dispensing unit to the edge of the base measured longitudinally.



**Figure (6.7)**

30. Hose length at service station shall not exceed 5m. When not in use hose shall be secured so as to protect it from damage.
31. The nozzle through which fuel is dispensed to a vehicle shall be such that it automatically closes when the fuel tanks of the vehicles are full.
32. Individual dispensing units shall be provided with an emergency shut-off device.
33. A rigidly anchored emergency shutoff valve, incorporating a fusible link or other thermally activated device, designed to close automatically in the event of a severe impact or fire exposure shall be properly installed in the supply line at the base or inlet of each dispenser. The automatic closing feature of this valve shall be checked at the time of initial installation and at least once a year thereafter by manually tripping the hold-open linkage.
34. Remote pumping system shall apply to systems where petroleum is transferred from storage to individual or multiple dispensing units by pumps located elsewhere than at the dispensing units.
35. Pumps shall be designed or equipped so that no part of the system will be subjected to pressure above its allowable working pressure.
36. Pumps shall be located not less than 3m from the boundary or building opening.
37. Pit lid or cover for subsurface pumps or piping manifolds of submersible pumps shall be in accordance with clause 10 of this Appendix 6.

38. Attended self-service station shall be complied as follows;
- (a) All self-service stations shall have at least one attendant on duty while the station is open to the public. The attendant's primary function shall be to supervise, observe and control the dispensing of petroleum. The attendant is to be above 18 years of age formally trained in the safe handling of petroleum.
  - (b) Clear operating instructions shall be conspicuously posted at every dispenser.
  - (c) The dispensing area at all times is in clear view from the console area/cashier (area having control of the emergency shut-off devices for all and individual dispensing units including remote pumping systems).
  - (d) The console/cashier operator shall at all times be able to communicate with persons at the dispensing area. This can be by means of a voice communication system.
  - (e) Sufficient numbers of close circuit cameras are to be installed at the petroleum service station to cover the forecourt, backcourt, dispensing areas and other critical areas of the petroleum service station.
  - (f) Provisions must be made for bollards and chains to be installed at the exit and the entrance of the petroleum service station during refilling by the tank vehicle to cater during high alert situations.
  - (g) The setback distance from the edge of the roof of the dispensing area to any boundary line must be in accordance to the requirements in clause 19(C) of the Myanmar Fire Safety Code or 3m, which ever greater.



**Figure (6.8)**

39. An Emergency Information Panel shall be provided at the filling point.

40. Warning signs shall be complied as follows;
- (a) Warning signs shall be conspicuously posted at the individual dispensing area incorporating the following wordings: "WARNING -STOP ENGINE" "NO SMOKING, NO NAKED LIGHTS Within 6m". The lettering shall be clearly expressed.
  - (b) The signs shall be posted not less than 1.8m and not more than 2.5m above the ground level.
41. Approved types of fire extinguishers (having (9kg) or (2x4.5kg)) shall be provided at the individual dispensing units and protected from the weather.
42. Hose reels for the petro service station shall comply with the requirements of Chapter 7 of Myanmar Fire Safety Code.
43. A small quantity of absorbent or sand (1 full bucket minimum of 40 litres) shall be provided at the service station to mop up any spillage. These absorbent materials shall be kept in a container in a close fitting lid and shall be installed in an accessible place.
44. Fire hydrant must be within 50m from any part of the fire engine access road. The actual travel distance from the edge of the fire engine access road to the most remote point of the petroleum service station usable space must not be more than 50m.

**APPENDIX-7**  
**FIRE SAFETY REQUIREMENTS FOR HIGH CONTAINMENT FACILITY**  
**(BIO-SAFETY LEVEL 3 / 4)**

1. This appendix is intended for high containment facility or laboratory that handles biological agents or toxins, Bio-Safety Level 3 [BSL-3] or higher.
2. “High Containment Facility” refers to containment laboratory of Bio-safety Level 3 and maximum containment laboratory of Bio-safety Level 4 (It includes interstitial space, waste treatment area and anteroom etc).
3. “Anteroom” is the proceeding room leading into the BSL-3 or BSL-4 containment laboratory. This room is for showering and changing.
4. BSL-3 or BSL-4 containment laboratory shall preferably be located at the ground floor and shall be separated from areas that are open to unrestricted traffic flow within the building.
5. The word “BSL-3” or “BSL-4” shall be stated clearly in the project title and printed on the top-right corner (lettering shall be bold, in red color and at least 15mm in size) of all the fire safety plans of the high containment facility.
6. In sprinkler-protected building, the high containment facility shall be fire compartmented (it include interstitial space, waste treatment area, anteroom, etc.) from adjoining spaces with at least one-hour fire rated walls, floor and ceiling. For non-sprinkler- protected building, the fire rating shall be at least two hours.
7. The protecting structure shall be constructed of masonry or drywall. If drywall construction is used, it shall comply fully with Clauses 22(g)(ii) of Chapter 4 in Myanmar Fire Safety Code.
8. Entry to the high containment facility shall be either through a fire compartmented lobby or an anteroom having at least 1-hour fire rating. The anteroom can also be doubled up as the fireman staging lobby and both shall have a free working

space of at least 6 m<sup>2</sup> in size. This additional fireman staging lobby is only meant for BSL-3 or BSL- 4 and shall comply fully with the clauses 6(m)(ii) of Chapter 3 in Myanmar Fire Safety Code. A designated rising main landing valve, complete with standby fire hose, and fire hose reel shall be installed within the fireman staging lobby.

9. For biomedical facility or building provided with two-way emergency voice communication system, the two-way communication system shall be extended to the fireman staging lobby.

10. All high containment facilities shall be protected with sprinkler system. In a nonsprinkler- protected building, smoke detectors shall be installed along the exterior of the periphery walls of the high containment facility. The fire protection circuit for BSL-3 or BSL-4 shall be grouped in a different fire zone for ease of identification. The fire protection systems shall be linked to the building fire alarm system and if water discharge within the high containment facility is unacceptable, the sprinkler system may be replaced by an approved fire extinguishing system.

11. Caution labels shall be provided at all the laboratory entrances and exits.

12. A sign of the following wording “ In the event of fire or any water discharge, please notify to relevant department for control of contaminated water run off.” shall be displayed at all entrances to the high containment facility.



## APPENDIX-8

### FIRE SAFETY REQUIREMENTS FOR LIQUEFIED PETROLEUM GAS (LPG) CYLINDER INSTALLATIONS

1. This Fire Safety Guidelines covers outdoor and indoor LPG cylinder installations. It is intended for commercial, industrial and residential premises with eating outlets, eating places, canteens, restaurants and other eateries which use LPG for cooking purposes. It is also intended for industrial applications involving hot works.
2. All LPG cylinder installations shall be located outdoors and on the ground levels for all commercial and industrial buildings. Locating LPG cylinders indoor is normally not permitted, unless otherwise approved by the Myanmar Fire Services Department.
3. Private dwelling house is allowed to have a maximum of 30kg (2 x 15kg cylinders) to be installed or stored within the dwelling unit for domestic use. NFPA 54 and NFPA 58 shall be referred in addition to this Fire Safety Guidelines.
4. All LPG cylinders installations in commercial or industrial premises, including their manifold/piping systems, shall be approved by Myanmar Fire Services Department. LPG plans submitting for approval shall include the following items:
  - (a) Certified engineer's endorsement of LPG's storage and manifold system
  - (b) Location and site plans
  - (c) Schematic diagrams of the LPG supply system showing change-over valve, vaporizer, regulator, emergency shut-off valve, remote cut-off device, knockout pot, pipe entry and all other required safety features
  - (d) Plan and elevation views showing the following details:
    - (i) Location, quantity and capacity (in kg) of LPG cylinders
    - (ii) Locations of ancillary fixtures and fittings, e.g. vaporizer, regulators, emergency shut-off valve, change-over valves, remote cut-off device, knock-out pot, pipe entries, etc.

- (iii) Housing for the LPG cylinders, e.g. cabinets, fencing, compartment wall, etc.
  - (iv) All openings (doors, air intakes, windows, drains, manholes, etc.) and exits adjacent to the LPG installation
  - (v) Locations of hydrant, access way, access road, car parking area, building and boundary lines, source of ignition, etc.
  - (vi) Fire safety provisions, e.g. fire hose reel, fire extinguisher, sprinkler protection (if any), gas leak detector (if any), etc.
5. For LPG cylinders installation involving mechanical ventilation system and/or fire suppression system, separate Mechanical Ventilation plan and/or Fire Protection plan shall be submitted to Myanmar Fire Services Department for approval.
6. The following factors shall be taken into consideration when deciding on the practicality and reasonableness to use LPG:
- (a) Adequacy of ventilation
  - (b) Extent of usage of individual rooms
  - (c) Existing fire hazard Suitable means of escape
  - (d) Fire fighting equipment and provisions.
7. All cylinders and their ancillary fittings shall be designed, fabricated and tested in accordance with the accepted code or standard as stated in Annex A.
8. All pipes penetrating fire wall or floor slab shall be fire stopped appropriately.
9. No liquid LPG or LPG vapor at pressure exceeding 20 psi (approximately 138 kPa) shall be piped into any building.
10. The LPG installation shall be provided with at least one approved portable B:C rating dry chemical fire extinguisher having a minimum capacity of 9kg.

11. A warning sign or notice of minimum size of 800mm x 600mm shall be permanently and legibly displayed at the front of the installation. Red letterings of minimum height of 40mm which reads: "LPG / HIGHLY FLAMMABLE / NO SMOKING/NO NAKED LIGHTS" on white background shall be written on the left portion of the warning sign/notice.

12. The requirements for outdoor LPG cylinder installation shall be complied with the following standard;

- (a) LPG cylinders shall be placed on a firm, clean, dry and level base. They shall be sited at ground level and a well-ventilated area where any gas leakage can safely and rapidly disperse. They shall not be placed close to any passageways or exits.
- (b) LPG cylinders shall not be located within 3m of any fire exit route of a building having only one exit. If the 3m distance cannot be complied with, a 2-hour fire rated masonry wall shall be provided between the fire exit and the LPG installation. The masonry wall shall be at least 1.8m high.
- (c) The LPG cylinders shall be located at least 1m horizontally away from any openings (windows, doors, air vents, balanced-flue outlets, etc.) of the building having more than one exit. If the 1m distance cannot be complied, a 2-hour fire rated masonry wall must be provided between the openings and the installation so as to maintain a 1m horizontal distance. The masonry wall should be at least 1.8m high.
- (d) A minimum distance of 3m must be maintained between the edge of a vehicle parking lot.
- (e) LPG cylinders shall be located at least 5m horizontally from any mechanical air intake which is below any part of the manifold system and 1.5m from any mechanical intake which is above any part of the manifold system.

- (f) LPG cylinders may be installed below windows or openings provided that there is a minimum distance of 150mm between the top of any cylinder or the manifold system and the bottom of the windows or openings.
  - (g) LPG cylinders of total capacity up to 600kg shall be located at least 1m from any uncovered opening that is below the level of the cylinders, such as drains, pits, openings to basements, etc. For LPG cylinders having total capacity above 600kg, the distance from any uncovered opening shall be at least 3m.
  - (h) LPG cylinders shall be located at least 3m away from any boundary and any fire engine accessway.
  - (i) LPG cylinders shall be located at least 15m away from any fire hydrant.
13. The protection to LPG cylinder installation shall be complied as follows;
- (a) LPG cylinders located in places accessible to the public shall be protected and locked against tampering and accidental damage by fencing of height not less than 1.8m, a suitable housing or a cabinet made of non-combustible material.
  - (b) There shall not be any corrosive, toxic or oxidizing materials located within 6 meters from the cylinder installation.
14. The safety provisions for LPG installations shall be complied with the following standards;
- (a) For air-conditioned premises, an approved gas-leak detection system shall be provided in the area or compartment where the internal LPG pipes and fittings are installed, with a local alarm connected to a main fire alarm panel. The system shall be linked to the exhaust fan system and the emergency shut-off valve where applicable.

- (b) For kitchen provided with fixed fire suppression system, activation of the system shall automatically shut off the supply of LPG to the kitchen.
- (c) Remote Emergency shut-off valve shall be located at least 1m away from the edge of the installation. It shall be clearly marked and placed at a suitable height for easy access during emergencies. (see Annex B).
- (d) There shall be no ignition source within 3m from the cylinder installation.
- (e) All fixed electrical equipment within 3m of the installation shall be spark-proof and intrinsically safe.
- (f) Vaporizers shall be installed separately from the fire rated cabinet. Wall-mounted vaporizers shall be located at least 1.8m above the ground and 600mm away from any LPG cylinder.
- (g) The distance between two separate manifold systems shall be at least 3m. If a 2-hour fire rated wall is constructed, the distance between the two nearest cylinders may be halved.

15. LPG cylinder installation (for eating outlets) with capacity up to a maximum of 600kg by weight attached to a single manifold system installed adjacent to a building is allowed provided that the following requirements are fully complied.

- (a) maximum two numbers of steel cabinets are allowed for each installation, and each cabinet is allowed to house a maximum of 6 x 50kg LPG cylinders;
- (b) the separation distance between the two cabinets shall be at least 600mm; and
- (c) the building is of non-combustible construction and the wall has a fire rating of at least 2 hours resistance.

- (d) the maximum number of LPG manifold system shall not exceed two per building.

16. LPG cylinder installation of capacity exceeding 600kg to a maximum of 1000kg by weight attached to a single manifold system is allowed to be used for industrial applications only, provided that the following requirements are fully complied.

- (a) maximum two numbers of steel cabinets are allowed for each installation and each cabinet is allowed to house a maximum of 10 x 50kg LPG cylinders; and
- (b) a 2-hour fire rated wall or a spacing of 3m shall be provided to separate the LPG cylinders into two groups of maximum 10 x 50kg per group;

17. The requirements for indoor LPG cylinder installation shall be complied as follows;

- (a) LPG cylinder installation shall be properly located so as not to cause any obstruction to the fire escape and any danger to the public. Suitable access to the cylinder for emergency services shall be provided.
- (b) The edge of the installation shall be at least 3m from any boundary or any fire engine access way.

18. The indoor LPG installation shall have the following standards;

- (a) The area or compartment where the LPG cylinders, pipes works and ancillary fittings are installed should be sprinkler protected. If sprinkler system is not provided or the premises is air-conditioned, an approved gas leak detector system shall be provided in that compartment, kitchen and dining area, with a local alarm connected to a main fire alarm panel. The leak detector should link to the exhaust fan control panel and the emergency shut-off valve where applicable. (see Annex A)

- (b) The location of the gas leak detector should preferably be not more than 30cm above the ground level and not more than 4m away from the edge of the installation and the point of consumption.
- (c) Remote Emergency shut -off valve shall not be installed inside the compartment and be at least 1.5m away from the edge of the installation. It shall be clearly marked and at a suitable height to access during emergencies.
- (d) Fixed fire suppression system, if installed, shall be linked to the LPG cylinder installation in such a way that activation of the system shall automatically shut off the supply of LPG to the kitchen.
- (e) Vaporizers (where applicable) shall not be installed inside the compartment or within the same housing of the LPG cylinders.
- (f) The compartment shall only be used for LPG cylinder installation. No other usage is allowed.
- (g) The floor of the compartment shall be a smooth concrete base (rough surface might cause sparking during loading / unloading of cylinders) containing no opening or drain where vapor may accumulate and shall be level or slope down towards the ventilated external wall.
- (h) A ramp or sill of 250mm high shall be provided across the doorway (where applicable) into the compartment where LPG cylinders are installed to contain any heavy LPG vapor within the compartment.
- (i) All electrical connections and appliances shall be installed in accordance with Chapter 6 of Myanmar Fire Safety Code.

19. LPG cylinders are allowed to be installed in a separate compartment on the ground floor, provided with the following requirements are complied with:

- (a) Allowable Quantity

- (i) A maximum of 400kg of LPG is allowed to be installed using a single manifold system inside a compartment. The quantity of cylinder is restricted to 8, irregardless of the capacity of each cylinder (e.g. 2 groups of 4 x 50kg cylinders or 2 groups of 4 x 15kg cylinders).
  - (ii) The area or compartment in which the LPG cylinders are installed shall be sprinkler protected. If the compartment is not sprinkler protected, the quantity of LPG shall be halved (i.e. 200kg).
  - (iii) For commercial premises, the maximum number of LPG manifold system shall not exceed two per building.
- (b) Compartment
- (i) The compartment shall have at least one external wall and there shall be no access from the compartment into the building.
  - (ii) Walls common to the compartment and the internal spaces of the building shall be 2-hour fire rated and shall be of masonry construction.
  - (iii) Each compartment shall contain only one number LPG manifold system.
- (c) Ventilation
- (i) Doors shall have high and low level louvres and shall be opened outwards.
  - (ii) Natural ventilation is allowed if the total length of the compartment external wall is not less than 6m and the distance between the external wall and its opposite wall is not more than 3m. Otherwise, mechanical ventilation shall be provided.



- (iii) High and low vents shall be provided on the external wall at just below ceiling level and above floor level. The total free area of the vents provided shall be at least  $300 \text{ cm}^2/\text{m}^2$  of floor area.
- (iv) The vent openings shall be kept free from obstruction and shall not discharge directly onto a public place, e.g. a pavement or path. It shall not be less than 5m from any air intake openings and shall be at least 1.5m horizontally away from any building opening which is below the vent opening level.
- (v) Where mechanical ventilation is used, air circulation shall be at least  $0.3 \text{ m}^3/\text{min.m}^2$  of floor area. Discharge outlets shall be at least 1.5m horizontally away from any building opening which is located below the discharge level.

20. Building recess used for housing LPG cylinder installation shall comply with the following requirements:

(a) Design

- (i) The maximum depth of the recess shall be not more than 1m deep.
- (ii) The floor, ceiling and the dividing walls between the recess and the internal spaces of the building shall be brick or concrete, noncombustible and shall have a fire resistant rating of not less than 2 hours.
- (iii) Access to the recess shall only be from the external of the building.

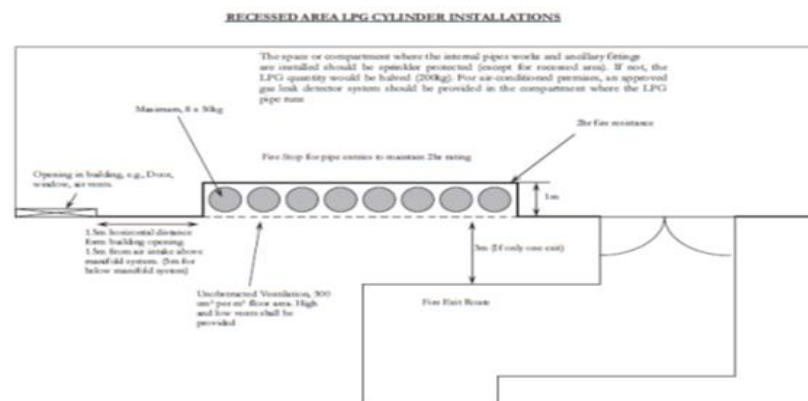
(b) Location

- (i) The recess shall be at ground-floor level and shall be for the exclusive use of housing LPG cylinders.

- (ii) The recess shall not be located within 3m of any fire exit route from a building that has only one designated means of exit. If the 3m distance cannot be complied with, a 2-hour fire rated masonry wall shall be provided between the fire exit and the installation so as to achieve the 3m horizontal distance.
  - (iii) The recess shall be located at least 1.5m from any horizontal openings (windows, doors, air vents, balanced-flue outlets, etc.) of the building having more than one designated means of escape, measured horizontally from the nearest LPG cylinder. If the 1.5m distance cannot be complied with, a 2-hour fire rated masonry wall shall be provided between the openings and the installation so as to achieve the 1.5m horizontal distance.
  - (iv) The recess shall be located at least 3m from ignition source.
  - (v) A minimum distance of 3m horizontal distance must be maintained between the nearest edge of a vehicle parking lot to the recessed area.
  - (vi) LPG cylinders shall be located at least 5m horizontally from any mechanical air intake which is below any part of the manifold system and 1.5m from any mechanical intake which is above any part of the manifold system.
- c. Allowable Quantity
- (i) A maximum of 400kg of LPG is allowed to be installed using a single manifold system inside the recessed area. The quantity of cylinder is restricted to 8, regardless of the capacity of each cylinder (e.g. 2 groups of 4 x 50kg cylinders or 2 groups of 4 x 15kg cylinders).

- (ii) The space or compartment where the pipes works and ancillary fittings are installed should be sprinkler protected (except for the recessed area). If not, the LPG quantity would be halved (200kg).
  - (iii) For commercial premises, the maximum number of LPG manifold system shall not exceed two per building.
- (d) Safety
- (i) Any pipe penetration on the walls of the recess area shall be suitably fire stopped to maintain the 2-hour fire resistance of the walls.
  - (ii) For air-conditioned premises, an approved gas leak detector system shall be provided in the compartment where the LPG pipes pass through, with a local alarm connected to a main fire alarm panel. The gas leak detector shall be linked to the exhaust fan control panel and the emergency shut-off valve where applicable.
- (e) Ventilation

Permanent unobstructed high and low ventilation openings, not less than 300cm<sup>2</sup>/m<sup>2</sup> of recess floor area, shall be provided for venting the recess space to the external of the building.



**Figure (8.1) Recessed Area LPG Cylinder Installations**

**ANNEX A****STANDARDS AND SPECIFICATIONS FOR LPG CYLINDER INSTALLATIONS****1. STANDARDS**

The following standards for LPG cylinders and ancillary fittings shall be complied with:

<b>S/N</b>	<b>ITEM</b>		<b>STANDARDS</b>	<b>PLSLISTING</b>
1	Cylinder		SS 99	Yes
2	Cylinder	(a)Flexible Hose	SS 233	Yes
	Fittings	(b)Regulator	SS 281, BS 3016, UL144	Yes
		(c)Cylinder valve	SS 294	Yes
3	Gas Leak Detector		BS EN 50054, BS EN 50057 and BS 5345 Part 1 and 3	Yes

Note:

- (a) SS 99 – Specifications for welded low carbon steel cylinders for storage and transportation of low-pressure liquefiable gases.
- (b) SS 233 – Specifications for flexible rubber tubing for use in domestic and commercial appliance
- (c) SS 281 – Specifications for pressure regulators for liquefied petroleum gases
- (d) BS 3016 – Specifications for pressure regulators and automatic changeover devices for LPG

- (e) SS 294 – Specifications for valves for use with domestic and industrial Liquefied Petroleum Gas (LPG) cylinders
- (f) BS 5345 Pt 1 & 3 – The Code of Practice for Selection, Installation and Maintenance of Electrical Apparatus for use in Potentially Explosive Atmospheres

## **2. SPECIFICATIONS ( Flexible hoses )**

Hoses or flexible connectors used to supply LPG to utilization equipment or appliances shall be installed in accordance with the relevant clauses of NFPA 54 and NFPA 58. The hose shall be securely connected to the appliance. The use of rubber slip ends without hose clips shall not be permitted for domestic cylinders.

## **3. Over Pressure Protection Device**

- (a) An over pressure protection device (OPD) is a device to protect the downstream installation and shut off the gas flow if the outlet pressure exceeds the set limit.
- (b) In general, a regulator with OPD shall be designed to achieve the following:
  - (i) ensuring reliable and continuous supply of LPG;
  - (ii) protecting downstream system against over pressure; and
  - (iii) protecting against failure of any regulating device.
- (c) Setting of OPD shall not be more than 30% of maximum operating pressure.

## **4. Valves**

- (a) Cylinder valves shall comply with the standards as specified in the SS294.

- (b) Hydrostatic relief valves designed to relieve the hydrostatic pressure that might develop in sections of liquid piping between two isolating valves shall be installed in each section. Hydrostatic valves shall comply with UL.
- (c) Emergency shut-off valve (ESV) shall be provided after the knockout pot. The ESV shall be linked to a release mechanism so that the valve can be closed from a safe distance of at least 3m from the LPG cylinders. The ESV may incorporate fusible element which melts at not more than 250 degree Celsius when exposed to fire, allowing the ESV to close by itself.
- (d) An accessible gas shut off valve shall be provided at the upstream of each gas pressure regulator. Where two gas pressure regulators are installed in series in a single gas line.
- (e) Main gas shut-off valves controlling several gas piping systems shall be prominent and readily accessible for operation and properly installed so as to protect it from physical damage. They shall be marked with a metal tag or other permanent means attached by the installing agency so that the gas piping systems supplied through them can be readily identified.
- (f) An exterior shut-off valve to permit turning off the gas supply to each building in an emergency shall be provided and plainly marked.

## **5. Piping**

- (a) Pipe design and specifications shall be in accordance with the relevant clauses in NFPA 54 and NFPA 58. No polyethylene material is allowed to be used for the piping system except for necessary industrial applications.
- (b) Pipe material shall be tested and certified according to recognized ASTM or British Standard. The pipe supplier shall produce Mill certificates.
- (c) The manifold and main LPG supply pipeline shall be welded together as far as practicable.

- (d) Pipelines pressure test must be witnessed and certified by a Professional Engineer (Mechanical).
- (e) The liquid LPG pipelines shall be painted in “Blue” and the vapor LPG pipelines in “Yellow” with the marking of the word “LP-Gas” at intervals of not more than 3m.
- (f) When connecting additional gas utilization equipment to a gas piping system, the existing piping shall be checked to determine if it has adequate capacity. If inadequate, the existing system shall be enlarged as required, or separate gas equipment of adequate capacity shall be provided.

## **6. Pigtail**

- (a) Pigtail shall include a 6mm flexible hose or tube, a 6mm tee-check valve or excess flow valve and a 6mm ball valve.
- (b) Flexible hose shall be fabricated of materials resistant to LPG reaction both in liquid and vapor state. It shall be designed for a minimum bursting pressure of 1,750 Psi (121 bar) and working pressure of 350 PSI (24 bar). The hose shall be marked “LPG” at intervals of not more than 3m.
- (c) The tee-check valve shall be Underwriters Laboratories Inc. (UL) listed or it shall comply with other recognized/approved standard.
- (d) The ball valve shall be rated to at least 600 PSI (41 bar).

## **7. The installation of pressure gauge shall be as follows;**

- (a) Each bank of LPG cylinder manifold shall have a pressure gauge.
- (b) For high-pressure section, the gauge shall have a range of 0 to 300 Psi (0 to 20.1 bar)

- (c) For low-pressure section, the gauge shall have a range of 0 to 50 Psi (0 to 3.45 bar).

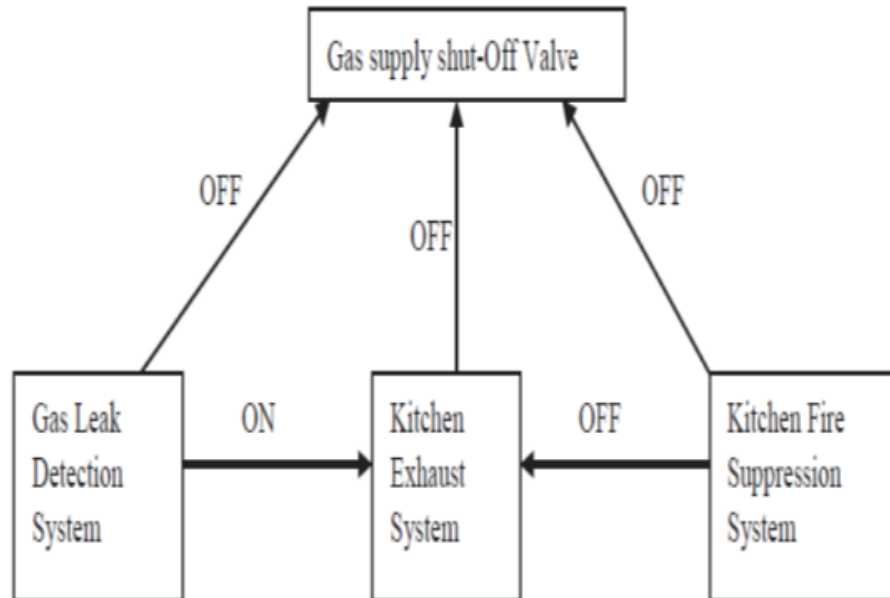
**8. The installation of vaporizer shall be as follows;**

- (a) Vaporizers, where applicable, shall be constructed in accordance with the applicable provision of NFPA 58, ASME Code or other recognized pressure vessel codes and standards for a design pressure of 250 PSI (17.24 bar) and shall be permanently and legibly marked with:
    - (i) markings required by the Code;
    - (ii) the allowable working pressure and temperature for which it is designed; and
    - (iii) the name or symbol of the manufacturer.
  - (b) Vaporizers shall be provided with a suitable automatic means to prevent the passage of liquid through the vaporizer to the vapor discharge piping. This feature shall be permitted to be integrated with the vaporizer or otherwise provided in the external piping.
  - (c) Vaporizers shall have a manual shut-off valve and an automated valve (e.g. thermostatic, magnetic or float) which closes in the event of power failure or overload.
  - (d) Vaporizers shall have relevant temperature control and the necessary safety features.
  - (e) Vaporizers shall have a pressure relief valve set at 250 PSI (17.24 bar) with the release point directed upward.
9. The knockout pot shall have at least two drain valves.
10. The installation of gas meters shall be as follows;



- (a) Installation and application of gas meters shall be in accordance with the relevant clauses in NFPA 54 and must be able to take a pressure of 20 PSI (1 PSI = 6.895 KPa).
- (b) Gas meters shall be selected for the maximum expected pressure and permissible pressure drop.
- (c) Vapour meters of the tin or brass case type of soldered construction shall not be used at pressure in excess of 1 Psi (7 KPa).
- (d) Vapour meters of the die cast or iron case type shall be permitted to be used at any pressure equal to or less than the working pressure for which they are designed and marked.
- (e) Gas meters shall be located in ventilated spaces readily accessible for examination, reading, replacement or necessary maintenance.
- (f) Gas meters shall not be placed where they will be subjected to damage, such as adjacent to a driveway, under a fire escape, in public passages, halls or where they will be subjected to excessive corrosion or vibration.
- (g) Gas meters shall be located at least 1m from sources of ignition.
- (h) Gas meters shall not be located where they will be subjected to extreme temperatures or sudden extreme changes in temperature. Meters shall not be located in areas where they are subjected to temperatures beyond those recommended by the manufacturer.
- (i) Gas meters shall be supported or connected to rigid piping so as not to exert a strain on the meters.
- (j) Gas meters shall be protected against over pressure, backpressure, and vacuum, where such conditions are anticipated.

11. Strainers shall be designed to minimize the possibility of particulate materials clogging lines and damaging meters or regulators. The strainer element shall be accessible for cleaning.
12. The electrical bonding and grounding shall be as follows;
  - (a) Electrical circuits shall not utilize gas piping or components as conductors.
  - (b) All electrical connections between wiring and electrically operated control devices in a piping system shall conform to the requirements of SS 254.
  - (c) Any essential safety control (in the vaporizer) depending on electrical current as the operating medium shall be of a type that will shut off (fail safe) the flow of gas in the event of current failure.
13. The gas leak detection shall be complied with the following standards;
  - (a) Gas leak detection system shall be provided for LPG pipes running in air conditioned areas (including the dining & kitchen area) or within basement floor).
  - (b) Gas leak detectors shall be connected to a localized alert alarm, emergency shut-off valve as well as the kitchen exhaust systems. The gas supply safety shut-off valve system shall also be interlocking with the kitchen automatic fire suppression system (see figure below).



- (c) LPG pipe installation shall not be permitted in the following areas:
- (i) in the ground under concrete flooring within building
  - (ii) under building foundations
  - (iii) within lift shafts and cavity walls
  - (iv) in compartments or ducts dedicated for electrical switchgears, transformers or generators
  - (v) in refrigeration chambers, cold rooms, air handling rooms and ventilation or air-conditioning ducts
  - (vi) adjacent to pipes and vessels containing flammable, oxidizing, corrosive and other hazardous materials
  - (vii) in fire-fighting lobby, fire command centers, smoke stop lobbies, fire pump rooms, fire-fighting water tank rooms, sprinkler control valve rooms, firefighting riser ducts, areas of refuge, protected corridors, protected staircases, bedrooms and other occupied area etc.

- (d) Proper metal pipe sleeves shall be installed for the gas pipes running in enclosed, unventilated areas or basement floor, and at last one end exposed directly to the exterior open safe space.
  - (e) Gas pipe running vertically shall be enclosed within a protected riser shaft & be fully fire separated from other M&E risers. Ventilation opening shall be provided for such gas riser
14. The following list of Items shall be included in the plan submission;
- (a) Endorsement on this guideline, NFPA 58, NFPA 54, other relevant and approved standards by Myanmar Fire Services Department and Myanmar Fire Safety Code.
  - (b) Location and site plan associated with the LPG installation.
  - (c) Detailed plan and elevation views associated with the LPG installation showing the following:
    - (i) Location and number of cylinders as well as quantity in kilograms.
    - (ii) Housing for the LPG cylinders, e.g. cabinets, fencing.
    - (iii) Location of ancillary fittings, e.g. vaporizer, 1st stage regulator, emergency shut off valves, change over valve, remote cable pull, knock out pot and pipe entry.
    - (iv) Hydrant location, fire engine access way, source of ignition, boundary line, building line, internal roads and parking area.
    - (v) Location of exits, staircases, details of horizontal openings (e.g. doors, air intakes and windows) and ground openings (e.g. drains, manholes and entrance to basement).
    - (vi) Fire safety provisions like, hose reel, fire extinguishers, indication of sprinkler protection, gas leak detectors, mechanical ventilation,

exhaust systems and fire suppression systems, where applicable.

(Fire Protection Plan and Mechanical Ventilation Plan shall be

submitted accordingly in addition to the Building Plan submission.)

### VARIOUS DISTANCES FOR OUTDOOR LPG INSTALLATIONS

LPG quantity	Distance from boundary	No. of cabinet per manifold	No. of cylinder per cabinet/cluster	No. of cylinders per manifold	Distance between cabinet/cluster	Distance from drains, pit, manhole, oil tank bund wall, basement opening etc.	Distance from fire exit route	Horizontal distance from windows, doors, vents, balance flue outlets, etc.	Distance from mechanical air intake	Distance between manifold systems	Distance from vehicle parking lot
kg	m	No.	No.	No.	m	m	m	m	m	m	m
Not more than 600kg	3 min.	2 max.	6 max.	12 max.	0.6 min.	1.5 min.	3 min. (one exit Only)  1.5 min. (more than one exit)	1.5 min.	5 min (intakes below manifold system)  1.5 min. (intakes above manifold system)	3 min. (no fire rated wall)  1.5 min. (with 2-hr fire rated wall)	3.0 min.
S600kg to 1000kg (Industrial applications only)	3 min.	2 max.	10 max.	20 max.	3m min. or 2-hr fire rated wall	2 min.	3 min. (one exit Only)  1.5 min. (more than one exit)	1.5 min.	5 min (intakes below manifold system)  1.5 min. (intakes above manifold system)	6 min. (no fire rated wall)  1.5 min. (with 2-hr fire rated wall)	3.0 min.

### TECHNICAL DETAILS FOR INDOOR LPG INSTALLATIONS

Location of LPG	Quantity Allowed	Fire rating of compartment	Distance from Open flame, ignition source	Sprinkler / Gas Leak detector	Natural Ventilation	Mechanical Ventilation	Distance from exits	Min. Dist. Of discharge from mech. air intake
	kg	hr	m			m <sup>3</sup> / min	m	m
Separate Compartment	400 max. (8 x 50kg or 8 x 15 kg) Maximum 8	2	Not applicable	Sprinkler required else only max. 200 kg of LPG is allowed	a) 300cm <sup>2</sup> opening per m <sup>2</sup> of compartment	0.3 Per meter square of compartment	1.5	1.5 min. (intakes above manifold system)  5 min.

Location of LPG	Quantity Allowed	Fire rating of compartment	Distance from Open flame, ignition source	Sprinkler / Gas Leak detector	Natural Ventilation	Mechanical Ventilation	Distance from exits	Min. Dist. Of discharge from mech. air intake
	cylinders			If no sprinkler or if air-conditioned, gas leak detector is required	floor area b) high and low vents shall be provided c) min. length of external wall: 6m	mechanical floor area		(intakes below manifold system)
Recessed Area	400 max. (8 x 50kg or 8 x 15 kg) Maximum 8 cylinders	2	3	Sprinkler required (excluding recessed area) else only max. 200kg of LPG is allowed If no sprinkler or if air-conditioned, gas leak detector is required (excluding recessed area)	a) 300cm <sup>2</sup> opening per m <sup>2</sup> of compartment floor area b) high and low vents shall be provided	Not applicable	3m if only one exit, otherwise 1.5m	1.5 min. (intakes above manifold system) 5 min. (intakes below manifold system)

15. The conditions for indoor storage/use of LPG in eating outlets shall be as follows;

(a) Definition

Eating outlet, shop unit/units operated as food outlet, food court, eating place, restaurant, hawker centre or coffee shop Food stall, stall operated by independent operator within an eating outlet

(b) General Requirements

All eating outlets shall not use or store LPG cylinders within building unless the following conditions are fulfilled:

- (i) The eating outlet is located on or above ground level;
- (ii) It shall be naturally ventilated;

(c) Allowable Quantity

- (i) The maximum allowable quantity of LPG shall be limited to 2 x 15kg cylinders (including standby cylinder) per food stall; and

- (ii) The total capacity for each eating outlet shall not be more than 200 kg.
- (d) Fire Safety Requirements
- (i) The eating outlet shall be separated by fire-resistant walls (1-hour fire resisting for sprinkler protected building and 2-hour for non-sprinkler protected building) from other areas.
  - (ii) Stalls within food court or coffee-shop shall be separated from each other with 1-hour fire-resisting side-walls.
  - (iii) Each cylinder shall be connected to cooking hob/stove with flexible hose. The LPG cylinders shall not be connected together with manifold system.
- (e) LPG Cabinet
- (i) LPG cylinders shall be housed in a 2.5mm thick steel cabinet. There shall be not more than 2 x 15 kg cylinders in each cabinet.
  - (ii) The cabinet shall be placed directly on a firm floor.
  - (iii) The cabinet shall be adequately ventilated with openings at the bottom of the cabinet.
  - (iv) The cabinet should always be kept free of any combustible materials.
- (f) Gas-Leak Detection System
- (i) Gas-leak detection system (approved by recognized certifying bodies, e.g. PSB, UL or FM) shall be provided (be supplied directly from the building electrical power supply). The system shall be linked to shut off the LPG supply automatically and activate local alert alarm. The gas-leak detector shall be located at low level and

near to the possible leak areas such as the connecting hoses, LPG cylinder cabinets, etc.

(ii) If kitchen automatic fire suppression system is provided, it shall also be linked to shut-off the LPG supply automatically.

(g) Plan Approval

(i) Plan submission is not necessary unless the system is linked to the kitchen automatic fire suppression system. However, the LPG supplier/dealer and the user shall be responsible to ensure that the LPG installation is carried out by a competent person.

(ii) To facilitate the storage/use of 15kg LPG cylinders within building, the above-mentioned conditions and shall be observed strictly by all parties including the gas supplier, dealer, user and Fire Safety Manager(FSM).

(iii) The eating outlet or food stall operator together with the gas supplier/dealer are responsible to ensure that the automatically shut off system is well maintained and that the gas leak detection system is checked and calibrated periodically basing on the manufacturing recommendation by a competent person.

(iv) The building's Fire Certificate inspection programme shall include the "automatic detection and shut off system".



## **APPENDIX-9**

### **FIRE SAFETY REQUIREMENTS FOR TEMPORARY WORKERS' QUARTERS IN UNCOMPLETED PERMANENT BUILDINGS ON CONSTRUCTION SITES**

1. This Code comprises the design, construction, installation and maintenance of temporary workers' quarters in uncompleted buildings on construction sites.
2. This MFSC shall not be applicable if the aggregate number of workers housed in the temporary workers' quarters on the construction site is not more than 40.
3. The temporary workers' quarters shall be located within the boundary of the construction site.
4. The temporary workers' quarters shall not be located higher than 10m above the access road level of the uncompleted building and shall not be lower than second basement level.
5. The temporary workers' quarters shall only be used for housing workers working within the construction site.
6. The accommodation period for the temporary workers' quarters shall be up to the time before Temporary Occupation Permit (TOP) application from the Ministry of Construction Authority (BCA).
7. The submission of fire safety plans for temporary workers' quarters in uncompleted permanent buildings on construction sites shall be as follows:
  - (a) The main contractor of the project shall engage a Qualified Person(s) to design and supervise the erection of the temporary workers' quarter(s).
  - (b) The Qualified Person(s) shall submit fire safety plans for the proposed temporary workers' quarters to MFSD for approval prior to the commencement of the fire safety works. Upon completion, the QP shall inspect the fire safety works.

8. The occupant load and exit provisions for temporary workers' quarters shall be complied with the following standards:

- (a) The occupant load shall be based on the floor area of the temporary workers' quarters on the basis of 3m<sup>2</sup> per person, excluding non-simultaneous areas such as toilets, kitchens etc., or the actual number of occupants for which each occupied space of the floor is designed as shown on the plan, whichever is greater.
- (b) The travel distance, measured from the most remote point of the quarters to the nearest exit staircase or other exits, shall not exceed the maximum travel distance permitted under Table 9.1 below.

**Table (9.1) Travel Distances**

Max Travel Distance (m) (One-way travel)		Max Travel Distance (m) (Two-way escape)	
Unsprinklered	Sprinklered	Unsprinklered	Sprinklered
15	30	45	75

- (c) Every storey shall be provided with exit facilities for its occupant load. Only those exits designated for escape of the workers shall be included in the exit capacity calculations.

9. The compartmentation for temporary workers' quarters shall be complied with the following standards:

- (a) Only non-combustible materials shall be used for the construction of temporary workers' quarters.
- (b) Compartment wall of having fire resistance rating of at least 1 hour shall be provided to separate the bedrooms so as to limit each compartment size to a maximum of 120m<sup>2</sup>.
- (c) The worker bedrooms shall be separated from the internal corridor and external corridor by a wall having fire resistance rating of at least 1 hour

and doors opening into the internal corridor having fire resistance rating of at least half an hour.

- (d) Cooking is only allowed at a designated kitchen area, including basement(s). Such kitchen, unless having adequate setback from the temporary workers' quarters, shall be enclosed with minimum 1-hour fire-rated compartment wall and ½-hour fire rated door.
  - (e) Office and storage are allowed in the basement(s) where the temporary workers' quarters are located. They shall be compartmented from the accommodation areas with minimum 1-hour fire-rated compartment wall and ½-hour fire rated door.
  - (f) Hot work is not allowed in the basement(s) where the temporary workers' quarters are located.
10. The exit staircase for temporary workers' quarters shall be as follows:
- (a) For above ground levels, provision of only one exit staircase is permitted provided that the one-way travel distance stipulated in Table 9.1 above is complied with. The exit staircase shall discharge directly to exterior open space.
  - (b) At least two independent exit staircases shall be provided for the temporary workers' quarters located in basement levels.
11. Emergency lightings and exit signs serving the temporary workers' quarters shall comply with the requirements stipulated in the Myanmar Fire Safety Code.
12. The dry/wet riser system shall be as follows;
- (a) Where dry riser system is required for the main development, they shall be commissioned and made operable for the storeys housing the temporary workers' quarters during the accommodation period. Wet riser system is not necessary for the sole purpose of such temporary workers' quarters during the accommodation period.
  - (b) Standby fire hoses can be installed in lieu of the dry riser system, on condition that the temporary workers' quarters are adequately covered by fire hose reel(s).

13. Provision of fire engine access road shall be provided in accordance with the requirements for the development. Only the portion of the fire engine access road serving the temporary workers' quarters shall be made available.
14. Every part of the required fire engine access road shall be within an unobstructed distance of 50m from the nearest working fire hydrant. Where the remotest temporary workers' quarter is located not more than 100m away from the site entrance at the public road, provision of working private fire hydrant is exempted.
15. Provision of fire extinguishers and fire hose reels shall comply with the requirements stipulated in Myanmar Fire Safety Code.
16. The fire protection systems shall be complied as follows;
  - (a) Temporary workers' quarters located in basement(s) shall be protected by an automatic sprinkler system, irrespective of compartment size. Provision of automatic sprinkler system is exempted if the basement(s) is effectively cross ventilated to avoid smoke logging conditions.
  - (b) Effective cross-ventilation shall be achieved by means of evenly distributed vertical openings along the perimeter walls and evenly distributed voids over the basement(s) in such manner that:
    - (i) no point within the basement(s) is more than 12m from any vertical opening or void for spaces that are in between two openings or voids;
    - (ii) no point shall be more than 6m from any opening or void for spaces that are ventilated by such opening or void on only one side; and
    - (iii) such vertical openings shall be at least 600 mm in height.
  - (c) The total aggregate area of these voids and vertical openings shall also be not less than 20% of the total basement floor area.
  - (d) Automatic fire alarm system shall be provided if provision of automatic fire sprinkler system is exempted for the temporary workers' quarters located in the basement(s).
  - (e) For temporary workers' quarters located above ground level, manual alarm system shall be provided.
17. The engineered smoke control system shall be as follows;
  - (a) Engineered smoke control system shall be required for the basement levels where the workers' quarters are located, if the provision of cross ventilation stipulated in Clause 16 cannot be fulfilled.

- (b) Requirements in Clause 16 (except clause 16(d)) and Clause 17 are exempted if the occupant load of the temporary workers' quarters at the basement level is computed basing on 6m<sup>2</sup> per person, instead of the 3m<sup>2</sup> per person specified in clause 8.
18. The secondary source of power supply shall have the following standards;
- (a) Secondary source of power supply shall be provided for all firefighting systems serving the temporary workers' quarters.
  - (b) The location, arrangement, control and installation of electrical wiring of the secondary source of power supply, be it in the form of battery, standby generator, inverter or other accepted equipment, shall comply with the requirements stipulated in the Fire Code.
  - (c) The secondary source of power supply shall be sufficient to last for a minimum duration of 2 hours.
19. The storage of hazardous materials for temporary workers' quarters shall be as follows;
- (a) All stores of highly flammable substances shall be sited in open space at a minimum distance of 5m away from the building where the temporary workers' quarter is located.
  - (b) All LPG cylinder installations serving the temporary workers' quarters shall comply with the Myanmar Fire Safety Code.
20. All temporary workers' quarters shall be maintained in good conditions and they shall not be allowed to deteriorate into a slum-like condition through unauthorized extensions and overcrowding. Unwanted articles shall not be stored in and around the temporary workers' quarters. All exits, escape routes and passageways shall be kept free of obstruction at all times.

## APPENDIX-10

### DUCTLESS JET FANS SYSTEM IN CAR PARKS

1. The objectives of this appendix are to relief heat and smoke from the car park in the event of fire and to assist fire-fighters in locating and attacking the fire safely.
2. This set of requirements is only applicable to conventional car parks where passenger cars/light weight vehicles are parked alongside each other with common driveways and is not intended for mechanized car park system or other forms of car parking systems.
3. The basement car park shall be sprinkler protected in accordance with the Chapter 7 of the Myanmar Fire Safety Code. The arrangement of the sprinkler heads and the jet fans shall be such that, upon the operation of the jet fans, the effect on the spray pattern of the sprinklers is minimized.
4. The zoning of car park shall be complied as follow;
  - (a) The car park space shall be divided into smoke control zones with each zone not larger than 2000m<sup>2</sup> (excluding plant rooms and circulation spaces) for purpose of smoke containment and faster location of fire.
  - (b) Each smoke control zone shall have its own jet fans system (fresh air fans, exhaust air fans and jet fans) to purge smoke from the affected zone. Sharing of the fresh air and exhaust air fans is permitted provided the fans, wiring and control panel are protected with at least 1-hr fire resistance rating. The exhaust fan system shall also be designed to run in at least two parts, such that the total exhaust capacity does not fall below 100% of the required rate of extract for the zones affected in the event of failure of any one part.. This requirement is also applicable for mechanized supply fan system, if it is used.

5. The jet fans system shall be activated by the sprinkler system serving the basement car park level and any other areas located within the same level. The activation of the jet fans system shall at least be confined to the smoke control zone on fire and all its adjacent zones. A fireman cut off and activation (override) switch shall be provided at the Fire Command Centre. As an alternative form of fans activation, the use of smoke detectors to activate the jet fans system is allowed based on the following conditions:

- (a) The detectors are positioned at the effective mid-range of the jet fan profile.
- (b) In-duct smoke detector is located at the start point of the exhaust duct.
- (c) Jet fans system is only operated upon activation of 2 smoke detectors. This is to minimize any false alarm.

6. The jet fans system shall be provided with a secondary source of power supply through automatic operation of an emergency generator in case of failure of the primary power supply source.

7. The jet fans shall be distributed at a spacing of  $2/3$  of the tested effective range of the particular jet fan. The tested effective range of the jet fan shall be taken as the distance up to the point at 0.2m/s of the air-velocity distribution profile.

8. The minimum headroom for the installation of the jet fans system is 3m.

9. The interaction of the various components of the jet fans system shall be in the following manner:

- (a) Each group of exhaust fans for each smoke control zone shall be interlocked with its corresponding groups of jet fans for that zone.
- (b) If the group of exhaust fans stops/fails in any smoke control zone, its corresponding groups of jet fans in that zone shall stop. But if any of the

exhaust fan is still in operation in a particular smoke control zone, all the jet fans shall continue to operate in that zone.

- (c) The exhaust fan shall continue to run even if any corresponding group of jet fans fails.
- (d) The other groups of jet fans shall continue to run even if any one group of jet fans fails.
- (e) If the fire alarm signal is isolated, the exhaust fans and jet fans shall continue to run at high speed. If the fireman stops the fans and restart them, both the exhaust fans and jet fans shall continue to run at high speed. This continues to be so until the fans are reset to low speed at the field control panel.

10. The jet fans system shall be independent of any systems serving other parts of the building.

11. The jet fans system design shall be such that the bulk air velocity induced by the jet fans is sufficient to stop the advance of the ceiling jet within 5m from the fire location in the direction opposite to the induced bulk air flow.

12. There shall be at least one viable approach route for the firefighters to any possible fire location up to a distance of 5m from that fire. As such, information as to the viable approach route should be displayed at the main fire alarm panel. Upon detection of the fire within a particular smoke control zone/sprinkler zone, reference can be made to the display showing the viable approach route for that particular smoke control zone.

13. The Medium Voltage sub-panel in each smoke control zone is to be connected to the main Medium Voltage panel, such that any isolation of jet fans system at a particular zone is automatically displayed at the main MV panel.



14. The car park main MV panel at FCC and remote local panel are required to show the status lights of the fan speeds (i.e. low and high speeds) for the supply and exhaust fans. The panels are also required to have the individual group of jet fans indication lights interlocked with the main exhaust fans in the respective smoke control zones.
15. In the event of failure of the primary source of power supply and subsequent operation of the secondary power supply, the mode of operation of the jet fans system during the fire mode shall follow that prior to the failure of the primary power supply.
16. The jet fans system design shall take into consideration the presence of any down stand beams and other obstruction that are of depths of more than 1/10 of the car park floor to ceiling height so as to account for any resistance to airflow and turbulence.
17. The movement of smoke towards the extract point(s) should not adversely affect the means of escape and cause smoke to be blown into the lobby area or exit staircases.
18. The operation of the jet fans system should be such that there are no stagnant areas where smoke can accumulate in the event of fire.
19. The operation of the jet fans system should not cause the volume of air movement to be greater than that volume extracted by the main exhaust fans.
20. Wiring arrangement of jet fans shall be complied with the following standards;
  - (a) All jet fans shall be connected to the local jet fan control panel in groups of not more than 3 jet fans.
  - (b) Each group will be connected by fire rated cabling.
  - (c) Each group of jet fans will be protected by a MCB (main circuit breaker). As each group of 3 jet fans is protected by a MCB, this MCB will trip before

affecting the main MCB at the incoming power supply in the event of an overload.

- (d) The incoming power supply for the jet fan panel shall comply with the Myanmar Fire Safety Code. Should there be a fault with 1 jet fan, it will trip the MCB of the group only; it will not trip the main RCB protecting the other groups.
- (e) The jet fans shall also be wired in a zigzag configuration and no two consecutive jet fans in a straight line is to be wired as the same group. Should 1 group of jet fans, all other groups shall still continue to run.
- (f) The location of the local control panel for the operation of the jet fans within each zone shall be in a relatively safe area within the zone and be spaced as least 5m apart from the local control panels of adjacent zones.

21. Provision of supply air shall be complied with as follow;

- (a) Supply air to the car park can be provided via mechanized supply air fans or by permanent openings of at least 2.5% of the floor area. Whether supply air is provided via permanent openings or by mechanized supply fans, the maximum inlet air speed should be 2m/s to prevent recirculation of smoke.
- (b) The air velocity within escape routes and ramps shall not exceed 5m/s to prevent escapees from being hindered by the air flow.
- (c) The replacement air intakes shall face away from any smoke exhaust points and sited at least 5m apart so as to prevent recirculation of smoke. If the supply and exhaust louvres are located on the same building façade, they shall also be separated at least 5m apart.

- (d) The replacement air intake should also be located on the opposing end of the smoke exhaust points so that there is no opposing flow between the supply air and the smoke that is drawn towards the exhaust fan.

22. Exhaust fan design shall be comply with as follow;

- (a) The car park shall be provided with at least 12 air-change per hour during fire condition.
- (b) The capacity of the exhaust fan and any associated ducting should be calculated on the basis that the pressure in the car park close to the extract points is equal to the external atmospheric pressure.
- (c) Each smoke control zone of the car park shall have its own exhaust fan system. The exhaust fan system in each zone should be designed to run in at least two parts, such that the total exhaust capacity does not fall below 50% of the required rate of extract in the event of failure of any one part and that a fault or failure of the exhaust fan system in one zone will not affect the operation of the exhaust fan system in the other zones.
- (d) The smoke discharge points should be located such that the smoke extracted from the smoke exhaust fans does not affect any occupied area or means of escape at the level where smoke is discharged.

23. The fire resistance of jet fans system such as the mechanized air supply fans, smoke exhaust fans, jet fans, duct works and wiring shall be capable of operating effectively at 2500C for 2 hours.

24. The effectiveness of the jet fans system design shall be demonstrated using hot smoke test. The heat release rate of the fuel load for the hot smoke test must be at least 1MW. The hot smoke test will also be required in the following instances:

- (a) If air-change per hour is smaller than 12.

- (b) If there are general goods vehicle or coaches where design fire size exceeds 4MW (i.e. car fire).
- (c) If replacement air is a combination of natural and mechanical means.
- (d) If spacing of jet fans is more than 2/3 of the tested effective range.

25. Not more than 1000m<sup>2</sup> of the car park space can be smoke-logged for at least 20 mins, regardless of whether the fire is located within the smoke control zone or across the zone boundaries. Within this smoke-logged area, there shall be at least 1 viable route for the fire-fighters where the following conditions are satisfied:

- (a) Smoke temperature shall not exceed 2500C at a height of 1.7m from floor level.
- (b) Visibility shall not be less than 5m at a height of 1.7m from floor level.

26. These conditions shall commence at a distance of 5m from the fire location in the direction opposite to the induced bulk air flow induced by the jet fans. All other areas outside the smoke-logged area shall be kept substantially free from smoke i.e. smoke temperature not more than 600C and visibility of at least 25m. If hot smoke test is performed, assessment is to be made on the operation of the jet fans system, movement of smoke towards the extraction points and smoke spread. The latter 2 aspects can be generally verified using the above visibility criterion.

27. An operations and maintenance manual shall be attached. The manual shall contain the roles and responsibilities of the building owner/operator, the restrictions placed on the building, identification of the sub-systems, servicing and maintenance plan, fault identification, etc. The manual can also be used as a guide for future renovations and changes to the building.

## APPENDIX-11

### FIRE SAFETY REQUIREMENTS FOR LIFT RESCUE

1. This fire safety requirement for lift rescue stipulates the fire safety provisions for performing lift rescue operation in buildings with blind lift hoist ways exceeding 11m and shall be applicable to buildings of all purpose groups except purpose group I.
2. Rescue hooks shall be complied as follows;
  - (a) When the distance between consecutive lift landing doorsills exceeds 11m but not more than 18m, rescue hooks meeting the requirements stipulated under clause 2(c) of this appendix shall be provided at the underside of the upper lift landing door head.

Figure (11.1) Lift Sill to Sill Distance  $>11\text{m}$  , but  $<18\text{m}$

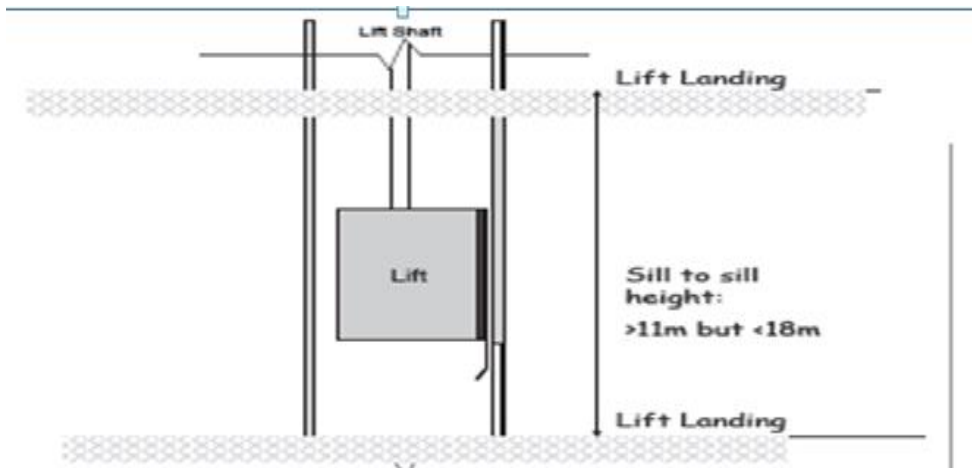
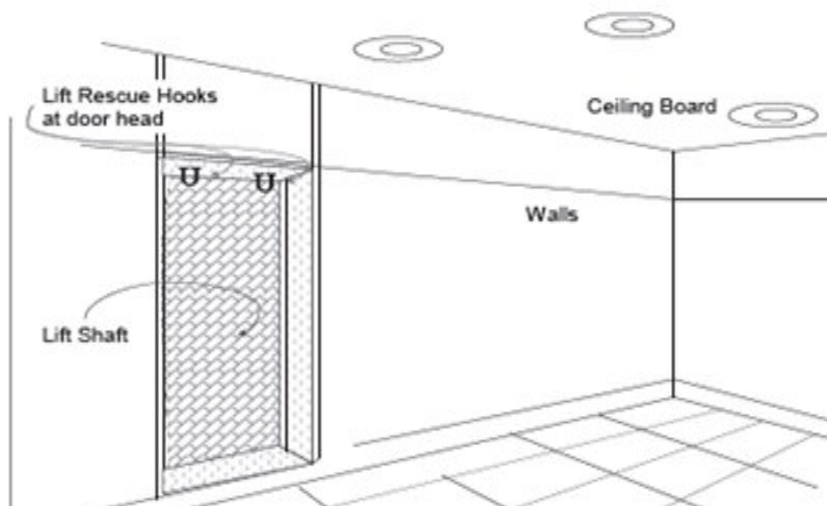
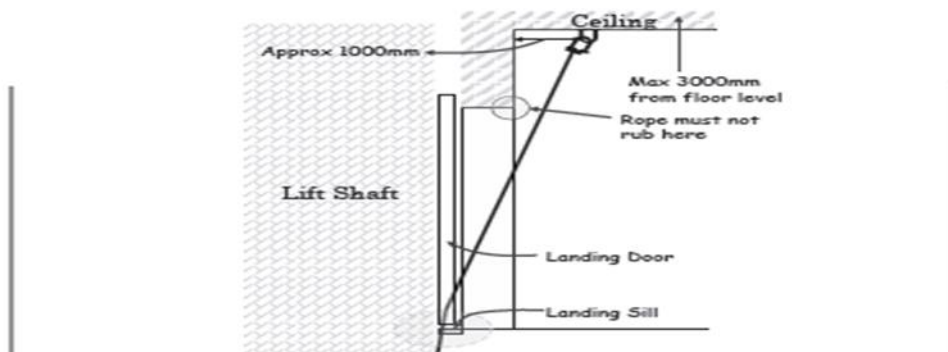
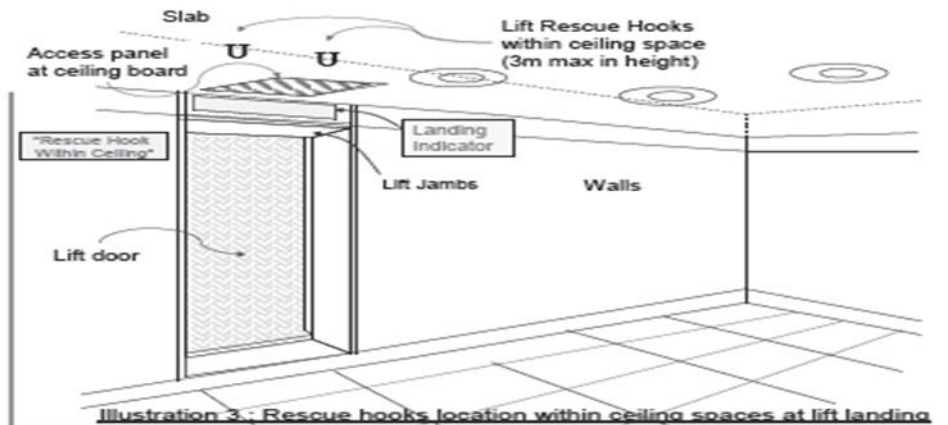


Figure (11.2) Rescue Hooks Location of Lift Landing



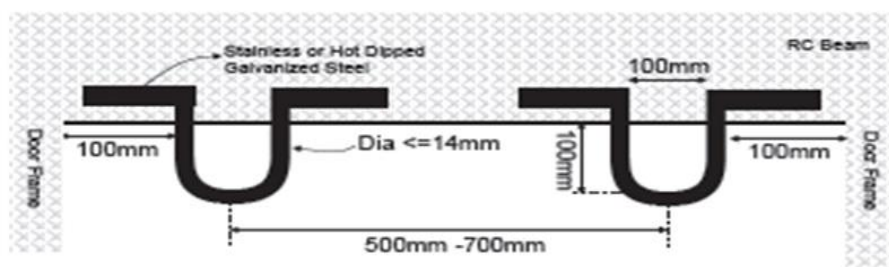
- (b) Alternatively, these hooks can also be installed in the ceiling space directly above the upper lift landing door such that the heights of these hooks are not more than 3m above the finished floor level of that upper lift landing and at an approximate distance of 1m away from the lift shaft wall. The ceiling space shall be easily accessible and a visible sign shall be provided to indicate the locations of the rescue hooks.

Figure (11.3) Rescue Hooks Location Within Ceiling Spaces at Lift Landing



- (c) Each rescue hook shall have pull-out strength of not less than 1000kg and a thickness of not more than 14mm in diameter. The clear space between the hook and the emergency door frame shall not be less than 100mm and the spacing between the two hooks shall be between 500 to 700mm.

Figure (11.4) Rescue Hook

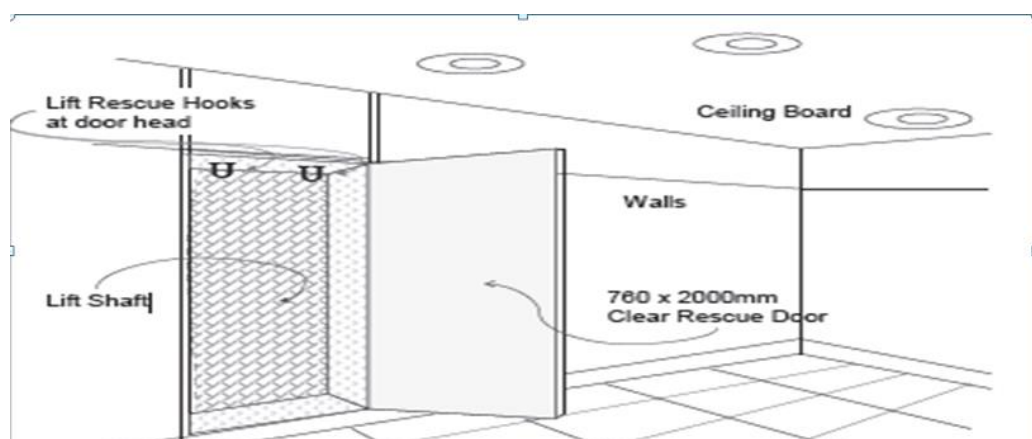


Note: Pull down capacity = 10KN

3. When the distance between consecutive lift landing doorsills exceeds 18m, intermediate landing emergency doors shall be provided and complied with the following;

- (a) They shall be at least 760mm wide and 2m high (clear opening);
- (b) They shall be easily accessible and free from fixed obstructions;
- (c) They shall be either of the horizontally sliding or swinging single section type, irrespective of the type of door installed at the other landings;
- (d) They shall be self-closing and self-locking and shall be marked in letters not less than 50mm high, "DANGER, LIFT WELL"
- (e) They shall be provided with a landing door lock which can be unlocked only from the landing side through the use of a key. The lock shall not be unlocked by any key which will open any other lock or device used for any other purpose in the building. The key shall be kept where it is accessible only to authorized persons;
- (f) Each door shall be provided with an electrical contact the opening of which will render the lift inoperative;
- (g) Two rescue hooks meeting the requirements stipulated under clause 3.1.3 shall be provided at the underside of each emergency door head. Alternatively, these hooks can also be installed in the ceiling space as stipulated under clause 3.1.2.

Figure (11.5) Landing Emergency Door



4. When car emergency doors are provided in adjacent cars to permit the lift-to-lift rescue and evacuation of passengers, there shall be no limit on the maximum allowable length of the blind lift hoist way. When car emergency doors are provided, the following requirements shall be complied with:

- (a) The horizontal distance between cars shall not exceed 750mm.
- (b) Car emergency doors shall measure at least 1800mm high and 350mm wide.
- (c) Car emergency doors shall be opened from outside the car without a key and from inside the car using a key.
- (d) Car emergency doors shall not open towards the outside of the car.
- (e) Car emergency doors shall not be located in the path of a counterweight or in front of a fixed obstacle (except for beams separating the cars) preventing passage from one car to another.
- (f) A set of detachable bridging plate and handrail, painted in bright yellow colour, shall be provided and secured to each emergency door. The plate shall have an anti-slip surface and means shall be provided to prevent accidental dropping of the plate and handrail into the lift well during deployment.
- (g) The detachable bridging plate shall have a minimum loading capacity of 200kg and shall not weigh more than 10kg. The maximum loading capacity shall be clearly marked on the top-face of the plate.
- (h) Each car emergency door shall be provided with an electrical contact the opening of which will render the lift inoperative. Safety feature to prevent the lift from operating when the bridging plate or the handrail is deployed shall also be provided.

Figure (11.6) Car Emergency Doors For Lift to Lift Rescue

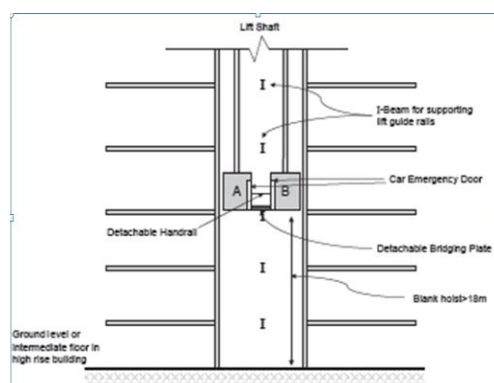
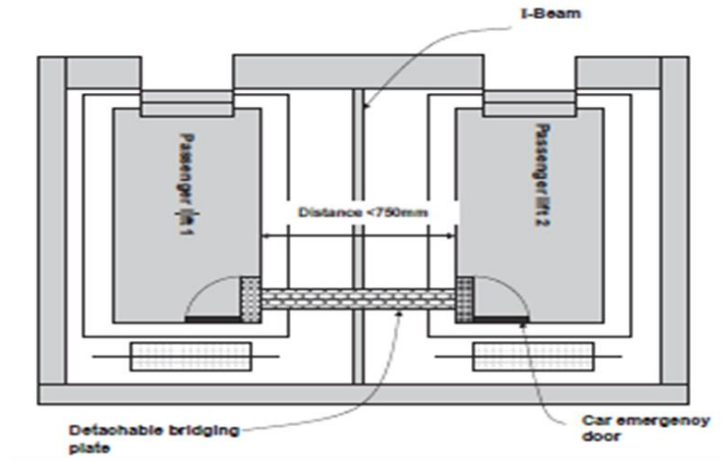




Figure (11.7) Car Emergency Doors-Deployment of Bridging Plate



## APPENDIX-12

### FIRE SAFETY REQUIREMENTS FOR PERSONS WITH DISABILITIES

1. The scope of these requirements covers the provision of fire safety features to assist persons with disabilities (PWDs) during emergencies and the development of plans to manage the evacuation of PWDs. It shall be applicable to all buildings except Purpose Group I and II buildings (residential) and Health Care Occupancy (i.e. Hospital, Nursing Home, Ambulatory Health Care Centre, Custodian Care and Supervisory Care facility) as defined in the Fire Code. Non-residential standalone buildings such as carpark buildings and clubhouses that are located within the residential development and intended as ancillary use are not required to comply with these requirements.
2. Generally, staircase is not suitable for use by PWDs for purpose of fire evacuation. It is also not appropriate to use the lift for evacuation since it may not be in operation during a fire emergency, unless it is incorporated with additional features to protect the users.
3. Ramps, evacuation lifts and wheelchair stair lifts can also serve as alternative means of escape in lieu of exit staircases. If ramps are used, it shall be complied with the suitable ramp gradient.
4. The escape routes shall be free from any obstacle that may cause undue delay to PWDs during evacuation e.g. raised thresholds or steps.
5. The holding point for persons with disabilities shall be complied as follows;
  - (a) A PWD Holding Point shall be provided on all storeys including all basement levels, except first storey or storey at grade level.
  - (b) There shall be at least two designated PWD Holding Points on every storey of a building except for building designed with single exit staircase allowed under Clause 8 (d), (e), and Clause 10 (a) of Chapter 3 of

Myanmar Fire Safety Code. The corridor serving as escape route shall have a minimum width of 1.2m.

- (c) The PWD Holding Point shall be kept free of obstruction and located in the following order of priority:
  - (i) The PWD Holding Point designated in an external corridor shall be positioned at least 2m away from the edge of exit staircase. In the case of PWD Holding Point within the fire fighting lobby and smoke stop lobby, it shall be positioned at least 0.5m away from the edge of exit staircase;
  - (ii) Inside the exit staircase, provided there is no fire-fighting lobby, smoke-stop lobby or external corridor. (See Diagrams 12.1, 12.2, 12.3 and 12.4 )
- (d) Where a PWD Holding Point is located inside a protected lobby or staircase, a mandatory sign worded “PWD Holding Point” shall be prominently displayed.
- (e) A PWD Holding Point shall be enclosed with fire-resisting construction (other than any part that is an external wall of a building) and shall be served directly by a safe route to a storey exit, evacuation lift or final exit.

6. A suitable means of communication shall be provided between the PWD holding point and Fire Command Centre (FCC) or any 24-hourly manned station, for PWDs to call for assistance during a fire emergency. It may be in the form of a distress button or voice communication. The means of communication shall:

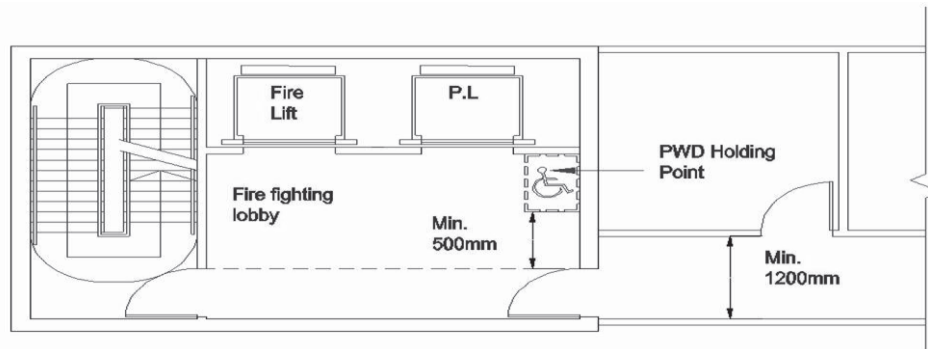
- (a) be located between 800mm and 1200mm above ground level;
- (b) be appropriately labeled;

- (c) be provided with prominently displayed clear instruction sign on its operation; and
- (d) When the device for communication is activated, it shall generate a clear visual indication to indicate that the distress signal has been relayed. The purpose is to enable the PWDs in the holding point to alert the FCC or the manned station that they are in need of assistance and for them to be reassured that this assistance will be forthcoming.

7. A PWD Holding Point shall be adequately sized so as to accommodate a wheelchair user and to allow the user to manoeuvre easily. In this respect, the PWD Holding Point shall meet the following requirements:

- (a) The space provided for a wheelchair in a PWD Holding Point shall be at least 900mm X 1400mm to allow manoeuvring of wheelchair.
- (b) Each PWD Holding Point shall have an area accessible to a wheelchair so that a wheelchair-bound person can await assistance.
- (c) Where a PWD Holding Point is sited inside a protected exit staircase, smoke stop lobby or fire-fighting lobby, the wheelchair space shall not result in reduced size of these spaces and its access shall not obstruct the flow of evacuation.
- (d) There shall be dotted rectangle markings to define the space and a symbol of access in white against contrasting green background on the floor shall be provided to designate the PWD Holding Point for PWDs to wait for rescue.

Figure (12.1) PWD Holding Point sited within a Fire-Fighting Lobby



Protected lobby (Fire fighting lobby) used as PWD Holding Point where the PWDs await for assistance to use either a staircase or an evacuation lift. The designated PWD Holding point serving as wheelchair space shall be placed at a distance of minimum 500mm away from the exit staircase and away from the occupant escape path.

Figure (12.2) PWD Holding Point along external approach (smoke free approach)

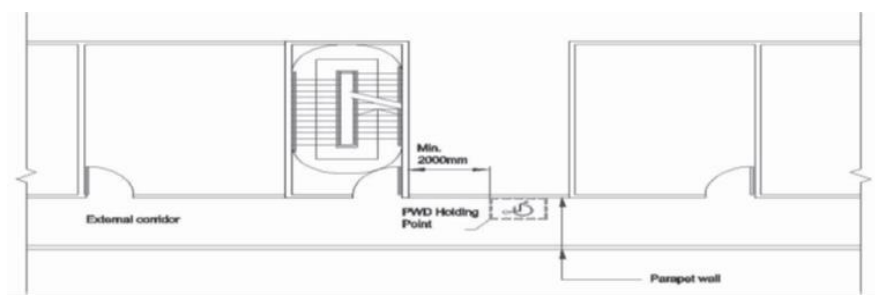
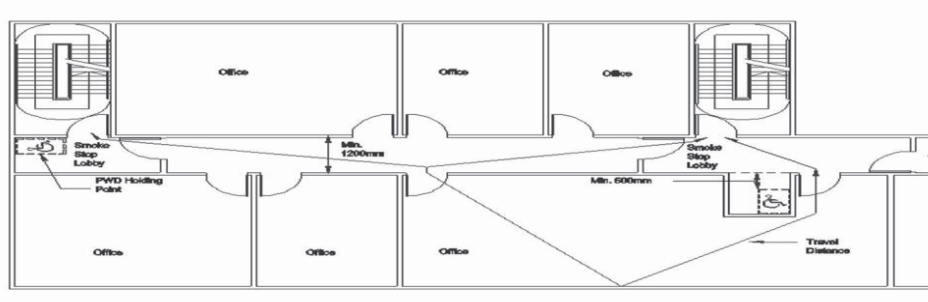
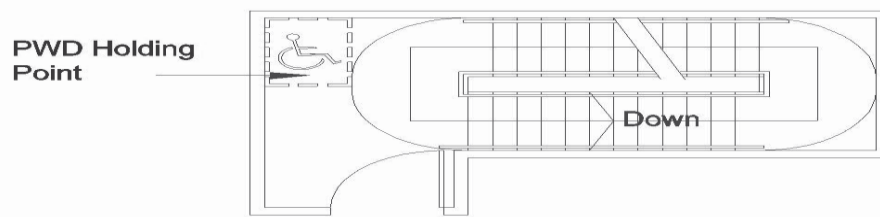


Figure (12.3) PWD Holding Point sited inside Smoke-Stop Lobby and not provided with evacuation lift



The requirement on travel distance shall be similar to that stipulated in the Fire Code (see Table 3.5 in Chapter 3 of Myanmar Fire Safety Code). The wheelchair space incorporated in the smoke stop lobby shall not reduce the area of smoke-stop lobby.

Figure (12.4) PWD Holding Point in buildings without Smoke-Stop Lobby or Fire-Fighting Lobby



The positioning of PWD Holding Point inside the staircase is only permitted for buildings not exceeding 5 storeys above ground. The designated PWD Holding Point shall not obstruct or disrupt the escape flow within the staircase.

8. The handrails within a protected staircase shall be continuous.
9. A wheelchair stair lift is intended to transport a person or person with a wheelchair between 2 or more levels/storeys by means of a guided carriage moving along a flight of stairs, either in upward or downward direction. This is not a mandatory requirement but if it is to be installed inside a protected staircase and serve as a means of escape for PWD, any protrusion of the stairlifts in its operating position shall not encroach into the escape path of building occupants.
10. An evacuation lift is a lift provided for the evacuation of PWDs during emergencies by persons authorised by the building owner. Evacuation lift shall be located within a protected lobby such as smoke-stop lobby, external exit passageway or external corridor. The installation of the evacuation lift shall be in accordance with the Myanmar Fire Safety Code for Installation, Operation and Maintenance of Electric Passenger and Goods Lifts.
11. The evacuation lift for persons with disabilities of buildings installed with lifts shall be complied as follows;
  - (a) At least one of the lifts shall be designated as evacuation lift.
  - (b) Fire lift shall not be designated as evacuation lift unless there is more than 1 fire lift provided in the building. Where the fire lift doubles up as

evacuation lift, its design shall follow that as stipulated in this set of requirements.

- (c) A readily visible sign marked “Evacuation Lift for PWDs” shall be affixed onto the wall adjacent to the lift door at every landing of the evacuation lift.
  - (d) The evacuation lift shall have a clear platform size of minimum 1200mm width x 1400mm depth.
  - (e) The evacuation lift shall be provided with standby power supply for continuous operation during power failure and/or fire emergencies. Routing of cables for evacuation lift shall be similar to that of fire lift.
  - (f) In the event of power failure and/or fire, the evacuation lift shall be brought to the designated floor.
  - (g) A switching device, similar to the fireman switch, shall be installed next to each evacuation lift landing door on the designated floor (and the alternative designated floor, if provided) for persons authorised by the building owner or fire fighters to activate the evacuation mode of the lift.
12. The visual alarm system for the hearing impaired shall be complied as follows;
- (a) At least 10% of the guestrooms or accommodation units shall be provided with visual alarms.
  - (b) The visual alarm signal shall be clearly distinguishable from any other visual signal used in the premises.
  - (c) The visual alarm signal shall flash at a rate within the range of 30 to 130 flashes per minute.
  - (d) Visual alarm devices shall be sufficient in number and their distribution should be readily visible from all accessible locations.

- (e) The intensity of the light signal shall be sufficient to draw the attention of people in the vicinity.

13. Evacuation procedures shall be planned by the building owner. Planning includes identifying the needs of PWDs and making arrangements for assistance during emergency. The building owner must keep the following information:

- (a) the number of PWDs;
- (b) the location of the PWDs;
- (c) the nature of their disabilities; and
- (d) the PWD Holding Point(s) in which they are allocated.

14. In the building with evacuation lift, PWDs requiring assistance shall move or be directed to the PWD Holding Point in the evacuation lift lobby. The trained staff shall attend to PWDs from PWD Holding Point and direct them to the final exit.

15. In the Building without evacuation lift, on hearing the alarm, PWDs requiring assistance shall be moved or be directed to the nearest PWD Holding Point inside the exit staircase. The trained staff shall proceed to the PWD Holding Point and assist the PWDs down the stair to the final exit.



## APPENDIX-13

### REQUIREMENTS ON THE USE OF LIFTS FOR EVACUATION OF BUILDING OCCUPANTS DURING EMERGENCY

1. The scope of these requirements covers the provisions of lift design for evacuation of building occupants requiring assistance during emergencies. It shall be applicable to all buildings exceeding 24m except Purpose Group I and II buildings (residential developments).
2. Unless there are extenuating circumstances which call for total simultaneous evacuation of a building, evacuation of occupants in tall buildings is generally carried out in phases on activation of fire alarm, as these buildings are installed with sprinkler system and passive fire protection systems (eg. compartmentation or fire-rated enclosure), which serve to prevent spread of fire.
  - (a) An option to use lifts for evacuation is now made available to fire-fighters. Lifts used in combination with exit staircases is a more practical strategy to speed up building evacuation, particularly if there are occupants who may require assistance such as the aged, pregnant women and young children.
  - (b) Notwithstanding this, the use of exit staircases is still the dominant mode of occupant evacuation during an emergency. Evacuation via lift is only a secondary means to complement evacuation via exit staircases. The use of lift is primarily aimed at persons requiring assistance. Able-bodied occupants are therefore still required to use the exit staircases for their evacuation.
3. The provisions of lift evacuation for the buildings above 24m in habitable height except purpose groups I & II shall be as follows;

- (a) Fire lift shall be provided for the above building. This lift can be used for evacuation of occupants requiring assistance. Where the provision of a fire lift is already a requirement in Myanmar Fire Safety Code, such lift is to be primarily used for fire-fighting and rescue purposes. The installation of the fire lift shall be in accordance with SS 550 (Installation, operation and maintenance of electric passenger and goods lifts). All other related fire safety measures where fire lift is provided such as fire-fighting lobby, location of exit staircase adjacent to the fire lift shall be designed in accordance with the Myanmar Fire Safety Code.
  - (b) Where the fire lift is provided, it can double up as an evacuation lift for persons with disabilities (PWDs) i.e. evacuation lift for PWDs need not be separately provided. The design requirements of the fire lift shall follow that of the evacuation lift for PWDs.
4. The communication system for the requirements on the use of lifts for evacuation of building occupants shall be as follows;
- (a) A lift monitoring system shall be provided within the Fire Command Centre (FCC). It shall monitor the floor location of the lift, direction of travel, status with respect to occupation, both the normal and emergency power supplies to the lifts, activation of a fire alarm within the lift shaft or lift motor room or lift lobby. Provision to manually override the lift shall be installed in the FCC for use by the fire-fighters.
  - (b) Voice communication system shall be provided in the building.
  - (c) An intercom system in the lift car must be provided for communication between the lift operator and the Fire Command Centre.
  - (d) Close circuit television at lift lobbies to facilitate situation awareness for the authorized personnel overseeing the evacuation at the FCC. Alternatively, a suitable means of communication may be provided between the protected lobby and Fire Command Centre (FCC), for persons

requiring assistance to call for assistance during a fire emergency. It may be in the form of a distress button or voice communication. The means of communication shall:

- (i) be located between 0.8m and 1.2m above ground level;
- (ii) be appropriately labelled;
- (iii) be provided with prominently displayed clear instruction sign on its operation; and
- (iv) When the device for communication is activated, it shall generate a clear visual indication to indicate that the distress signal has been relayed.

5. While the use of fire lift would facilitate occupant evacuation, the increased rate of evacuation is limited by the availability of such lift. Therefore, passenger lifts shall be designed for use together with the fire lifts so as to speed up occupant evacuation. Passenger lifts shall be designed with the following features:

- (a) Where there is provision to manually override the passenger lifts at the FCC by authorized personnel or fire-fighters, fire lift switch need not be installed.
- (b) Power cables which are routed through an area of negligible fire risk.
- (c) Close circuit television shall be provided at lift lobbies.

6. There will be no change to the current evacuation strategy as occupants will still use the exit staircases for evacuation, although fire-fighters or Fire Safety Manager to use the fire lift for evacuation. As such, evacuation via lift shall only be conducted under the supervision of fire-fighters. When fire fighters arrive at the fire scene, the fire officer in charge should be briefed by Fire Safety Manager supervising the evacuation on the position and circumstances of the fire and the progress of the evacuation. The fire officer will then take over the supervision of the evacuation.

## APPENDIX-14

### PROVISION OF EXIT SIGNS FOR ROOM

1. Entrance to every exit on every floor shall be clearly indicated by an exit sign placed over the exit doors. In long corridors, open floor areas, and all situations where the locations of the exits may not be readily visible, directional signs shall be provided to serve as guides from all portions of the corridors or floors.
2. For rooms, the guidelines for the provisions of exit sign are as follow:
  - (a) When a room is provided with more than one door, exit signs shall be placed over the exit access doors serving as means of escape.
  - (b) In a room provided with emergency lighting and where the line of sight to the exit access door is obstructed, directional sign shall be provided.
  - (c) In a room provided with emergency lighting, exit sign is not required if there is only one exit access door.
  - (d) In a room without emergency lighting and:
    - (i) If the direct distance from the furthest point in the room to the only exit access door does not exceed 7m, exit sign is not required.
    - (ii) If the direct distance from the furthest point in the room to the only exit access door exceeds 7m but does not exceed 13m, exit sign shall be provided over the door. Alternatively, the room can be provided with emergency lighting.
  - (e) When the wall of a room without emergency lighting comprises of not less than 50% glazing and is facing a corridor (with emergency lighting) or external of a building, exit sign over the only exit access door is not required if the furthest point in the room to the exit access door does not exceed 13m.

## APPENDIX-15

### FIRE SAFETY FOR TRANSFORMER INSTALLATIONS

1. The requirements mentioned here are for the purpose of fire safety only and not the requirements of Electric Power Authority. This section sets the requirements for dry transformer of class up to 66 kV and liquid insulated transformer, both naturally cooled and transformer utilizing forcibly circulate cooling medium. Liquid used in transformers may be Approved Liquid or Non-Approved Liquid (refer to clause 2). Non-approved liquid may be used for transformers, provided proper fire protection and construction of transformer rooms / detached building are followed strictly to this section. Non-Approved Liquid filled transformer installation below any habitable floor of the same building is not allowed (refer to clause 3). This section also limits to the natural cooled transformer rated from 50kVA to maximum capacity of 10,000 kVA and 35kV class (i.e. 33 kV system) or lower to be installed for any building including factories. For installation of larger capacity or higher class transformers are not allowed to be installed in the same building of any occupancy and it shall be of either outdoor installation or in a dedicated separate building with necessary provisions for fire protection approved by Fire Authority.

2. Approved Liquid and Non-Approved Liquid. Commercially used transformer liquid like mineral oil is although flammable it is used in many oil immersed transformers. Less or non-flammable transformer liquid in compliance with Table 1 is considered as Approved liquid and the rest are considered to be non-approved liquid for the purpose of fire safety and environmental protection.

Table (1) Characteristic of approved liquid

1	Transformer liquid shall be soybean oil based natural ester liquid type EnvirotempFR3 or equivalent, with fire point $\geq 350^{\circ}\text{C}$ and flash point (Cleveland Open Cup) $\geq 300^{\circ}\text{C}$ in accordance with ASTM D92/ISO2592 method, also, flash point (Pensky-Marten Close Cup) $\geq 250^{\circ}\text{C}$ in accordance with ASTM D93/ISO2719.
2	Transformer liquid shall be listed as both UL & FM Global Less-Flammable liquid on both Transformer Fluids EOVK.MH10678 and Dielectric Mediums EOUV.MH10678, UL Listed and Classified Products, Underwriters Laboratories.

3. The transformer installation below habitable floor shall be as follows;

- (a) To mitigate any possible fire case, for any transformer installed below any habitable floor of the same building shall be either of dry type transformer, having with properly designed air-conditioned system or mechanical ventilation system, or filled with an Approved Liquid (i.e. less or non-flammable natural ester liquid) immersed type transformer, strictly in compliance with clauses 3.3, 3.4, 3.5 shall be installed. Approved liquid shall be used for transformers, tap changers and all oil-filled accessories.
- (b) To ensure the operation of cooling or M/V system, in case of dry type transformers, standby facilities shall be provided and interlocked with fire alarm signal where applicable.
- (c) The transformer shall be equipped with high pressure alarm and trip by means of Buchholz relay. In addition, high oil temperature alarm and trip relays shall also be provided. Other electrical protection relays shall be provided as per requirements of relevant Electric Power Authority.
- (d) The transformer shall be installed with pressure relief valve connected with pipe down extension (elephant nose) to the oil containment bund/tray of capacity not less than 110% of oil content of installed transformer. The containment bund/tray shall be constructed at the base of transformer.

- (e) The transformer room shall be constructed as separate room and withstanding structure fire rating hours and provision of fire protection as per Table 2.
4. The liquid spill containment in transformer rooms & construction and provide liquid spill containment in transformer rooms containing transformer liquids shall be as follows;
- (a) Use liquid-tight walls sealed to the floor.
  - (b) If interior openings must be made in these walls, locate above the level of minimum curb height specified in Clause (4)(c).
  - (c) Design curb height or pit depth for largest design spill (based on contents of one transformer) plus 50 mm, but no less than 100 mm total height.
  - (d) Provide individual containment for the contents of each transformer containing non-Approved liquid to prevent spills from flowing to other transformers or important equipment in the room. Common containment can be used for Approved Liquids.
  - (e) Where sprinklers are provided for transformer fluid protection, also provide an emergency drainage system to direct the transformer fluid and sprinkler discharge out of the building to an impoundment area.
  - (f) Where foam-water sprinklers are provided for transformer liquid protection, design containment pits or curbing to hold the transformer liquid contents and at least 30 minutes discharge from the foam-water sprinklers for Non-approved Liquids before discharge out of the building to an impoundment area.
  - (g) Locate transformers a minimum distance of 0.9 m from walls or more as needed for maintenance access and ventilation requirements.

5. If transformers cannot be located outdoors, provide a detached building or room with location and construction safeguards as described in Figure 1a and Table 2. The fire protection for indoor transformers shall be as follows;

- (a) Arrange transformer rooms for direct access only from outdoors. If access door from transformer room is provided with access door from inside, it shall be in compliance with Clause 4(b) & (c) to prevent oil spill from the transformer room to the main building.
- (b) Provide construction for transformer rooms and detached buildings as follows: (Transformer rooms below habitable floor, refer to clause 3)
  - (i) For dry or gas-insulated transformers: non-combustible construction.
  - (ii) For transformers with approved liquid: Minimum one-hour fire-rated construction if no fire protection is provided, or
  - (iii) Non-combustible construction if fire protection (automatic sprinklers, foam-water sprinklers, approved water mist or gas/aerosol fire suppression system) is also provided.
  - (iv) Transformers with no more than 380 liters of non-approved liquid: one-hour fire-rated construction if fire protection is also provided.

6. Transformers with greater than 380 liters of non-approved liquid: three-hour fire-rated construction. If multiple transformers are present, also provide one of the following:

- (a) Three-hour fire-rated subdivisions for each transformer, or automatic sprinklers, foam-water, approved water mist or gas/aerosol total flooding fire suppression system.
- (b) Where three-hour fire-rated construction is required for transformer rooms where transformer filled with non-approved liquid, also protect exposed structural steel (if any) with a 3-hour fire-proofing rated for hydrocarbon fires.



7. Where fire protection is required for transformer fluids as described in Table 2, provide automatic fire protection for transformer buildings and rooms in accordance with the following design:

- (a) Transformer using approved transformer liquids, provide sprinkler protection over the entire room with a design density of 8 mm/min.
- (b) Where transformer filled with non-approved liquids, provide sprinkler protection with design density of 12mm/min.
- (c) Where sprinkler protection is provided, design containment and drainage in accordance with clause 4. Also provide an emergency drainage system to direct the transformer fluid and sprinkler discharge out of the building to an impoundment area.
- (d) Foam-water sprinkler system approved by Fire Authority is acceptable as an alternative to sprinkler protection for ignitable transformer liquids and provide containment for transformer liquid contents plus at least 30 minutes of discharge from the foam-water sprinklers.
- (e) An approved automatic water mist protection system or gas/aerosol total flooding fire suppression system approved by Fire Authority as an alternative to automatic sprinkler protection for transformer liquids is acceptable.
- (f) Also, provide fire protection for transformer rooms and buildings where combustible grouped electrical cables and Bus Bars are present.

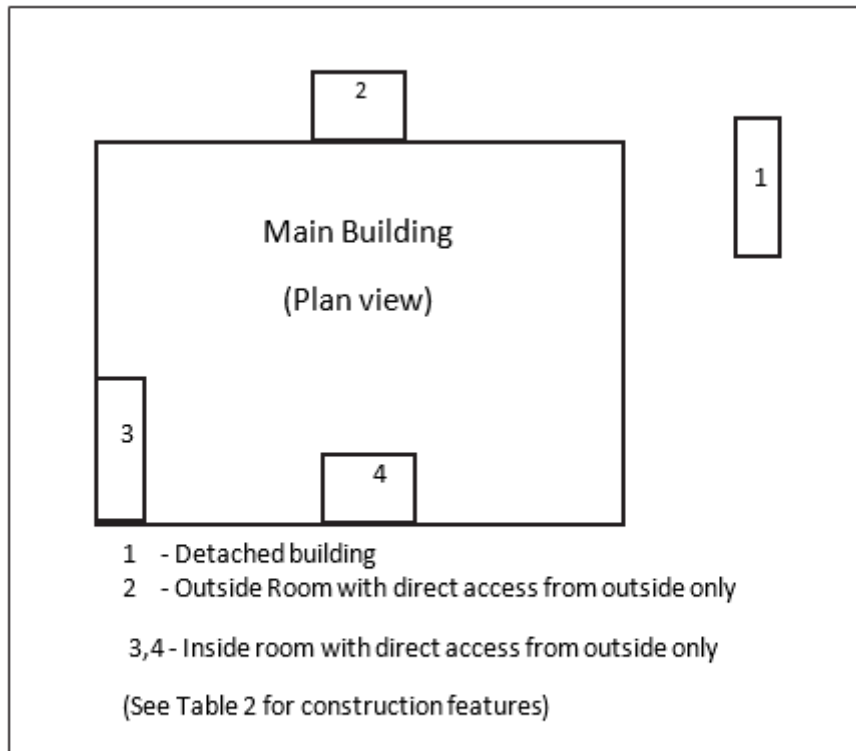


Fig. 1a. Locations for transformer buildings and rooms

8. Location and Construction shall be followed to protect important buildings and equipment from exposure to fire involving outdoor transformers.
- (a) The separation distances and construction features mentioned below shall be implemented together with spill containment as described in Figure 1b / Table 3, Figure 1c / Table 4 and Figure 1d / Table 5. For multiple transformer installation, provide separation distances for exposed transformers and other critical equipment in accordance with Table 3. Distances are referred to the closest edge of containment.
  - (b) Where the separation distances in Table 3 cannot be met, provide 2-hour fire-rated barriers between transformers as shown in Figure 1e and extend the barriers 1 ft (0.3 m) vertically and 2 ft (0.6 m) horizontally beyond transformer components that could be pressurized as the result of an electrical fault, including bushings, pressure-relief vents, radiators, and tap changer enclosures.
  - (c) Use concrete block/brick or reinforced concrete construction adequate for two-hour fire-resistance for the fire barriers.

- (d) For installations where the separation distances between transformers in Table 3 are not met and barriers are not provided, install fixed water spray protection system on each transformer as follows:
- (i) Design with discharge density of 12mm/min for all over surface of transformer including dike area around transformer.
  - (ii) Locate components of the water spray system, such as piping, spray nozzles, etc., a minimum of 45 cm from the transformer and do not pass piping over the top of the transformer or tank relief vents and orient water spray
  - (iii) For multiple transformer installations, design the water spray system based on simultaneous operation of the water spray systems for the adjacent transformers and diked areas.
  - (iv) If automatic water spray is provided on the building wall for exposure protection, provide design protection 8mm/min.

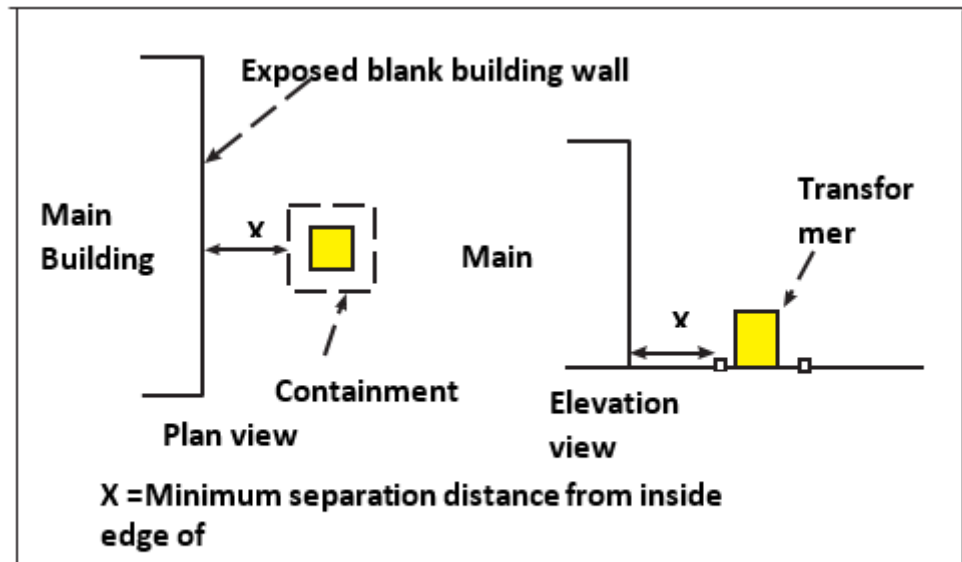


Fig.1b. Minimum horizontal separation distance between outdoor liquid-insulated transformers

Table 3. Separation for Exposure Protection of Main Building Wall &amp; Other Equipment

Transformer liquid	Liquid Volume, Liters	Minimum Horizontal Distance from Containment to Exposed Building Wall		Minimum distance between adjacent for Transformers (m) (For multiple transformer installation)
		2-hour fire-rated wall (m)	Non-combustible wall (m)	
Approved liquid in Transformer	≤38,000	1.5	1.5	1.5
	>38,000	4.6	4.6	7.6
Non-approved transformer liquid	<1,900	1.5	4.6	1.5
	≤1,900 – 19,000	4.6	7.6	7.6
	>19,000	7.6	15.2	15.2

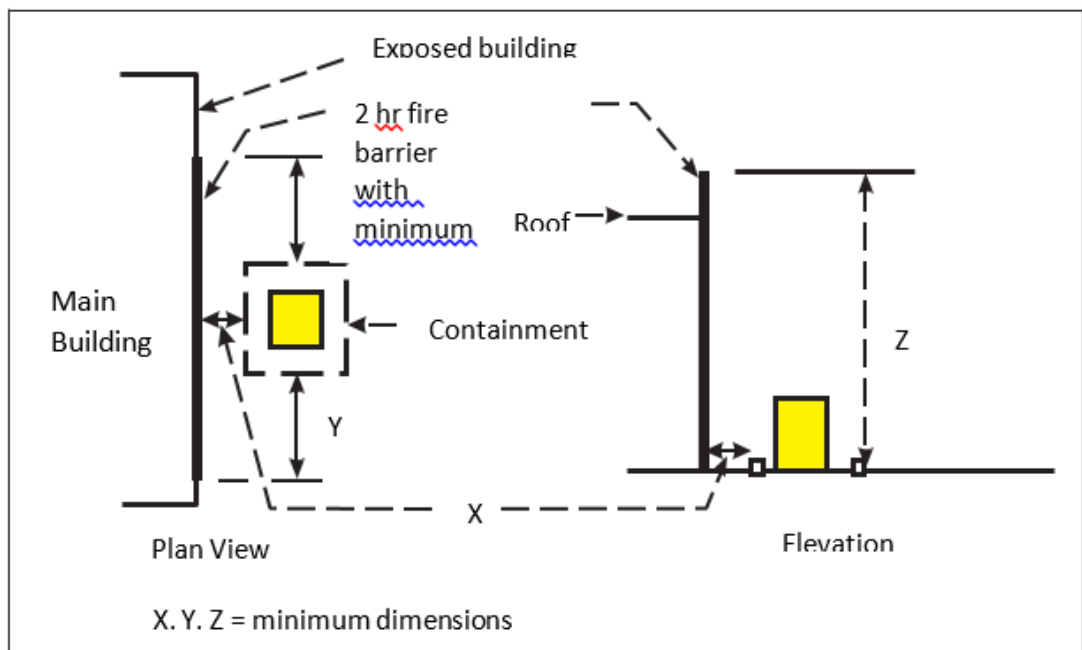


Fig.1c. Use of 2-hour fire barriers and separation distances for protection of exposed main building wall

Table 4. Separation and Extent of 2-hour Fire Barriers for Protection of Main Building Walls (for dimensions refer to Figure 1c)

Fluid Type	Fluid Volume Liters	Separation and Extent of 2-hour Fire Barrier		
		Dimension <sup>1,2</sup> (See Fig. 2c)	Noncombustible Wall (m)	Combustible Wall (m)
FM Approved transformer fluid	≤38,000	X	1.5	1.5
		Y	1.5	7.6
		Z	7.6	7.6
	>38,000	x	4.6	4.6
		Y	4.6	15.2
		Z	15.2	15.2
Non-Approved transformer fluid	<1,900	X	1.5	1.5
		Y	4.6	7.6
		Z	7.6	7.6
	≤19,000	X	4.6	4.6
		Y	7.6	15.2
		Z	15.2	15.2
	>19,000	X	7.6	7.6
		Y	15.2	30.5
		Z	30.5	30.5

<sup>1</sup> The X distances refer to minimum separation between the closest inside edge of the spill containment barrier area and the 2 hour fire barrier. These are the same as Table 3 for 2-hour fire-rated walls. Dimension Y is the horizontal extent of the barrier starting from the respective edge of containment.

<sup>2</sup> Barrier vertical extent is dimension Z in the Table or the building height plus 30 in. (0.75 m) parapet, whichever is less.

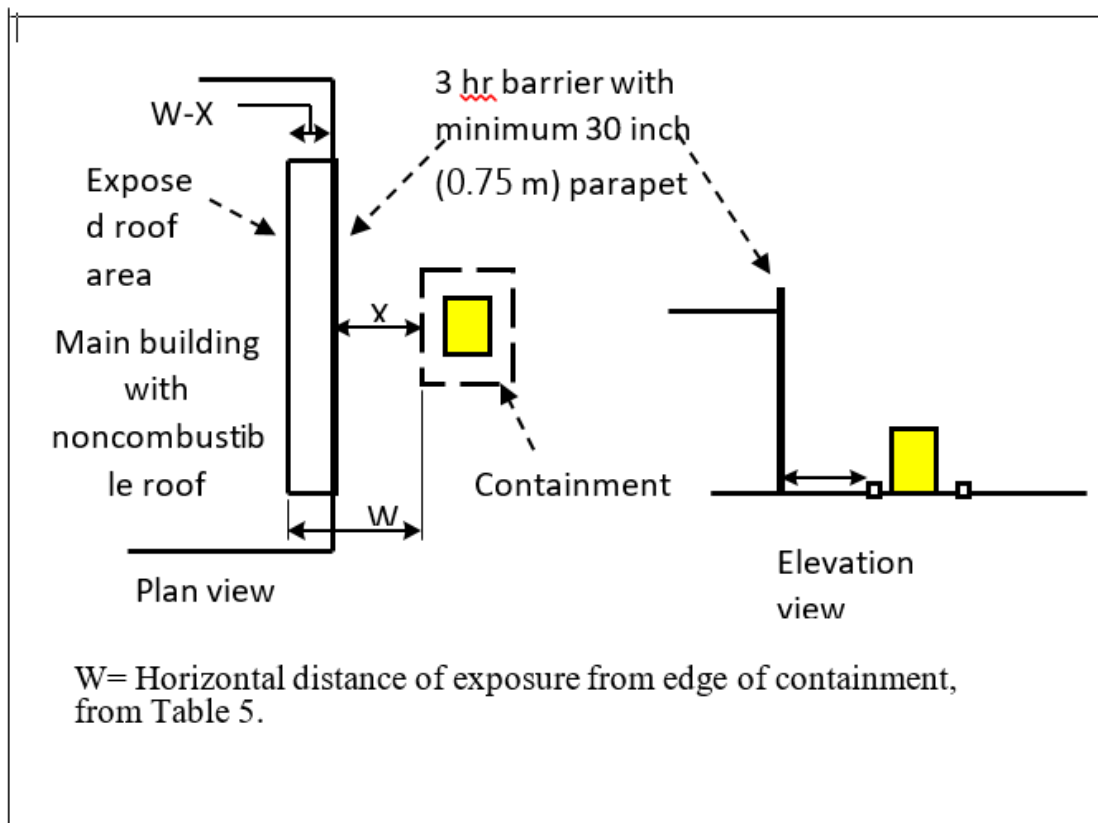


Fig 1d. Determination of exposed roof area

Table 5. Transformer Fire Exposure to Noncombustible Building Roof Where Separation from Wall is Based on a 3-hour Fire Barrier or Water Spray Protection

Liquid Type	Maximum Liquid Volume Liters	Building Height, (m)	W (see Fig. 1d) (m)
Non-Approved transformer fluid	Any	≥15	Not exposed
	<3,800	Any	Not exposed
	3,800-19,000	≥7.5	Not exposed
		<7.5	4.5
	>19,000	<15	7.5

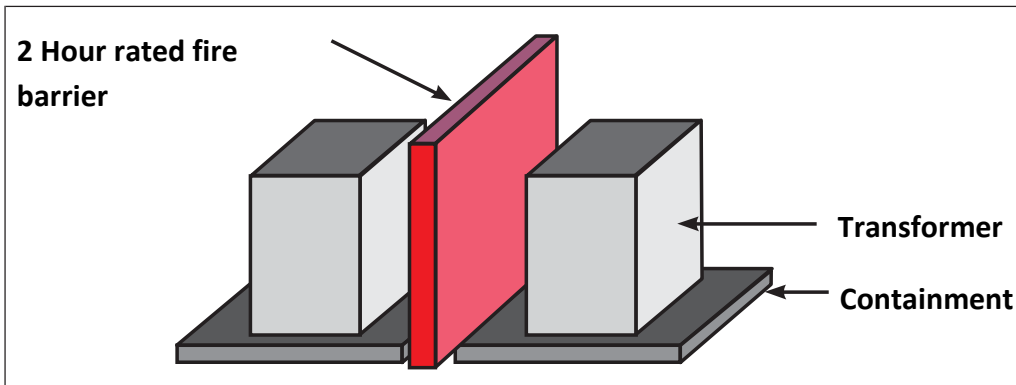


Fig. 1e. Fire barriers for multiple outdoor transformers

- (e) For transformers with 500 us. Gal. (1,900 liters) or less of non-approved insulating liquid, the containment system may be a welded steel pan or curbed and sealed concrete pad with capacity large enough to handle the liquid in the largest transformer. For non-approved oil-insulated transformers with more than 1,900 liters, provide a rock-filled containment design with drainage to a suitable impoundment area. Rock filled containment's effective capacity is max. 40% of total volume as oil filled to void volume only). For transformer using approved liquid, the containment system is only required if it is more than 2,640 us. Gal. unless there is exposure to a navigable water way, then, the containment system is needed if it is more than 1,320 us. Gal. Open containment is acceptable for approved transformer liquids.
- (f) For transformer using non-approved liquid where transformers present an exposure to buildings or equipment, provide a hose stream water supply using nozzles for application on oil-filled electrical equipment design for the following duration and flow rates:
- (i) Adequate for 1-hour hose stream demand of 950 L/min for transformers holding Approved liquids or up to 3,800 liters of non-approved liquids.
  - (ii) Adequate for 2-hour hose stream demand of 1900 L/min hose stream for greater than 3,800 liters of non-approved liquids in an individual transformer. The requirements mentioned in above clause 6.6 is not required for transformer using Approved Liquid.)