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THE FIRE AND RESCUE FORCE ACT
(CAP. 427)

REGULATIONS

(Made under section 19 and 32)

THE FIRE AND RESCUE FORCE (FIRE PRECAUTIONS IN BUILDINGS)
REGULATIONS, 2015

PART I
PRELIMINARY PROVISIONS

Citation and application 1. These Regulations may be cited as Fire and Rescue (Fire Precautions in Buildings) Regulations, 2015 and shall apply to all areas where the Act applies.

Interpretation 2. In these Regulations, unless the context otherwise requires-

Cap 427 “AC” means Air Condition;
 “Act” means Fire and Rescue Force Act;
 “approved” means approved by Relevant Authority;
 “ancillary office” means 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;
 “ancillary usage” means the ancillary office, sick room or first aid room, reception lobby or area, waiting area, staff lounge or staff recreation room, staff rest room or pantry, staff changing or locker room, meeting room, staff training room;
 “area of building” means-
 (a) a total area of a storey bounded by the inner finished

surfaces of the enclosing walls or, any side where there is no enclosing wall, by the outermost edge of the floor on that side;

- (b) the area of any room or space taken as the total area of its floor bounded by the inner finished surfaces of the walls forming the room or space; or
- (c) the area of any part of a roof taken as the actual visible area of such part measured on a plane parallel to the pitch of the roof.

“Area of refuge”

- (a) 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; or
- (b) an area in an adjoining building which is separated from the building under consideration by fire resisting construction and evacuees similarly enter the area of refuge using an external corridor.

“ASTM” means American Standard for Testing Materials;

“atrium” is a large open space created by an opening, or a series of openings, in floor assemblies, thus connecting two or more storeys. 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;

“AHU” means Air Heating Unit;

“Basement Storey” means a storey of a building which is below the ground storey and the floor of which is situated at such a level that more than half the height of such storey is below the level of the ground adjoining its perimeter walls for more than half the length of such perimeter walls;

“Boundary” means the boundary of the land belonging to the building under consideration, and includes the

imaginary extension of the boundary up to the centre of an abutting public street, canal or river;

“BS” means British Standard;

“Cavity barrier” means-

- (a) seal (concealed space) against the penetration of smoke and flame; or
- (b) a cavity (concealed space) to stop the movement of smoke and flame within the cavity;

“ceiling” means a part of a building which encloses and is exposed overhead in a room, circulation space or protected shaft. A soffit or rooflight is included as part of its surface, but not the frame of a rooflight;

“circulation space” means a space mainly used as means of access between a room or protected shaft and an exit from the building or compartment;

“code of practice” means the standard of practice acceptable to the Relevant Authority;

“compartment” means 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;

“compartment wall and compartment floor” means a wall or a floor which is provided for the purpose of dividing a building into compartments;

“concealed Space” means is 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;

“Commissioner General” means Commissioner-General of Fire and Rescue Force;

“cold room” means a store room used for the storage of materials or chemicals under cold temperature;

“corridor” means a passage providing means of access from rooms or spaces to an exit;

“cubical extent of building compartment” means the volume

of space contained within the building or compartment;
and includes;

- (a) the inner finished surfaces of the enclosing walls or, on any side where there is no enclosing wall, a plane extending vertically above the outermost edge of the floor on that side,
- (b) the upper surface of its lowest floor, and
- (c) in the case of a building or compartment which extends to a roof, the under surface of the roof or, in the case of any other compartment, the under surface of the ceiling of the highest storey within the compartment, including the space occupied by any other wall, or any unprotected shafts, ducts or structure within the space to be measured, but excluding protected lift walls, exit staircases and other accommodation such as lavatory and locker rooms which are enclosed with walls having fire resistance of not less than one hour and openings protected by doors of one half hour fire resistance fitted with automatic self-closing device;

“dead-end” means a situation within a common area, normally a corridor or lift lobby spaces, where exit is only possible from one end, with no possible escape from the other end;

“direct distance” means 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;

“door” includes any shutter, cover or other form of protection to an opening in any wall or floor of a building or in the structure surrounding a protected shaft, regardless of whether the door is constructed of one or more leaves;

“electromagnetic or electro-mechanical device susceptible to smoke” means a device which will allow a door held open by it to close automatically in the event of each or

anyone of the following:

- (a) detection of smoke by automatic apparatus suitable in nature, quality and location;
- (b) operation of a hand operated switch fitted in a suitable position;
- (c) failure of electricity supply to the device, apparatus or switch;
- (d) operation of the fire alarm system if any.

“element of Structure” means-

- (a) a member forming part of the structural frame of a building or any other beam or column but not a member forming part of a roof structure only;
- (b) a load-bearing wall or load-bearing part of a wall;
- (c) a floor, including a compartment floor, other than the lowest floor in contact with the ground of a building;
- (d) an external wall;
- (e) a separating wall;
- (f) a compartment wall;
- (g) a structure enclosing a protected shaft protecting structure.

“emergency generator” means emergency power generating equipment that complies with the requirements for Installation, Operation, Maintenance, Performance and Constructional Requirements of Mains Failure Standby Generating Systems;

“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;

“EN” means European Norm;

“exit” is 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, it includes link ways, walkways, bridges and balconies, but exit excludes access stairs,

- aisles, corridor doors or corridors and access doors to rooms or spaces in occupancy areas;
- “exit access” means that portion of a means 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;
- “exit Access Door” means a door which provides access to a room or space(excluding toilet cubicle, bedroom, storeroom, utility room, pantry and the like) or installed across the escape path leading to an exit;
- “exit door” means 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;
- “exit passageway” means a horizontal extension of a vertical exit versus exits staircase or a passage leading from a courtyard to an open exterior space.
- “exit staircase” means a staircase which has its enclosure constructed of non- combustible material having a fire resistance of not less than the minimum period required by Regulation 74, for Elements of Structure for the part of the building in which it is situated;
- “external cladding” means material fixed to the outside face of an external wall for weather protection or decorative purpose;
- “external exit staircase” means-
- (a) an exit staircase located outside the building and open to the outdoor air, and enclosed by parapet walls or railing only; or
 - (b) an external staircase which 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;
- “external exit passageway” means an exit passageway open to the outdoor air that serves as a required exit;
- “external wall” means 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;

“fire resistance” means 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;

“fire stop” means 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;

“fire-fighting lobby” means a smoke-stop lobby which is adjacent to a fire lift and exit staircase designated for use by the firefighting team during an emergency;

“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;

“Fire Engine Access Road” means an access road to allow a fire fighting appliance to move from one location to another within a development for firefighting purpose or operation;

“Fire Engine Access way” means an access road to allow a fire fighting appliance to carry out firefighting operation located along the perimeter of a building;

“habitable floor” means a floor or part thereof, including roof level, regardless whether it is opened to sky or not, designated to be used for any purpose or activity other than housing lift motors, fire pumps, water supply pumps, cooling towers and water tanks;

“habitable height” means the height measured from the lowest level of fire engine access way or access road applicable to buildings under Purpose Group II to the finished floor level of the highest habitable floor;

“height of building” means the height of such building or part of the building, measured from the average level of the ground adjoining the outside of the external walls of the building to the level of half the vertical height of the roof of the building or part of the building, or the top of the walls or of the parapet (if any), whichever is the higher;

“high hazard occupancy” means any occupancy in which the contents or activities include one or more of the following-

- (a) materials that will flame up by themselves without the presence of any fire source below the ignition temperature of 200°C;
- (b) materials that would produce poisonous, noxious fumes, or flammable vapour;
- (c) materials that would cause explosions;
- (d) extra high hazard occupancies;
- (e) highly combustible substances and flammable liquids;

“ISO” means International Organization for Standardization;

“Load-bearing wall” means a wall which supports any load in addition to its own weight;

“MV” means Mechanical Ventilation;

“MSDS” means Material Safety Data Sheet;

“masonry” Means to brick or concrete construction or other equivalent construction approved by the Relevant Authority;

“NV” means Natural Ventilation;

“ NFPA” means National Fire Protection Association of United State of America;

“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;

- (a) any material of density 300 kg/m³ 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°C;

- (b) any material with a non-combustible core at least 8mm thick having combustible facings on one or both sides not more than 0.5mm thick; and
- (c) any material of density less than 300 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°C and on the furnace thermocouple is not more than 25°C ;

“non- load bearing wall” means a wall which supports no load other than its own weight;

“notional boundary” means boundary presumed to exist for the purpose of these Regulations between buildings on the same site;

“occupant load” means the total number of persons that may occupy such building or part thereof at any one time. The occupancy load can be established-

- (a) by applying to the floor areas available for occupation based on the appropriate areas per person;
- (b) by the number of fixed seating, if applicable, for Assembly Occupancies;

“permitted limit of unprotected area” means maximum aggregate area of unprotected areas in any side or external wall of a building or compartment;

“private lifts” means passenger lifts which are meant for the exclusive use of occupants in a building, and are located to open its door directly into private enclosed spaces but exclude vehicle lifts, home lifts and stair lifts;

“protected shaft” means 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;

“protecting structure” means wall, floor or other part of a building which encloses a protected shaft, but does not include-

- (a) a wall which also forms part of an external wall,

- separating wall or compartment wall;
 - (b) a floor which is also a compartment floor or a floor laid directly on the ground; or
 - (c) a roof.
- “public building” means a building or part thereof used or constructed or adapted for public to have access;
- “purpose Group” means a building or compartment regarded according to its use, intended use or main purpose of use;
- “Relevant Authority” means the Commissioner General of Fire and Rescue Force and includes officers authorised by him generally or specifically to exercise the powers, functions and duties conferred by these Regulations;
- “relevant boundary” means boundary in relation to a side or external wall of a building or compartment, including a notional boundary;
- “required exit” means an emergency exit;
- “roof light” includes any dome light, lantern light, skylight or other element intended to admit daylight;
- “room” means an enclosed space in a building that is not an enclosed circulation space or a protected shaft or an enclosed space not exceeding 750 mm in depth;
- “separated part of a building” means 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;
- “separating wall” means a wall separating adjoining buildings;
- “smoke check door” means a door or set of doors placed in an internal corridor to restrict the spread of smoke by reducing draft;
- “smoke-stop lobby” means a lobby located at the entrance to an exit staircase to help to prevent or minimise the entry of smoke into the staircase;
- “storey” means any floor or part thereof including platform, mezzanine and attic level;
- “tenancy unit” means to an individual unit or subdivided unit within a building or a compartment, and which is

managed by a different operator;

“travel distance” means 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, an exit passageway or an open exterior space;

“unprotected area” in relation to a side or external wall of a building means-

- (a) a window, door or other opening,
- (b) any part of the external wall which has less than the relevant fire resistance;
- (c) 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;

“vertical exit” means an exit staircase or exit ramp serving as required exit from one or more storeys above or below ground level.

“wall surface” for the purpose of internal surfaces, includes-

- (a) the surface of glazing;
- (b) any part of ceiling which slopes at an angle of 70 degrees or more to the horizontal, but excluding;
 - (i) door frames and unglazed parts of doors, and
 - (ii) window frames and frames in which glazing is fitted;
 - (iii) architraves, cover moulds, picture rails, skirtings and similar narrow members, and
 - (iv) fitted furniture.

PART II MEANS OF ESCAPE

General
provision
on means
of escape

3.-(1) The provisions of this Part shall apply in determining the design, construction, protection, location, arrangement and maintenance of exit facilities to provide safe means of escape for occupants from all buildings hereafter erected, altered or changed in occupancy.

(2) The first schedule contains list of tables for specific

requirements for fire safety in buildings.

Means of escape 4.-(1) The areas which are designated as means of escape shall include-

- (a) exit staircase;
- (b) firefighting lobby;
- (c) smoke stop lobby;
- (d) exit passageway; and
- (e) escape corridors.

(2) The areas which are designated as means of escape shall not be turned into other usage.

Determination of exit requirements 5.-(1) 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 6 of the First Schedule.

(2) Every storey of a building shall be provided with exit facilities for its occupant load.

(3) 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 storey below ground level, subject to the provisions of regulation 24 which prohibit basement staircases being continuous with exit staircases serving the upper storeys, unless otherwise allowed by the Relevant Authority.

Mixed occupancy 6. 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.

Multiple occupancy or use 7. 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.

Non-simultaneous occupancy

8. 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 a building on which they are located.

Capacity of exits and exit facilities

9.-(1) The capacity of exits, exit staircases, exit passageways, corridors, exit doors and other exit facilities shall be measured in units of width of half of a metre.

(2) The number of persons per unit of width shall be determined by the type of occupancy and type of exit as listed under Table 6 of the First Schedule.

(3) In the determination of each exit width, fractions of a unit width less than 250 mm shall not be credited.

(4) Where 250 mm or more are added to one or more full units, half of a unit of width shall be credited.

Requirement for two exits

10. Subject to regulation 9, 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

Determination of travel distance

11. The maximum travel distance for the respective types of occupancies shall be not greater than as provided in Table 6 of the First Schedule read together with the following-

- (a) in the case of a floor area designed with minimum two exits, the maximum travel distance as given in Table 6 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 6;
- (b) 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 6;
- (c) for the purpose of these Regulations, the most remote point from which the travel distance is measured shall be taken as being 400 mm from the enclosure walls of the room or space;

- (d) in the case of a hotel bedroom, travel distance shall be determined according to Regulation 52 for Exit Requirements for Hotels;
- (e) in the case of a residential apartment or maisonette, the travel distance shall be determined according to Regulation 36 for Exit Requirements for Residential Occupancy;
- (f) 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;
- (g) where permitted according to Regulation 22 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;
- (h) 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 that:
 - (i) the ancillary office is fire compartmented from spaces belonging to the other Purpose Groups; and
 - (ii) 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 or external exit passageway.

Mini-
mum
width

12. No exit, exit staircase or other exit facilities shall be narrower than the minimum width requirement as specified under Table 6;

(2) The minimum clear width of an exit door opening shall be not less than 850 mm.

(3) Exit access doors serving a room with an occupant load of not more than two persons shall not be less than 610 mm in clear width.

(4) A single leaf swing door along the means of egress shall not exceed 1250 mm in clear width.

Mini-
mum

13.-(1) The maximum width of exit staircases shall be not more than 2000 mm. Where staircases exceed 2000 mm in width,

width handrails shall be used to divide the staircase into sections of not less than 1000 mm of width or more than 2000 mm of width.

(2) For the purpose of determining the exit capacity of a staircase that is wider than 2000 mm that forms part of the required means of escape from any storey of the building, that part of its width in excess of 2000 mm shall not be taken into account.

Measure
ment of
width

14.-(1) The measurement of width referred to under Regulation 12 and Regulation 13 shall be the clear width, including the width of plinth to balustrade or parapet wall, in the case of an exit staircase, between-

- (a) the finished surfaces of the walls, where the staircase is enclosed on both sides by walls only, or
- (b) the finished surface of the wall and the inner side of the balustrade, if the staircase has a wall on one side and a balustrade on the other side, or
- (c) the inner sides of the balustrades where the staircase has balustrades on both sides, and the projection of handrail into the clear width of a staircase shall not exceed 80 mm on each side of the staircase; where the projection exceeds 80 mm, the clear width of the staircase shall be measured from the inner sides of the handrails.

(2) 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 as provided under Figure 10-

- (a) in the case of an exit door having two 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;
- (b) where 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 850 mm, 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; and
- (c) door hardware and handrails which do not protrude more than 80 mm into the clear width of exit opening can be ignored.

Number of exits from rooms and spaces 15. 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 2 of the First Schedule.

Number of exit staircases or exists per storey 16. 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 these Regulations.

Location of exits and access to exits 17. All exits and access facilities shall be required to comply with the following:

- (a) 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;
- (b) 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; and
- (c) 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 Regulation 247.

Smoke free approach to exit 18.-(1) Entry at every storey level to an exit staircase of any building or part of a building of more than four storeys above ground level shall be through:

- (a) an external exit passageway or external corridor that has openings for natural lighting and ventilation which are located to face and open upon-
 - (i) external space;
 - (ii) street, service road or other public space which is open to the sky; or
 - (iii) an air-well which opens vertically to the sky and having a minimum width of 6 m and a superficial plan area of not less than 93m², except that for residential occupancy, the external corridors for smoke free

approach shall comply with the requirements of Regulation 19 and Regulation 20, and in the case of dormitories and hotel bedrooms, which are served by external corridors, such corridors shall comply with Regulation 60(2) and Regulation 51 respectively;

- (b) a lobby that is separated from the adjoining areas of the building by a wall having a fire resistance of at least one hour and the exit access door shall have fire resistance of at least half an hour fitted with automatic self-closing device conforming to the requirements of Regulation 116.

(2) For the purpose of sub regulation (1) (b) the design of a smoke-stop lobby must be such as not to impede movement of occupants through the escape route and the floor area of a smoke-stop lobby shall be not less than 3m².

(3) Where the smoke-stop lobby serves as a fire fighting lobby, the floor area shall be not smaller than 6m² and with no dimension smaller than 2m and the floor shall be graded from the lift door towards the lobby door with a fall not exceeding 1 in 200.

(4) Subject to sub regulation (3), 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.

(5) The smoke-stop lobby shall be ventilated by-

- (a) permanent fixed ventilation openings in the external wall of the lobby, which must have an area of not less than fifteen per cent of the floor area of the lobby and located not more than 9m from any part of the lobby;
- (b) mechanical ventilation complying with the requirements in Part VII;
- (c) permanently fixed ventilation openings of area not less than fifteen per cent of the floor area of the lobby and located not more than 9 m from any part of the lobby, with opening to an open air well which is open vertically to the sky for its full height;
- (d) the air-well shall have a horizontal plan area of not less than 10m² or 0.1m² for each 300 mm of height of the building, whichever is greater, and the minimum width of space not less than 3000mm.

- (e) the enclosure walls to the air well shall have a minimum fire resistance of one hour and have no openings other than ventilation openings for the smoke-stop lobby, exit staircase and toilets,
- (f) cross-ventilated corridor having fixed ventilation openings in at least two external walls and the openings to each part of the external walls which are not less than fifty per cent of the superficial area of the wall enclosing the corridors, and no part of the floor area of the corridor shall be at a distance of more than 13m from any ventilation openings.

(6) The omission of smoke stop lobby required under sub regulation 1(b) to exit staircase of any building exceeding 4 storeys is allowed under the following situations, provided the door opening into the exit staircases shall be at least one hour fire resistance and fitted with automatic self-closing device to comply with the requirements of Regulation 116.

- (a) where the internal exit staircase is provided with pressurization up to a habitable height of 24m in compliance with the requirements of Part VII of these Regulations;
- (b) where an external exit staircase is constructed to comply with Regulation 22;
- (c) 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 fifty percent of the planal area of the staircase at each storey level;
- (d) in an open-sided car park floor where cross-ventilation is provided and the fire door to the exit staircase can be half an hour fire rated.

(7) The omission of smoke stop lobby to exit staircases shall not be allowed under the following situations-

- (a) where the building exceeds 4 storeys and belongs to Purpose Group III and VII;
- (b) where the internal exit staircase, which is provided with pressurization, exceeds the habitable height of 24m; or
- (c) where the exit staircase is designated as firefighting staircase adjacent to a fire lift as required in Part VI of these Regulations.

(8) Smoke free approach to exit staircase in basement occupancy shall comply with the following requirements-

(a) in a building comprising more than four basement storeys, entry to exit staircases serving the basement storeys at every basement storey level shall be through smoke-stop lobbies, one of which shall be designated as firefighting lobby, and the exit staircase connecting to the firefighting lobby shall be pressurized to comply with the requirements in Part VII of these Regulations.

(b) in a building comprising two, three or four basement storeys, entry at every basement storey level to at least one of the exit staircases serving the basement storey, shall be through a smoke-stop lobby but where only one smoke-stop lobby is provided, it shall be required to serve as a fire fighting lobby; and

(c) smoke-stop lobbies in basement occupancies shall be required to comply with the relevant provisions under sub regulation 1(b), and shall be mechanically ventilated to comply with the requirements in Part VII of these Regulations.

Area of
refuge
and exit
resuction

19.-(1) When a floor area has access to Area of Refuge in compliance with following requirements in these Regulations, 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.

(2) Area of Refuge shall be:

(i) 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 0.3m^2 per person except for health care occupancies when the occupant load shall comply with the provisions under Regulation 47 (2); and

(ii) 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.

(3) 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 one hour fire resistance.

(4) External corridors when used as entry into an Area of

Refuge shall conform to the requirements of external exit passageway for minimum width, changes in floor level, roof protection, enclosure on the open side and provision of opening of wall between the room or space and the exit passageway;

- (5) 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 Regulation 116; and
- (6) Every fire compartment in which exit reduction is permitted in connection with area of refuge shall have in addition to exit through the Area of Refuge at least one staircase complying with Regulation 23.

Means of
escape
requirements-
general

20.-(1) Means of escape shall be provided for all buildings by one or more of the facilities provided for under Section 22 of the Act and as listed in these Regulations.

- (2) Access and exit facilities not specifically covered in these Regulations shall not be used without the approval of the Relevant Authority,
- (3) Required exits shall be kept readily accessible, and doors shall be openable and unobstructed at all times during the occupancy of the building.

(4) Staircases serving all buildings except Purpose Group I shall be provided with a signage not smaller than 300 x 300 mm and within the stairwell at each storey landing.

(5) The signage shall contain the following information in the order as follows:

- (a) the storey number, at least 125 mm in height;
- (b) an identification of the staircase in alphabetical or numeric, at least 25 mm in height;
- (c) 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;
- (d) the letters and numbers on the sign may be of any colour that shall contrast with the background colour.

Internal
and
External
exit pass-
ageway

21.-(1) 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 Regulation 75.

- (2) Internal exit passageway-
 - (a) an internal passageway which serves as required exit of the building shall be enclosed with construction complying with the provisions of Regulation 75;
 - (b) an internal exit enclosure walls of an exit passageway shall have not more than two exit doors opening into the exit passageway;
 - (c) 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 Regulation 116 for fire resisting doors;
 - (d) the minimum width and capacity of exit passageway shall comply with the requirements as provided in Table 1 in first schedule;
 - (e) changes in level along an exit passageway requiring less than two risers shall be by a ramp complying with the provisions under Regulation 27; and
 - (f) where 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 Part VII of these Regulations.
- (3) External exit passageway-
 - (a) 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 3.0m from any opening of an exit staircase;
 - (b) may not be subjected to the limitations of a maximum of two exit doors opening into the exit passageway;
 - (c) may be roofed over provided the depth of the roofed over portion shall not exceed 3m to avoid smoke

logging;

- (d) may be enclosed on the open side by only a parapet wall of not less than 1.0 m 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.

(4) 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;

(5) All internal exit passageways shall be naturally ventilated by fixed ventilation openings in an external wall, such ventilation openings being not less than fifteen per cent of the floor area of the exit passageway, and

(6) Internal exit passageways that cannot be naturally ventilated shall be mechanically ventilated to comply with the requirements in Part VII of these Regulations.

Internal
and
External
Exit stair
case

22.-(1) An internal exit staircase which serves as the required exit of the building shall be enclosed with construction complying with the provisions of Regulation 106 to Regulation 114;

(2) 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; and

(3) There shall be no unprotected openings of occupancy area within 1.5m horizontally or within 3m vertically below any part of the ventilation openings located in the external wall of the internal exit staircase.

(4) 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 6 of these Regulations.

(5) 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-

- (a) the car park building shall not exceed five storey 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;

- (b) 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 ten per cent 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;
 - (c) every storey shall be provided with cross ventilation, the building shall be open sided having not less than fifty percent 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;
 - (d) 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 10m², and have a minimum dimension on plan of 2000mm, open vertically to the sky for its full height;
 - (e) travel distance within each car parking deck shall comply with Table 1 of the First Schedule, for upper storey, the travel distance requirement shall be measured to a position where the exit door to the staircase would be installed unless otherwise required; and
 - (f) 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.
- (6) 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, and
- (7) There shall be no unprotected openings within 3m horizontally or within 3m vertically below, or adjacent or facing, unless there is adequate separation complying with Regulation 85.
- (8) Any part of the external exit staircase, except in building designed with external corridor access, the access to the external exit staircase shall be permitted by means of the open sided external

corridor adjoining the occupancy areas, subject to the following-

- (a) the external corridor shall be served by at least two exit staircases;
 - (b) that unobstructed ventilation openings shall be provided along the long side of the external corridor above the parapet or balustrade;
 - (c) the external exit staircase shall be located so as to lead directly to a street or open space with direct access to street; and
 - (d) doors to the external exit staircases can be omitted, if the conditions given in Regulation 22(4)(5) are fully complied with.
- (9) All exit staircases shall discharge at ground level directly into a safe exterior open space, however, in sprinkler protected building, maximum fifty percent of the total building exits may be allowed to discharge directly to the ground level circulation space subject to the following:
- (a) the discharge point of the exit staircase shall be at a location in the circulation space at ground level within sight of and with direct access to a safe exterior open space;
 - (b) the maximum distance between the discharge point of an exit staircase and the exterior open space shall not exceed 10m; and
 - (c) the clear width of the exit doors leading to the safe exterior open space shall be adequate to receive the occupant load in the first storey circulation space and the total number of people discharging from the internal exit staircases.
- (10) The minimum width and capacity of exit staircases shall be as specified in Table 1 of the first schedule.
- (11) Exit staircases shall comply with the following:
- (a) winders shall not be permitted in any building other than for access staircases of residential buildings and in such cases, there shall be not more than 1 winder per 90 degree turn;
 - (b) where circular or geometric staircases are used as exit staircases or access staircase in Purpose Group I and II, the width of treads measured at the narrower end shall be not less than 100 mm in residential buildings and 125 mm in other buildings and at a distance of half metre from the narrower end shall be not less than 225

mm in residential buildings and 250 mm in other buildings.

(12) Where the width of the exit staircase exceeds 2000 mm, handrails shall be provided in accordance with the requirements of Regulation 15 of these Regulations.

(13) All exit staircases shall be ventilated by fixed openings in the external walls, such openings being of area not less than ten percent of the floor area per floor of the staircase, or mechanically ventilated to comply with the requirements in Part VII, exit staircase and occupancy area shall not share the same air well or void for lighting and ventilation.

(14) Any building of which the habitable height exceeds 24m, any internal exit staircases without provision for natural ventilation shall be pressurised to comply with the requirements in Part VII, in a building comprising more than four basement storey, the exit staircase connecting to the firefighting lobby shall be pressurised.

Scissor
exit
staircase

23.-(1) 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.

(2) Scissor exit staircases shall comply with all applicable provisions for exit staircase.

(3) Door opening into scissor exit staircases shall be at least 7m travel distance from each other.

Basement
exit stair
case

24.-(1) Any exit staircase which serves a basement storey of a building shall comply with all the applicable provisions for exit staircase.

(2) Exit staircase shall not be made continuous with any other exit staircase which serves a non-basement storey of the building.

(3) Basement exit staircases which are vertically aligned with the exit staircases of non-basement storey shall be separated from such other exit staircases by construction having fire resistance for a minimum period equal to that required for the enclosure.

(4) Where upper storey staircase is allowed by the Relevant Authority to be continuous with that serving the basement which is naturally ventilated, the following shall be complied with-

(a) 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 one hour fire rated;
- (b) to prevent occupants exiting continuously from upper storey 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 storey from the basement staircase;
 - (c) smoke stop lobby shall be provided for entry into the staircase at all storey, including basement where the staircase serves more than four storey; and
 - (d) appropriate signage's shall be provided inside the staircase enclosure to direct occupants out of the building at ground level.

Hard-wood staircase

25.- Hardwood staircase shall be allowed to be used as internal access staircase in building.

(2) Where timber staircases are used in units under Purpose Groups I and II buildings, which are not under conservation, the structural elements such as the stringer supporting the treads and risers shall be constructed of non-combustible material.

Spiral staircase

26.-(1) 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 750 mm may serve as required exits from mezzanine floors and balconies or any storey having an occupant load not exceeding twenty five persons.

- (2) Spiral staircases shall be not more than 10 m high.
- (3) 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.

Exit ramp

27. Internal and external exit ramps may be used as exits in lieu of internal and external exit staircases subject to compliance to the applicable requirements of Regulation 24 and to the following:

- (a) the slope of such exit ramps shall not be steeper than 1 in 10;

- (b) 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 and-
 - (i) level platforms or landings shall be provided at the bottom, at intermediate levels where required and at the top of all exit ramps;
 - (ii) level platforms shall be provided at each door opening into or from an exit ramp; and
 - (iii) 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 1 m.
- (c) exit ramps shall have walls, guards or handrails and shall comply with the applicable requirements of Regulation 22(4) for exit staircases;
- (d) all exit ramps shall be provided with non-slip surface finishes;
- (e) exit ramps shall be ventilated to comply with the requirements for ventilation of exit staircases, and
- (f) exit ramps serving as means of escape to only one basement storey need not be protected by enclosure walls.

Exit
doors and
exit
access
doors

28.-(1) Exit doors shall be capable of being opened manually, without the use of a key, tool, special knowledge or effort for operation from the inside of the building, not applicable to buildings under Purpose Group I and II.

(2) Exit doors which are required to have fire resistance rating shall comply with the relevant provisions for fire resisting doors under Regulation 116.

(3) Exit doors and exit access doors shall open in the direction of exit travel-

- (a) when leading to an area of refuge, exit and exit passageway;
- (b) 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;
- (c) when serving a high hazard area; or

(d) when serving a room or space with more than fifty persons.

(4) Exit doors opening into exit staircases and exit passageways shall not impede the egress of occupants when such doors are swung open, and 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 19 when such doors is swung open.

(5) Fire door to protected staircase and smoke stop or fire lift lobby shall be constructed to incorporate a vision panel, the clear opening for installation of the vision panel shall not exceed 60,000mm² and not less than 30 000mm² with a clear width of minimum 100mm, the vision panel height shall not be less than 600mm, 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 900 mm 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.

(6) Revolving doors shall not be used as exit doors for required exits.

(7) Exit door of each residential unit shall be located at not more than 500mm from the strata-title line to prevent the creation of large entrance alcove or corridor, however, in situation where the entrance alcove or corridor leads into an open sided common corridor which meets the requirements for smoke free approach under Regulation 36 the separation distance between the entrance alcove or corridor and the nearest exit staircase shall not be less than 3000mm.

(8) 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, except-

(a) requirement on door swing shall not apply to buildings under Purpose Group I and residential units under Purpose Group II.

(b) with prior consent from the Relevant Authority, locking of exit doors is permissible at certain rooms or spaces of health care occupancies and detention and correctional occupancies.

(c) sliding door and roller shutter as provided under

Regulation 29 are permitted to be installed across the exit access or escape paths leading to exits, including the exterior door openings except in areas stipulated under sub regulation (3) (a) and (c), these doors shall not form part of the fire compartment integrity.

Manually operable sliding doors or roller shutters

29.-(1) Manually operable sliding doors or roller shutters shall be capable of being opened and closed manually from either side of the door, the manual force required to operate the door in the direction of door travel shall not be more than 130N to set the door in motion, and 70N to close the door or open it to the minimum required width when applied at the door handle or catch or knob which is located at the opening edge of the door under still air conditions.

(2) Manually operable sliding door or roller shutter that can remain in closed position during the period of occupation is permitted at rooms or spaces with occupant load not exceeding fifty persons, when opened, it shall not reduce the effective width or height of the doorway leading to the escape route, sliding door or roller shutter is allowed within rooms or spaces that serve more than fifty 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 at a height of 1.4 m from the finished floor level, the lettering shall be 25mm in height and painted in white on a red background with reflective surface.

(3) 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 2.1m and a clear width of not less than the required door clear width, the wicket door shall comply with all the requirements of exit access door, and be clearly marked and readily visible so that the occupants can readily see where the door is, it should be fitted only with simple fastenings that can be manually operated for ease of escape.

(4) A sliding door which can be swung open as well, shall swing in the direction of escape travel when a certain horizontal force is applied to the door, when the sliding door is converted to a swing door, it shall comply with all the requirements of an exit access door, the manual perpendicular force required to open the door shall not be more than 70N when applied at the door handle or catch or knob located at the opening edge of the door under still air

conditions, a readily visible sign with the letterings in emergency, push to open shall be affixed onto the door.

(5) Power operated automatic sliding doors or roller shutters, shall be linked to the building fire alarm system, the sliding door or roller shutter shall automatically open to the required width or height of door opening upon the activation of the fire alarm, the automatic sliding door or roller shutter shall also comply with the following-

- (a) the automatic sliding doors or roller shutters shall be of the fail safe type, should there be any fault in the electrical or sensor device, or any power failure either mains or battery powered, these doors shall automatically open and remain in an open position until power is restored.
- (b) a manual override mechanism a device to trigger the immediate opening of sliding doors or roller shutters shall be provided, the doors shall open and remain open upon activation of this device, this device shall be housed in a break glass box located beside the sliding doors or roller shutters and fixed at a height of 1.4m above the finished floor level, it shall be easily accessible, conspicuous and be free from obstructions, a readily discernible sign with the lettering emergency door release shall be permanently pasted beside the switch, the letterings shall be of at least 15mm in height.
- (c) where powered sliding doors, roller shutters and swing doors that belong to the unit owners or tenants are not required to be linked to the building fire alarm system, provided they are designed as fail safe type, installed with manual over-ride, and do not form part of the building's fire protection system.

(6) Any exit door or exit access door serving spaces of assembly or mass occupation, such as auditorium, concert hall, theatre, assembly hall, exhibition hall, cinema, which has to be kept shut and fastened while the building or part of the building is occupied shall be fitted with panic bolt, the panic bolt shall operate to open the door when a pressure is applied on the bar in the direction of travel and be appropriately marked push bar to open in letters not less than 50mm high.

(7) Locking of staircase and smoke stop or fire lift lobby

doors, one way locking device is allowed to be provided to doors of exit staircase, smoke stop or fire lift lobby in the following situations, provided only one-way locking device is used as panic bolt or thumb turn locking device-

- (a) exit door between staircase shaft and occupancy area;
 - (b) exit access door between smoke or firefighting lobby and occupancy area;
 - (c) exit door between staircase shaft and smoke stop lobby;
 - (d) exit door between staircase shaft and circulation area;
 - (e) exit access door between smoke stop or firefighting lobby and circulation area, except floors provided under Regulation 29(8), the doors of the firefighting or exit staircase and smoke stop or firefighting lobby shall not be fitted with any locking device to allow for re-entry from the staircase to the interior of the building.
- (8) Where access-control is provided to exit door using smart card locking device, magnetic bar and electro-mechanical locking device-
- (a) 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;
 - (b) the door shall be arranged to unlock from a manual release device located within the occupancy space, 1200mm 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; and
 - (c) 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 first storey 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 centre and or building control room which shall be manned twenty four hours.

(9) Every exit staircase enclosure serving more than seven storey 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 one level where it is possible to re-enter into the interior of the building from the staircase enclosure.

(10) The re-entry points shall be located not more than six storey apart, there shall not be more than three storey above the highest re-entry door in the building.

(11) 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.

(12) Staircase doors permitting re-entry into the building shall be identified with a signage re-entry door of min. 50mm lettering height on the staircase side of the staircase door.

Residential buildings of purpose group I

30. Means of escape for a building or a separate part of a building of single occupancy of Purpose Group I may be provided through access staircases, and exit staircase under the provision of Regulation 20 is not required.

Residential buildings of purpose group II

31. Means of escape for a building or a separated part of a building of Purpose Group II shall comply with the provision of Regulation 20.

No of exit staircases or exits per storey

32. 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 Regulation 16 unless otherwise permitted.

Provision for buildings not exceeding 24m in height

33. 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-

- (a) the exit staircase shall comply with the requirements of Regulation 22.

- (b) where the building consists of more than four storey, approach to the exit staircase on all storey shall comply with the requirements of smoke free approach to exit staircase under Regulation 61
- (c) access to the building for firefighting appliances being provided for in compliance with the requirements in Part IV.

Provision
for
buildings
not
exceed-
ing 24m
in height

34. In a block of residential apartments or maisonettes exceeding 24 m in height, one exit staircase only may be allowed to serve every upper storey, provided that-

- (a) the height not exceeding 60 m unless otherwise permitted by the Relevant Authority;
- (b) the single exit staircase shall serve not more than four apartments or maisonettes at each storey level;
- (c) provision of exits from each residential apartment or maisonette shall comply with the requirements under Regulation 35;
- (d) travel distance from the most remote exit door to the exit staircase from each apartment or maisonette shall not exceed 15 m;
- (e) exit staircase shall comply with the requirements of Regulation 22 for exit staircases;
- (f) approach to the exit staircase shall be through cross-ventilated lobby, the ventilation openings having a minimum width of 2000 mm and a minimum height of 1200 mm shall be unobstructed from parapet wall or balustrade level upwards and be positioned on opposite sides of the lobby such that they provide cross-ventilation throughout the entire space of the lobby, where multiple ventilation openings are provided on opposite sides of the lobby, the minimum width and height of each opening shall not be less than 1000 mm and 1200 mm respectively, provided further that the aggregate width of the openings at each opposite side is not less than 2000 mm as stipulated in Figure 9;
- (g) fire lift shall be provided to comply with the requirements in Part VI;

- (h) dry rising main shall be provided to comply with the requirements in Part VI; and
- (i) access to the building for firefighting appliances shall be provided to comply with the requirements in Part IV.

Exits
from
Residential
unit

35-(1) 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 as stipulated in Figure 8.

(2) In the case of a maisonette unit comprising of not more than two storeys, where a single door is provided-

- (a) the door shall not be located on the upper storey of the unit; and
- (b) the floor area of the upper storey shall not exceed 60 m², unless a separate exit is provided on this upper storey.

(3) All exits from residential or maisonette units shall have direct access to exit staircase, exit passageway or exterior open space.

Measure-
ment of
travel
distance

36. 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 where only one way escape or one exit staircase only is provided, the travel distance shall be measured from the most remote door, unless two way escape is achieved, the travel distance shall be measured from each of the doors.

Smoke
free
approach
to exit
staircase

37. 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-

- (a) such external corridors conform to the requirements of external exit passageways for minimum width, headroom clearance, 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 3000 mm, 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;

- (b) the residential apartment or maisonette shall be separated from the external corridor by an external wall with fire resistance rating of at least one hour, except that ventilation openings of non-combustible construction may be fixed at or above a level of 1.1 m, measured from the finished floor level of the external corridor to the sill level of the opening.

Travel distance

38.-(1) In a block of residential apartment or maisonette where the means of escape is through an external corridor, the one-way travel distance measured from the door of the apartment or maisonette to exit staircase shall not exceed 20m or 24m where the aggregate one-way travel distance within the unit and along the external corridor does not exceed 40m.

(2) Subject to sub regulation (1) one-way travel distances along the external corridor shall not apply to residential apartments or maisonettes in a building exceeding 24m permitted under Regulation 33.

(3) In a block of residential apartments or maisonettes, the two-way travel distance may be extended to 45m where the means of escape is through an external corridor as in Regulation 37.

(4) In buildings which are required to be provided with rising mains, the number and distribution of rising mains specified in Part VI shall be complied with.

Protection of staircases

39. The provisions of Regulation 22 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 that-

- (a) the exit staircases are cross-ventilated and maintained undersmoke-free condition at all times; and
- (b) unprotected openings of the apartment or maisonette units are not facing or ventilating into the exit staircase enclosures as shown in Figure7.

Residential doors opening into external corridors

40. Doors of residential apartments or maisonettes opening into external corridors need not have fire resistance rating.

Attic floor

41. An attic in buildings under Purpose Group I and II may be constructed of timber boardings on timber joists, provided it is protected to achieve the fire resistance rating required of the elements of structure of the building or compartment.

Health care occupancy and hospital

42.-(1) The provisions of this regulation shall apply to health care occupancies and hospitals.

(2) Every building used for medical and surgical care shall comply with the following requirements include general hospitals, hospitals for psychiatric care, children's hospitals, with 24 hours or in-patient service.

- (a) patient accommodation area containing beds shall not be located in the basement storey;
- (b) each patient accommodation ward area shall be provided with at least two exits, which shall be remotely located from each other, where the occupant load exceeds fifty persons;
- (c) 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 Regulation 47(2);
- (d) each patient accommodation ward shall not exceed a floor area of 750m² and an occupant load of seventy five persons, calculated on the basis of gross floor area of 10m² per person;
- (e) each patient accommodation ward area shall be constructed as a compartment having fire resistance rating of at least one hour for walls or ceilings and half hour fire door for protection of door openings; the internal walls between wards shall be constructed to have minimum one hour fire resistance rating and door opening shall be protected by half hour fire door; for walls and doors between ward and main exit access corridor either internal or external corridor, the

requirements given in this regulation shall be complied with, this requirement shall not be applicable to patient accommodation floor which is sprinkler protected;

- (f) 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 first 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, in the event of a fire, by any means other than a bed, patient trolley or similar conveyance;
protected shaft containing an escape bed-lift shall be constructed to comply with the relevant requirements under Regulation 106;
- (g) the entry into the escape bed-lift and the protected exit staircase shall be through a common protected lobby which shall-
 - (i) have a floor area of not less than 9 m², having a depth of minimum 2.5m perpendicular to the lift landing door;
 - (ii) be large enough to hold a minimum of two beds, attendant staff and additional equipment;
- (i) in the situation where the protected lobby is also acting as a smoke stop lobby or firefighting 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;
- (j) escape bed-lift shall be used for the evacuation of patients in beds including those confined to wheelchairs or physically disabled, in a fire emergency;
- (k) a signage shall be posted outside the bed-lift stating fire escape bed-lift;
- (l) the escape route for the escape bed-lift at the first storey level shall be made protected from other occupancy areas by minimum one hour fire resistance separation and shall discharge directly into a safe exterior space;
- (m) 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,

- (n) an escape bed-lift shall be provided with the following features:
 - (i) a duplicate power supply from an emergency generating plant;
 - (ii) a switch labelled 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;
 - (iii) a communications system except in second storey building should be installed to allow communication between occupants at each lift landing and the operator in the lift car.
- (o) the installation of escape bed-lifts shall be in accordance with BS ISO 4190 Part 1.
- (p) Patient accommodation ward with access through an internal access corridor shall comply with the requirements as follows:
 - (i) each ward shall be separated from the internal access corridor by a wall having fire resistance of at least one hour;
 - (ii) 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 Regulation 116 or held open by electromagnetic or electromechanical device;

Provided that requirements on fire compartmentation will not be applicable if the patient accommodation floor is sprinkler protected;

 - (iii) internal access corridors shall be naturally ventilated with fixed openings in an external wall, such ventilation openings being not less than fifteen percent of the floor area of the internal access corridor;

- (iv) the ventilation opening in the external walls shall not be less than 3.5m² 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;
 - (v) the ventilation openings in the external walls shall not be more than 12m from any part of the internal access corridor;
 - (vi) internal access corridor may be provided with mechanical ventilation and pressurisation in lieu of natural ventilation; and
 - (vii) 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 compartmentalised by minimum one hour fire rated enclosures and minimum half an hour fire doors;
- (o) patient accommodation ward with access through an external access corridor shall comply with the requirements as follows:
- (i) it shall be separated from the external access corridor by a wall having fire resistance of at least one 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;
 - (ii) doors opening into the external access corridor shall not be required to have fire resistance rating; and
 - (iii) 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 1000 mm height along the outer side of the corridor.

- (p) entry into an exit staircase from any part of a building of more than four storey above ground level shall comply with Regulation 18;
- (q) pressurisation of staircase in lieu of the provision of smoke stop lobby is not permitted.
- (r) 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 6m².
- (s) 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.
- (t) the width of stair, landing width and depth shall comply with the requirement as provided in Table 3 of the First Schedule.
- (u) a building or part thereof, used for the housing and nursing care of persons, who because of mental or physical incapacity, 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 this regulation.

Custodian
care
facility

43.-(1) Every custodian care facility shall be compartmentalised from other spaces and occupancies by walls and doors having at least one hour fire resistance rating.

(2) Where facility referred to under sub regulation (1) is located on the first storey, it shall be provided with direct access to the exterior of the building and in case it is located on the upper storey it shall be sited adjacent to an exit staircase with direct dedicated access through smoke stop lobby to the staircase.

(3) Institutions for the mentally disabled shall be designed with each storey having an area of refuge in accordance with Regulation 24 and Fire safety requirements shall be in accordance with Regulation 41.

(4) For the purpose of this regulation 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.

Supervi-
sory care
facility

44. Every building or part thereof, used for the housing, on a twenty four 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 shall comply with fire safety requirements provided under Regulation 42(2) save for provision of escape bed-lift and staircase landing width or depth.

Ambula-
tory
health
care
centre

45.-(1) Ambulatory Health Care Centre, where located within a building of mixed use, shall be compartmentalised from other tenants and occupancies by walls and doors having at least one hour fire resistance rating.

(2) The Ambulatory Health Care Centre shall be provided with its own means of escape to at least one exit staircase.

(3) Ambulatory Health Care Centre shall fully comply with Fire Safety requirements provided under Regulation 42(2) except for provision of area of refuge for horizontal evacuation, escape bed-lift and staircase landing or depth.

Number
of doors
for
patient
sleeping
room

46.-(1) In compliance with the provisions of Regulation 15 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 fifty persons.

(2) Rooms and spaces with occupancy of fifty persons or more shall comply with the requirements of Regulation 55 for Assembly Occupancy.

Area of
refuge
occupancy
load

47.-(1) Where Area of Refuge serves as required exit, the calculation of area for refuge occupants shall be based on the following:

- (a) hospitals - 2.8m² per person;
- (a) nursing homes - 2.8m² per person;
- (b) custodian care facility - 1.4m² per person;
- (c) supervisory care facility - 0.56m² per person;
- (d) ambulatory health care centre - 1.4m² per person.

(2) On storey of hospitals or nursing homes where patient accommodation is not provided, at least 0.56m² per occupant shall be taken for the calculation of the area for refuge of occupants.

- Number of exit staircase per storey for office shop, factory and warehouses occupancy
- 48.-(1) 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 Regulation 16.
- (2) Where a building is of non-combustible construction and not exceeding four storey one exit staircase may be permitted to serve the upper storey, subject to the following conditions-
- (a) the maximum travel distance on any storey complies with column (ii) of Table 6;
 - (b) exit staircase conforms to the requirements of Regulation 22;
 - (c) the gross floor area of each upper storey of shop, factory and warehouse building does not exceed 200m², including service ducts, lift shafts, toilets, staircase;
 - (d) the habitable height of the shop, factory or warehouse building does not exceed 15m; and
 - (e) access to the building for firefighting appliances are provided for in compliance with the requirements in Part IV.
- Internal corridor to hotel bedrooms
49. Hotel bedrooms with access through an internal corridor shall comply with the requirements as follows:
- (a) hotel bedrooms shall be separated from the internal corridor by a wall having fire resistance of at least one hour;
 - (b) 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 Regulation 116;
 - (c) internal corridors shall be naturally ventilated with fixed openings in an external wall, such ventilation openings being not less than fifteen per cent of the floor area of the internal corridor, and internal corridors which cannot be naturally ventilated shall be pressurised to comply with the requirements in Part VII; and
 - (d) other rooms or spaces which open into or form part of the bedroom corridor which may *prejudice* the

means of escape provision shall be required to be compartmented to the same extent as the bedrooms.

External
Corridor
of hotel
bedrooms

50. Hotel bedrooms with access through an external corridor shall comply with the requirements as follows:

- (a) hotel bedrooms shall be separated from the external corridor by a wall having fire resistance of at least one hour, except that ventilation openings of non-combustible construction may be fixed at or above a level of 1.1 m, measured from the finished floor level of the external corridor to the sill height of the opening;
- (b) doors opening into the external corridor shall not be required to have fire resistance rating; and
- (c) 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.

Number
of the
exit doors
from
hotel
bedrooms

51.-(1) The hotel bedroom or suite shall require one exit access door provided that the distance measured from the most remote point in the bedroom or suite to the door does not exceed 15 m.

(2) Where the distance measured from the most remote point in the hotel bedroom or suite to the exit door exceeds 15m, there shall be at least two exit doors located.

(3) In the case of hotel bedrooms in a building fitted throughout with an automatic sprinkler system which complies with the requirements in Part VI, the distance measured from the most remote point in the bedroom or suite to the door shall not exceed 20m, for bedrooms with provision for one door remote from each other in accordance with Regulation 247.

Measure-
ment of
travel
distance
in a hotel
bedroom

52.-(1) The travel distance in a hotel bedroom or suite shall be measured from the exit door of the hotel bedroom or suite to the exit door of an exit staircase, exit passageway or exterior open space.

(2) Where only one way escape is provided along the corridor, the travel distance shall be measured from the most

remote exit door of the bedroom, and if two way escape is provided, the travel distance shall be measured from each of the exit doors of the bedroom.

Spacing
of smoke
barrier

53.-(1) Internal corridors which are not naturally ventilated shall be subdivided by smoke barriers into the following lengths, building protected by sprinkler system 45m and building not protected by sprinkler system 30m.

(2) The smoke barriers shall consist of non-combustible partitions containing smoke check doors.

(3) 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.

(4) 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.

(5) Smoke check doors excluding glass doors, shall be provided with clear glass vision panels having at least twenty five percent of the surface area of each door leaf.

(6) 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.

(7) The smoke check doors shall be closely fitted around their edges and the bottom clearance gap between such doors and the floor shall not exceed 4 mm.

(8) Smoke check doors shall normally be in the closed position, but they may be left open unless 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.

Assem-
bly
occupa-
ncy

54.-(1) For the purpose of this Regulation Assembly Occupancy includes all buildings or portions of buildings used for gathering together of more than fifty persons for such

purpose as deliberation, worship, entertainment, eating, drinking, amusement or awaiting transportation.

(2) Without prejudice to the provision of sub regulation (1) the Assembly Occupancies shall include-

- (a) performance Theatres;
- (b) cinemas;
- (c) Assembly Halls;
- (d) Auditoriums;
- (e) Exhibition Halls;
- (f) Museums;
- (g) skating Rinks;
- (h) Gymnasiums;
- (i) bowling Establishments;
- (j) pool Rooms;
- (k) armouries;
- (l) mortuary Chapels;
- (m) libraries,
- (n) restaurants,
- (o) nightclubs,
- (p) discotheques,
- (q) churches,
- (r) dance Halls,
- (s) club Rooms,
- (t) passenger Stations and Terminals of Public Transportation Facilities,
- (u) courtrooms, Conference Rooms; and
- (v) drinking Establishments.

Number and width of exit facilities for Assembly occupancies

55. Number and minimum width of exits for assembly occupancies shall comply with the provisions as provided under Table 4 of the First Schedule.

Requirements for Aisles and

56. Assembly occupancy with fixed seating shall comply with the requirements as follows-

- (a) clear aisles or gangways of not less than the

Gang-ways

- minimum width of corridors shall be provided around the auditorium, stalls and balconies leading to doors or exit doors;
- (b) 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 provided in Table 5 of the First Schedule.
 - (c) 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;
 - (d) 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;
 - (e) flooring for the surface of steps and ramps forming the aisles or gangways shall be finished using non-slip materials; and
 - (f) illumination of steps shall be such that each step is clearly visible in the event of emergency.

Combustible seats

57. The construction of combustible upholstered seats in cinema, theatre, auditorium, shall comply with BS 5852 in respect of the following testing standard-
- (a) Smouldering Ignition Source;
 - (b) Flaming Ignition Source 1; and
 - (c) Crib Ignition Source 5.

Exits from a theatre cinema or a concert hall

- 58.-(1) 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 with 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.
- (2) Notwithstanding the provision of sub regulation (1), where the occupancy load does not exceed two hundred

persons, at least half the capacity of exits shall be provided within the compartment.

(3) 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, and each Cineplex shall be treated as a single big cinema for the purpose of determining the exit requirements under this regulation.

(4) Where the occupancy load of the cinema, theatre, concert hall and the like does not exceed two hundred persons, the exits adjacent or attached to cinema, theatre or concert hall and the like can be shared as exits with the other parts of the building, provided the exits are accessible from the common circulation areas.

Dormitor
ies

59.-(1) 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.

(2) Each dormitory bedroom shall not exceed 120m².

(3) The occupant load shall be based on gross floor area on the basis of 3m² per person or based on the actual number of occupants for which each occupied space of the floor is designed as shown on the plan, whichever is greater.

(4) There shall be at least two independent exit staircases or other exits from every storey of a building.

(5) 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 6.

Internal
and
External
corridor
to
dormit-

60.-(1) Dormitory bedrooms with access through an internal corridor shall comply with the requirements as follows-

(a) dormitory bedrooms shall be separated from the

ory
bedrooms

- internal corridor by a wall having fire resistance of at least one hour;
- (b) 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 Regulation 116;
 - (c) internal corridors shall be naturally ventilated with fixed openings in an external wall, such ventilation openings being not less than fifteen percent of the floor area of the internal corridor;
 - (d) the ventilation openings in the external walls shall not be less than 3.5m² and shall be unobstructed from parapet wall or balustrade level upwards and be positioned on opposite sides of the corridor such that they provide effective cross-ventilation throughout the entire space of the corridor;
 - (e) the ventilation openings in the external walls shall not be more than 12m from any part of the corridor;
 - (f) pressurisation of internal corridors in lieu of natural ventilation is not permitted, and
 - (g) 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 one hour fire rated enclosures and half an hour fire doors.
- (2) Dormitory bedrooms with access through an external corridor shall comply with the requirements as follows-
- (a) dormitory bedrooms shall be separated from the external corridor by a wall having fire resistance of at least one hour, except that ventilation openings of non-combustible construction may be fixed at or above a level of 1.1 m, measured from the finished floor level of the external corridor to the sill height of the opening;
 - (b) doors opening into the external corridor shall not be required to have fire resistance rating; and

- (c) 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.

Smoke free approach to exist staircase

61.-(1) Entry into an exit staircase from any part of a building of more than four storeys above ground level shall comply with requirements of Regulation 18.

(2) Pressurisation of staircase in lieu of the provision of smoke stop lobby shall not be permitted.

Exit lighting

62. 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 Part VIII.

Exist and directional sign

63. 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 Part VIII.

Photo luminescent marking

64.-(1) All buildings, except Purpose Groups I and II, photo luminescent marking or tape to guide occupants along evacuation routes to appropriate exit shall be provided:

- (a) along internal walls and or floors of the exit staircase and protected lobby;
- (b) at the exit staircase door; and
- (c) in designated corridor with exit directional sign.

(2) Photo luminescent marking or tape shall not be applicable to Purpose Groups III, IV, V, VI, VII and VIII unless the emergency lighting system is back-up by secondary power supply and self-contained battery power unit.

(3) 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 150 mm or more than 400 mm above the floor level.

**PART III
STRUCTURAL FIRE PRECAUTIONS**

General provisions on structural fire precautions

65. This Part stipulates requirements to minimise 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.

Compartment size-floor area and cubical extent

66. Any building other than a building of Purpose Group I which has-

- (a) any storey the floor area of which exceeds that specified as relevant to a building of that height in column (2) of Table 7, or
- (b) a cubic capacity which exceeds that specified as relevant in column (3) of Table 7, shall be divided into compartments by means of compartment walls and compartment floors so that-
 - (i) no such compartment has any storey the floor area of which exceeds the area specified as relevant to the building in column (2) of the Table; and
 - (ii) no such compartment has a cubic capacity which exceeds that specified as relevant in column (3) of the Table.

Cubical extent for compartment exceeding 4m in height

67.-(1) In computing the cubical extent of compartments in single storey buildings such as factories, sport halls, markets, food courts, 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.

(2) 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.

(3) Where two buildings are connected by external open-sided covered way or covered link-bridge, the buildings are considered as separate buildings, unless the following conditions are

complied with:

- (a) there is no commercial activities or other usage that would pose a fire risk within the covered way or link-bridge;
- (b) the width of the covered way or covered link-bridge shall not exceed 5m measured from eave to eave, except the requirement provided under Regulation 66 is not applicable when the building is:
 - (i) fitted throughout with an automatic sprinkler system which complies with the requirements in Part VI; and
 - (ii) complies with Regulation 68, Regulation 70 and provision of the Second Schedule.

Compartmentation by height

68.-(1) No habitable compartment up to a height of 24m shall comprise more than three storeys except those mentioned under Regulation 68(3).

(2) The requirement of sub regulation (1) can be relaxed for atrium spaces provided that design of such spaces complies with the conditions provided under Regulation 70.

(3) In any building which exceeds 24m in habitable height, no compartment shall extend to more than one storey for compartments at storey level exceeding 24m above average ground level, other than a compartment which is within a residential maisonette which may extend to two storey levels.

(4) Buildings under Purpose Group I may consist of more than three floors if they are occupied as a single household dwelling.

Other cases requiring compartment walls and compartment floors

69.-(1) The following situations shall require compartmentation by provision of compartment walls and compartment floors:

- (a) 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;
- (b) 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 20 except the following:

- (i) ancillary offices located within a building or compartment of Purpose Group III, V, VI, VII and VIII;
 - (ii) rooms or spaces for ancillary usage located within a building or compartment of Purpose Group III, IV, V, VI, VII and VIII;
 - (iii) rooms or spaces located within a sprinkler protected building, unless otherwise stated in these Regulations.
- (c) any floor immediately over a basement storey unless such storey-
- (i) 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 first storey grade level;
 - (ii) has an area exceeding 100m² except that in the case of a building or compartment of Purpose Groups IV, V and VII, the Relevant Authority may consent to exemption from the above requirements provided the building is fitted throughout with an automatic sprinkler system in compliance with the requirements in Part VI and the floor at first basement storey level is constructed as a compartment floor unless the building comprises of more than one basement storey;
- (d) 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 sub paragraph (c)(ii) 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;
- (2) 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 two hours.
- (3) The kitchen shall be separated from other parts of the

same building by compartment wall and floor having fire resistance of at least one hour.

(4) Openings in the compartment wall and floor of the kitchen shall comply with the relevant provisions of Regulation 115 for protection of openings.

(5) Doors of the kitchen shall have fire resistance of half an hour and fitted with automatic self-closing device.

(6) Where the flue or duct passes through the compartment wall or floor of the kitchen, the flue or duct shall be encased by noncombustible construction to comply with the requirements of Regulation 119 and no damper shall be permitted to be installed in such flue or duct.

(7) Separation requirement for kitchen could be exempted under the following conditions:

(a) when all the cooking facilities in the kitchen are fitted with approved extinguishing systems;

(b) when there are at least twenty five percent 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 or 12m from the nearest opening;

(c) when an eating establishment is separated from other parts of the same building by walls and floors having fire resistance of at least one hour and doors having fire resistance of at least half an hour; and provided 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 150m².

(8) LPG LNG OR CNG 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 and Rescue Force (General Fire Precaution) Regulations.

(9) Notwithstanding the provision of sub regulations (7) and (8), the compartment where open flame cooking activities is carried out shall not comprise more than one storey.

(10) 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 two hour, unless the building is protected by an

automatic sprinkler system.

(11) The fire resistance rating of the compartment walls or floors can be reduced to one 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.

(12) The openings of a theatre, cinema or concert hall 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:

- (a) the lobby is enclosed by walls having fire resistance of at least one hour, is naturally ventilated complying with the requirements for ventilation of smoke stop lobbies, or mechanically ventilated to comply with the requirements in Part VII;
- (b) all doors to the lobby shall each have fire resistance of not less than half an hour and fitted with automatic self-closing device.

(13) Where theatres or concert halls is separated by proscenium wall-

- (i) in a place of public resort, such as theatres, and concert halls, capable of seating more than five hundred 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 one hour fire resistance in such a way that the stage and the audience seating area form separate compartments;
- (ii) the proscenium opening shall be protected by fire curtain with fire resistance of at least one hour, automatically operated by a fusible link or a smoke detector, in lieu of fire curtain, a smoke curtain is acceptable, unless engineered smoke control and automatic sprinkler systems are to be provided to the stage area;

- (iii) not more than three other openings may be provided in the proscenium wall, such openings shall not exceed 2m² 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
- (iv) the entire stage side of the proscenium wall shall be fitted with an automatic sprinkler system which complies with the requirements in Part VI.

(14) 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 one hour, unless otherwise permitted under Regulation 50 for the provision of window openings between the guestroom or accommodation unit and external corridor.

(15) 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 Regulations 49 and 50.

(16) Every dwelling house shall have portable fire extinguisher(s) and smoke alarm(s).

(17) 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 one hour, unless otherwise permitted under Regulation 60(2) for the provision of window openings between the bedroom and external corridor.

(18) 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 Regulations 60.

(19) Dormitory kitchen shall be enclosed with minimum one 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.

(20) 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 two 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 four hours.

(21) 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 two hours, where spray painting booths that have built-in vapour extraction system complying with NFPA 33, the fire resistance requirement is not applicable.

(22) 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 two hours to one hour.

(23) 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.

(24) Where a coldroom has a floor area exceeding 10m², a separate outer layer of non-combustible construction, including the door, having minimum one hour fire resistance rating, shall be provided to compartmentalize the coldroom enclosure from other areas.

(25) Provision of the fire resisting outer layer enclosure, including the fire door to the coldroom would not be required unless-

- (a) the coldroom has a floor area not exceeding 20m² 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;
- (b) the cold room is located in a building under Purpose Groups I or II;
- (c) the cold room is located in a kitchen compartment

with or without open flame cooking appliances in an eating establishment, provided the floor area of the cold room does not exceed 20m², and the kitchen is compartmentalised from other parts of the building by compartment walls and floor having minimum one hour fire resistance and door having minimum half an hour fire resistance, irrespective of the relaxation allowed under this regulation;

(d) the insulation material for the cold room shall pass Class B under BS EN 13501 or its equivalent.

(26) For non-sprinklered buildings, the area of the store room exceeds 10m², it shall be compartmented from the other parts of the same building by compartment walls and floors having fire resistance of not less than one hour.

(27) No fire compartmentation is required for a store room which is housed within a sprinklered protected building, but store room exceeding 700m² and 100m² for above-ground and below-ground respectively are subject to the compartment size requirements stipulated under Second Schedule.

(28) 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 two hours.

(29) Where the building is protected by an automatic sprinkler system, the fire resistance rating of the compartment walls and floors can be reduced to one hour.

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

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

(32) Fire compartment between car parking area Purpose Group VIII and other areas shall be provided and the fire compartment walls and floors shall have minimum one hour fire rating.

(33) Warehouse compartment size exceeding 700m² above ground level and 100m² below ground level are subject to full compliance of the Second Schedule.

Provisions
for
Atrium
spaces

70. The Relevant Authority may consent to modify the requirements under Regulations 66 and 68 for the design of Atrium spaces in a building provided the following conditions are complied with:

- (a) the minimum plan area of the Atrium void shall be not less than 93m² and no horizontal dimension between opposite edges of the floor opening is less than 6m wide;
- (b) occupancy within the floor space of the Atrium meets with the specification for low or ordinary hazard content;
- (c) 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;
- (d) the building is fitted throughout with an automatic sprinkler system to comply with the requirements in Part VI;
- (e) the building is fitted with an engineered smoke control system in accordance with Regulation 230; and
- (f) provision of openings and enclosures, and the planning of means of escape shall be subject to the approval of the Relevant Authority.

Buildings
of high
hazard
occup-
ancy

71.-(1) The compartment of buildings of high hazard occupancy shall not exceed one half of the sizes given in Table 7 and each compartment shall comprise one storey only.

(2) 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 Part VI.

(3) The type of storage materials or substances shall not include the following:

- (a) materials that will flame up by themselves without the presence of any fire source below the ignition temperature of 200°C; and
- (b) combustible or highly flammable materials.

Exemption
from
Regulation
66 on size
limitation
of compart-
ment

72. The requirements of Regulation 66 may be exempted under the following circumstances:

- (a) 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;
- (b) single storey buildings of Purpose Group VI, provided that the buildings are used solely for the sale, storage, processing and packaging of goods and substances of a non-combustible nature;
- (c) open sided car parking decks having not less than fifty percent of the sides permanently open and unobstructed, and such openings being evenly distributed along each of the perimeter walls and on every individual floor or deck, excluding perimeter walls to air-well, so as to provide cross ventilation to all parts of the car parking decks; and
- (d) no part of the floor space shall be more than 12m from the openings on the perimeter walls of the building or air-well;
- (e) air-well where provided for the purpose of paragraph (d) shall have a superficial plan area of

not less than 10m², or 0.1m² 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.

Additions and alterations to existing buildings

73. The areas undergoing additions and alterations to existing buildings, shall be separated from other occupied areas of the building in accordance with Regulation 154.

Fire resistance of elements of structure

74.-(1) Subject to any 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 Regulation 154 relevant period specified in Table 8 having regard to the Purpose Group of the building of which it forms a part and the dimensions specified in that Table, provided that-

- (a) any separating wall shall have fire resistance of not less than one hour; and
 - (b) any compartment wall 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 one hour.
- (2) For the purpose of this Regulation-
- (a) any reference to a building of which an element of structure forms a part means the building or the building is divided into compartments any compartment of the building of which the element forms a part;
 - (b) any reference to height means the height of a building, but where 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;

- (c) any element of structure forms part of more than one building or compartment and the requirements of fire resistance specified in Table 8 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;
- (d) 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, where they are not relied on to contribute to the fire resistance of the wall or floor.

Exemption
for non-;
pad bearing
external
walls and
steel
structures
for
standalone
car park

75. The requirement on fire resistance in Regulation 74 shall not apply to:

- (a) any part of any external wall which is non-load bearing and can, in accordance with Regulation 84 be an unprotected area.
- (b) steel structures for standalone car park where the following conditions are fulfilled:
 - (i) 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;
 - (ii) the area of the openings shall not be less than fifty percent of all external walls or fifteen of the footprint per storey, whichever is greater, this condition is not applicable where sprinkler system is installed throughout the car park;
 - (iii) no point on any storey shall be more than

- 12m from external air or air-well;
- (iv) air-well where provided for the purpose of paragraph (iii) shall have a superficial plan area of not less than 10m², or 0.1m² 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;
 - (v) the condition under paragraph (iv) shall not be applicable if sprinkler system is installed throughout the car park;
 - (vi) all floor beams shall be designed as a composite structure with the floor slab;
 - (vii) where a building is not more than 24m in habitable height, there shall not be any basement storey;
 - (viii) no other usages shall be permitted other than the electrical services that serve only the car park;
 - (ix) steel structures shall meet the specifications of BS 5950 part 8 or other acceptable standards ; and
 - (x) requirements provided under paragraph (i) to (ix) shall apply for car park for passenger vehicles.

Exemption for single storey buildings

76. 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 Regulation 74 shall not apply to any element of structure which forms part of the first storey and consists of:

- (a) 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 these Regulations for that wall or gallery;

- (b) an internal load bearing wall or a load bearing 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
- (c) part of an external wall which does not support a gallery and which may, in accordance with Regulation 84 be an unprotected area.

Wall
separating
Residential
apartment
or
maisonette

77. 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 one hour unless-

- (a) the wall is a wall forming part of a protected shaft and the minimum period of fire resistance required by the provisions of this Regulation for the protecting structure is more than one hour; or
- (b) 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 these Regulations for any element of structure in that part is more than one hour.

Suspended
ceiling

78. 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 11 for Limitations on Fire Protecting Suspended Ceilings.

Fire rated
board

79. 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:

- (a) material shall be non-combustible BS 476 Part 4 or Part 11;
- (b) it shall have fire resistance for not less than the relevant period specified in Table 8 having regard

to the Purpose Group of the building of which it forms a part and the dimensions specified in that Table;

- (c) 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 or other acceptable standards for calcium silicate or cement board; and
- (d) dry wall shall meet the criteria, in terms of impact and deflection performance, when subject to the test of BS 5588 or Part 5 Appendix A and BS 5234 Part 2 or other acceptable standards

Prohibition of the use of fire rated board

80.-(1) Fire rated boards shall 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.

(2) In buildings under Purpose Groups VI and 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 the Relevant Authority.

Test of fire resistance

81.-(1) 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 or other acceptable standards Part 20 to 23, which specify tests for stability, integrity and insulation.

(2) Specific requirements for each element in terms of the three performance criteria of stability, integrity and insulation are given in Table 11.

Requisite fire resistance

82. An element of structure or other part of a building shall be deemed to have the requisite fire resistance unless-

- (a) 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 other acceptable standards Part 20 to 23, and satisfies the requirements of that test for the three performance

criteria of stability, integrity and insulation for not less than the specified period; or

- (b) in the case of a wall, beam, column, stanchion or floor to which Regulation 81 and Table 11 of the First Schedule relates, it is constructed in accordance with one of the specification set out in that Table and the notional period of fire resistance given in that Table as being appropriate to that type of construction and other relevant factors is not less than the specified period.

Timber floors

83. The use of timber floors shall not be allowed, except:

- (a) for an attic in buildings under Purpose Groups I and II; and
(b) in buildings designated for conservation where the timber floors are required to be retained, but subject to compliance with the technical guidelines for fire safety requirements affecting shop houses under conservation.

Requirements for external walls

84. Requirements for External Walls shall be as follows:

- (a) 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-
- (i) be constructed wholly of non- combustible materials apart from any external cladding which complies with Regulation 87 or any internal lining which complies with Regulation 143, and
(ii) be so constructed as to attain the fire resistance required by this Part;
- (b) 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 paragraph (a).

Exception to requirements for external walls

85.-(1) The requirements of Regulation 84(a)(i) for non-combustibility of external walls shall not apply to the external wall of a building or separated part of a building-

- (a) unless that wall is:
 - (i) situated 1m or more from the relevant boundary;
 - (ii) not exceeding 15m in height; and
 - (iii) separated as described in Regulation 74(2)(b); or
- (b) unless that wall is situated 1m or more from the relevant boundary:
 - (i) of Purpose Group I and II of not more than three storeys;
 - (ii) of single storey construction and not exceeding 15m in height and floor area not exceeding Purpose Group III, IV, VII 3000m², Purpose Group V, VI 2000m², Purpose Group VIII 500m² ; or
 - (iii) other than single storey buildings, but not exceeding 7.5m in height and floor area not exceeding Purpose Group IV, VI, VII 25m², Purpose Group V, VIII 150m².

(2) The requirements of Regulation 84 for fire resistance of external walls shall not apply to the external wall of a building or separated part of a building unless that wall is situated 1m or more from the relevant boundary and it is-

- (a) for single storey buildings not exceeding 15m in height and floor area not exceeding 2000m² or 500m² under Purpose Groups VI or VIII respectively; and
- (b) provided with minimum period of fifteen minutes insulation from inside the building under BS 476 or other acceptable standards Part 20 to 23.

Unprotected areas in any side of a building

86. Except where otherwise provided, unprotected areas in any side of a building shall comply with the following:

- (a) any relevant requirements relating to the permitted limits of unprotected areas specified in Second Schedule unless the building is so situated that such side can in accordance with Second Schedule consists entirely of any unprotected area;
- (b) 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 as specified in Second Schedule when the building or compartment is:
 - (i) used solely for the sale, storage and processing involving goods and substances of a non-combustible nature, or
 - (ii) fitted throughout with an automatic sprinkler system in compliance with the requirements in Part VI.
- (c) as an alternative to (b) (ii) above, the distance between the external wall of a building and the relevant boundary may be half that specified in Second Schedule where the building is fitted throughout with an automatic sprinkler system in compliance with the requirements in Part VI;
- (d) the extent of unprotected openings in an external wall of a building or part of building used for car parking in relation to its distance from the lot boundary or relevant boundary may be based on the floor having the largest extent of unprotected openings for the purpose of complying with Table 1 of the Second Schedule;
- (e) 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 may be based on the internal room or space in the building that has the largest extent of unprotected

openings for purpose of complying with Table 1 of the Second Schedule;

- (f) internal walls enclosing the room or space in the building are not required to be fire rated but shall be constructed of non-combustible materials, except glazing.

Cladding
on
External
Walls

87. Cladding on External Walls shall comply with the following, unless:

- (a) such cladding is situated less than 1m from any point on the relevant boundary, it shall have surface complying with the requirements for Class '0', and
- (b) such cladding is situated 1m or more from the relevant boundary it shall have, where 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, when tested in accordance with BS 476: or other acceptable standards Part VI have an index of performance (I) not exceeding 20, provided that the building is of Purpose Group VI or VIII, such cladding material shall, when tested in accordance with BS 476: or other acceptable standards Part VI have an index of performance (I) not exceeding twelve and a sub-index (i₁) not exceeding six.

Refere-
nce to
Part I and
II of
Second
Schedule

88. Any reference to Second Schedule shall be construed as referring to the provisions of that Schedule.

Buildings
on land

89. Where two or more detached buildings are erected on land in common occupation, any external wall of any

in
common
occupa-
tion

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 Regulation 86.

Vertical
fire
spread

90.-(1) 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:

- (a) the roof over the lower part of the building shall be fire rated in accordance with the element of structure for minimum one hour for a distance of 5m measured horizontally from the external wall of the higher part of building; or
- (b) 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 one hour for a vertical height of not less than 9m measured from the roof of the lower part of the building.

(2) The above requirements shall not be applicable to buildings or lower parts of the building which are sprinkler protected.

Require-
ments of
separate-
ing walls

91.-(1) Every separating wall shall-

- (a) 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 Regulation 92;
- (b) have the appropriate fire resistance to comply with the requirements of Regulation 74;
- (c) be constructed of non-combustible materials, together with any beam and column which form

- part of the wall and any structure which it carries;
- (d) not include glass fire resisting walls; and
- (e) except sub Regulation (a) need not be applied to wall between car porches of buildings under Purpose Group I.

(2) For terrace-housing situation, the provision of sub regulation (1) (e) shall not apply unless the car porch is spanning from one side boundary to the other.

Opening
in
separate-
ing walls

- for-
92. A separating wall shall have no openings except
- (a) 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 Regulation 116;
 - (b) a door provided for the purpose of public circulation and permitted by the relevant authority, having the same fire resistance as that required for the wall and complying with Regulation 116; or
 - (c) opening for the passage of a pipe complying with the relevant provisions of Regulation 117.

Separat-
ing wall
roof
junction

93. 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.

Separat-
ing wall
external
wall
junction

94. 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 Regulation 138.

Prohibi-
tion of
combusti

95. No combustible material shall be built into, carried through or carried across the ends of or carried over the top of

ble materials in separating walls separating walls in such a way as to render ineffective such separating walls to the effects of the spread of fire.

Requirements of compartment walls or compartment floors 96. Every compartment wall or compartment floor shall be required to-

- (a) form a complete barrier to fire between the compartments it separates;
- (b) have the appropriate fire resistance to comply with the requirements of Regulation 74;
- (c) 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
- (d) have no fire resisting glass forming part of it unless permitted under Regulation 152.

Openings in compartment wall or compartment floor 97. A compartment wall or compartment floor shall have no openings in it, except for-

- (a) a door which has the same fire resistance rating as the compartment wall and complies with the relevant requirements of Regulation 81 unless permitted by other provisions of these regulations;
- (b) a protected shaft which complies with the requirements of Regulation 112; or
- (c) 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 Regulation 115.

Junction with other structures and opening in curtain walling 98.-(1) 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 Regulation 137.

(2) 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.

(3) Materials to be used for sealing the opening shall have the requisite fire resistance rating as the elements of structure.

Compartment wall-roof junctions

99. 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.

Prohibition of Combustible materials

100. Combustible material shall not 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.

Non-combustibility of compartment walls or floors

101. Every compartment wall or compartment floor shall be constructed of non-combustible materials, unless permitted by the Relevant Authority.

Use of fire shutter

102. Fire shutter shall be 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 or fire-fighting lobby and internal exit passageway.

Fire shutters in compartment-

103.-(1) The fire shutters, which are used to protect openings in compartment wall or floor, shall have the necessary fire resistance including thermal insulation, not less

ment wall
or floor than that of the compartment wall or floor.

(2) 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.

Require-
ments of
common
used
shutters

104. The common used shutters such as vertical, horizontal and lateral fire shutters shall comply with the following:

- (a) for vertical fire shutter operated by gravity during fire condition, upon activation by fire alarm system or fusible link, the operating mechanism of curtains or leaves of vertical fire shutter shall be released and the curtain or leaves shall descend under gravity at a controlled rate; or
- (b) 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 or leaves to descend and shall be backed up by emergency power supply, and the power and signal cables shall be fire-rated.

Mode of
Fire
shutters
activation

105. The mode of activation for fire shutters at different locations shall be as follow:

- (a) in case of fire shutters separating wall between two buildings-
 - (i) two buildings separated by a common fire shutter, for vertical fire shutter operated by gravity and electrically operated fire shutters, shall be linked to fire alarm systems of both buildings and shall be activated by fire alarm system of either building, and mode of activation by fusible link only shall not be permitted;

- (ii) 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, and mode of activation by fusible link only shall not be permitted.
- (b) in case of fire shutters as compartment wall or 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, and as compartment of basement passenger or goods lift lobby:
 - (i) for vertical fire shutter operated by gravity, mode of activation by fusible link is acceptable; or
 - (ii) for electrically operated fire shutter, mode of activation shall be by local smoke detectors.
- (c) in case of fire shutters as compartmentation at atrium or voids or between floors being part of the engineered smoke control design:
 - (i) only electrically operated fire shutter is permitted and signal to operate the respective fire shutter shall be from dedicated smoke detector installed at the respective smoke zone; and
 - (ii) vertical fire shutter operated by gravity activated by fusible link shall not be permitted.

User of
protected
shaft

106. A protected shaft shall not be used for any purpose additional to those given as defined under Regulation 247.

(2) All services such as pipe, duct installation or washroom shall not be located inside protected staircase.

Require-
ments of
protected
shaft

107. Every protected shaft shall be required to-
- (a) form a complete barrier to fire between the different compartments which the shaft connects;
 - (b) have the appropriate fire resistance to comply with the requirements of Regulation 74; and
 - (c) be constructed of non-combustible material together with any beam or column which forms part of the enclosure and any structure which carries it.

Openings
in
protected
shaft

108. A protected shaft shall have no openings in its enclosure, except-
- (a) in the case of any part of the enclosure which is formed by a separating wall, any opening which complies with the requirements of Regulation 94 for separating walls;
 - (b) 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 Regulation 96 for compartment wall or compartment floor; or
 - (c) in the case of any part of the enclosure which is formed by the protecting structure:
 - (i) a door which has the appropriate fire resistance to comply with the requirements of Regulation 81 for test of fire resistance, or otherwise permitted by provision of Regulation 111; or
 - (ii) the passage of a pipe, excluding protecting structure to exit staircase and exit passageway, or
 - (iii) 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 Regulation 115 for protection of openings.

Non-combustibility of protecting structures

109. 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.

Ventilation of protected shaft

110. Ventilation of protected shaft shall comply with the following-

- (a) a protected shaft used for the passage of people, such as exit staircases, shall be ventilated to comply with the relevant provisions of these Regulations; or
- (b) a protected shaft containing a pipe conveying gas shall be adequately ventilated directly to the outside air.

Doors in protecting structures

111. 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 these Regulations for the protecting structure surrounding the opening, except 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, shall not have the fire resistance rating where the door is located along the wall facing the external corridor.

Protected shaft containing exit staircase

112.-(1) A protected shaft which contains an exit staircase shall not contain any services that are not solely serving the same exit staircase even such services are protected with fire rated dry construction, except for-

- (a) cut-off sprinkler and pipe for that staircase;
- (b) UPVC or cast iron rain water downpipes serving the roof directly above the exit staircase, and not

- routed through anywhere outside the staircase; and
- (c) rising mains.
- (2) The protecting structure shall be constructed of masonry, or drywall.
- (3) Where drywall construction is used, the following conditions shall be complied with-
- drywall shall be non-combustible-
- (a) drywall shall have fire resistance for not less than the relevant period specified in Table 8 having regard to the Purpose Group of the building of which it forms a part and the dimension specified in that Table;
 - (b) drywall shall meet the criteria, in terms of impact and deflection performance, when subject to the tests of BS 5588 Part 5 second schedule and BS 5234 part 2 or; and
 - (c) 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 or other acceptable standards for calcium silicate or cement board.
- (4) The building shall have at least two independent exit staircase shafts scissors staircases are considered as single shaft.

Protected
shaft
contain-
ing lift

113. A protected shaft which contains a lift shall comply with the following:
- (a) it shall not contain any pipe conveying gas or combustible liquid, other than those in the mechanism of a hydraulic lift;
 - (b) the protecting structure shall be constructed of masonry, or drywall, where drywall construction is used, the following conditions shall be complied with:
 - (i) drywall shall be non-combustible;
 - (ii) drywall shall have fire resistance for not less than the relevant period specified in Table 8 having regard to the

- Purpose Group of the building of which it forms a part and the dimension specified in that Table;
- (iii) drywall shall meet the criteria, in terms of impact and deflection performance, when subject to the tests of BS 5588 Part 5 Second Schedule and BS 5234 or other acceptable standards Part 2;
 - (iv) drywall shall meet the criteria, in terms of water absorption and bending strength performance, when subject to the test of BS EN520 for gypsum plaster board or ISO 1896 or other acceptable standards for calcium silicate or cement board; and
 - (v) drywall shall meet the criteria of Cyclic Loading and Dynamic test as specified under Relevant Authority.
- (c) 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;
 - (d) the protected shaft shall be vented in accordance with BS ISO 4190 Part 1, 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 Regulation 113(b) serving as ventilation of the shaft may be provided instead, unless 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;
 - (e) 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;
 - (f) 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;

- (g) where it serves any basement storey it shall be protected by a smoke-stop lobby with walls having one hour fire resistance and fire door of half-an-hour fire resistance, and the protected lobby shall be mechanically ventilated, except where the lift landing area is adjoining an air-well or external space of minimum clear area of 10m² and minimum width of 3m, and the distance between the nearest edge of lift door opening to the air-well shall not exceed 3m;
- (h) 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:
 - (i) smoke detectors shall be provided at the lift landing area and the activation of any of the smoke detectors at the lift landing area shall cause the lift to home to the designated floor;
 - (ii) 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;
 - (iii) the designated floor can either be on grade level or one level below grade level, unless it is the latter, the lift shall home to a protected lobby, with direct access to an exit;
 - (iv) the lift shall not be permitted to double-up as a fire lift; and
 - (v) private lifts shall comply with BS ISO 4190 Part or acceptable standards.

Protected
shaft
contain-
ing other
services
installa-
tions

114. A protected shaft used for the enclosure of services shall comply with the following:

- (a) the protecting structure for protected shaft containing kitchen exhaust ducts and mechanical ventilation ducts serving areas specified in Regulation 164 which pass through one or more floor slabs shall be of masonry or drywall and such shaft shall be completely compartmented from the rest of the shaft space containing other ducts or any other services installations;
- (b) protected shaft containing ducts serving other areas which pass through two or more floor slabs shall be constructed of drywall and where the protecting structure for the protected shaft is constructed of drywall, the following conditions shall be complied with-
 - (i) drywall shall be non-combustible;
 - (ii) drywall shall have fire resistance for not less than the relevant period specified in Table 8 having regard to the Purpose Group of the building of which it forms a part and the dimension specified in that Table;
 - (iii) drywall shall meet the criteria, in terms of impact and deflection performance, when subject to the tests of BS 5588 Part 5 Second Schedule and BS 5234 or other acceptable standards Part 2; and
 - (iv) 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 or other acceptable standards for calcium silicate or cement board.

- (c) 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;
- (d) 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 Regulation 125;
- (e) the 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;
- (f) all protected shafts containing services shall not be located within an exit staircase except for the case of residential apartment or maisonette development under Purpose Group II not exceeding four storey where smoke-stop lobby is not required.

Applica-
tion for
protect-
tion of
openings

115. The provisions of this regulation 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.

Fire
doors

116. Fire doors for protection of openings shall comply with the following:

- (a) fire doors shall have the appropriate fire resistance as required by relevant parts of these Regulations;
- (b) 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;
- (c) 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 and the omission of the self-closing device to the bolted door leaf of a two leaf door is acceptable if the door is the entrance door to a residential unit under Purpose Group II;
 - (d) where a self-closing device is considered a hindrance to the normal use of the building, fire doors may be held open as follows:
 - (i) by a fusible link, or
 - (ii) where 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.
 - (e) any hinge on which a fire door is hung shall be of the type approved under the product listing scheme;
 - (f) any fire door fitted in an opening which is provided as a means of escape:
 - (i) 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;
 - (ii) 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; and
 - (iii) shall open in the direction of exit

travel in accordance with Regulation 28.

- (g) fire doors where required to be provided shall be constructed and installed to comply with specifications stipulated under BS ISO 4190 Part 1.

Pipes

117. Pipes which pass through a separating wall, compartment wall or compartment floor shall be kept as small as possible and fire stopper be around the pipe.

(2) The nominal internal diameter of the pipes shall be not more than the relevant dimension given in Table 13 and spacing between pipes shall be minimum 50mm or half diameter of the largest pipe, whichever is the larger.

(3) Routing of gas pipes in basements shall comply with following-

- (a) all gas pipes that are routed in basement shall be American Petroleum Institute pipes with welded joints and these joints shall be hundred percent radiography checked;
- (b) the gas pipes are not required to be fire rated if they are running outside essential areas such as exit staircases, smoke stop or firefighting lobby, fire pump room, generator room, fire command centre, unless they run into essential area, they are required to be encased in masonry;
- (c) 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; and
- (d) for naturally ventilated basement that complies with Regulation 196 the provision of pipe sleeve is not required.

Ventilation ducts

118. Ventilation duct which passes directly through a compartment wall or compartment floor shall comply with the following-

- (a) where the ventilation duct does not form a

protected shaft or is not contained within a protecting structure;

- (i) the duct shall be fitted with a fire damper where it passes through the compartment wall or compartment floor; and
 - (ii) the opening for the duct shall be kept as small as practicable and any gap around the fire damper shall be fire stopped.
- (b) where the ventilation duct forms a protected shaft or is contained within a protecting structure, the duct shall be:
- (i) fitted with fire dampers at the inlets to the shaft and outlets from it; and
 - (ii) constructed and lined with materials in accordance with the requirements in Part VII.
- (c) the installation of ventilation ducts and fire dampers shall comply with the requirements in Part VII.

Flues

119. 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

Services
passing
through
Fire
Comm-
and
Centre,
Fire
Pump
Room,
emergen-

120.-(1) Air ducts, sanitary pipes, gas pipes, electrical conduits or 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-

- (a) fire Command Centre;
- (b) fire Pump Room;
- (c) emergency Generator Room;
- (d) smoke Control Fans Room, except where such

cy
generator
room and
smoke
control
fans
room

services are required for the operation of this equipment.

(2) Air ducts, sanitary pipes, gas pipes, electrical conduits or 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 fire-fighting lobby and smoke-stop lobby, unless all these services are protected with one hour fire resistance enclosure, or separated with one hour fire resistance ceiling from the said lobby, and unless these services are required for the operation of the above lobbies, they need not be separately protected.

Exit
staircases
and Non-
combust-
ibility of
structure

121. Every exit staircase, including the treads or risers and landing, shall be constructed of non-combustible materials; except for buildings under Purpose Group I, where only the stringer or structures supporting the treads or risers and landing shall be constructed of non-combustible materials.

Structure
separate-
ing exit
structure

122. The exit staircase shall be separated from other parts of the building by a masonry structure or drywall complying with Regulation 112(3) (c) which shall have fire resistance for not less than the period required by Regulation 74(2) (c) for Elements of Structure.

Exit
doors

123. Doors opening into the exit staircase shall have fire resistance of at least half an hour and fitted with automatic self-closing device.

Finishes

124. Finishes to the ceilings or walls and floors of exit staircase shall be of non-combustible materials.

Concealed
spaces

125. Unless stated otherwise in these Regulations, concealed spaces in a building shall be interrupted by construction of cavity barriers to restrict the spread of smoke and flames.

Closing the edges of cavities

126. 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.

Interrupting cavities

127. Cavities including roof spaces shall be interrupted by cavity barriers where a wall, floor, ceiling, roof or other part of the construction about the cavity, unless there is provision for the element of structure to form a fire resisting barrier, such cavity barriers shall be of fire resisting construction at least equal to the provision for that required for the fire resisting barrier.

Sub-division of extensive cavities

128. 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.

Fire resistance and fixing of cavity barriers

129. Cavity barriers shall be-

- (a) constructed to provide at least half an hour fire resistance; and
- (b) tightly fitted to rigid construction, or the junctions shall be fire stopped to comply with the requirements of Regulation 138.

Opening in cavity barriers

130. A cavity barrier shall have no opening in it except for-

- (a) a door which has at least half an hour fire resistance and which is closed all the time;
- (b) a pipe which complies with the provision under Regulation 117;
- (c) a cable or conduit containing one or more cables;

- (d) an opening fitted with suitably mounted automatic fire damper; and
- (e) a duct which is fitted with a suitably mounted fire damper where it passes through the cavity barrier.

Raised floors for fixed stages and display platforms

131. The construction of raised floors for fixed stages and display platforms shall comply with the following requirements-

- (a) the concealed space between the structural floor and raised floor shall not be used for storage purpose;
- (b) no services or installation shall be permitted within the concealed space other than electrical wiring in conduit in compliance with the requirements of Code of practice for wiring of electrical equipment of buildings;
- (c) all sides shall be properly sealed; and
- (d) the concealed space shall be sub divided by cavity barriers in compliance with the requirements of Regulation 128.

Raised floors with or without accessible panels

132. The construction of raised floors with or without accessible panels shall comply with the following requirements-

- (a) the supporting structure shall be constructed of non-combustible materials having a melting point of at least 800°C;
- (b) the concealed space between the structural floor and raised floor shall not be used for storage purpose; and
- (c) no services or installation shall be permitted within the concealed space other than-
 - (i) electrical wiring in metal conduit and metal trunking in compliance

- with the requirements of IEC 60364;
- (ii) communication cables for computer equipment;
- (iii) fire protection installations serving the area;
- (d) where the raised floor is used as a plenum, requirements in Regulation 209 shall be satisfied-
- (e) decking of the raised floor shall be constructed of non-combustible material or where combustible material is used as core material, when 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; refer Regulation 142.
- (f) 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;
- (g) 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;
- (h) all sides shall be properly sealed;
- (i) the concealed space shall be sub-divided by cavity barriers such that the maximum unobstructed area within the concealed space does not exceed 930m²;
- (j) where the concealed space is fitted with an automatic sprinkler system which complies with the requirements in Part VI, cavity barriers are not required;
- (k) for a non-sprinklered protected building, where 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 requirements of NFPA 72;

- (l) for a sprinkler protected building, the concealed space shall be fitted with automatic smoke detection system under paragraph (k), unless its height is between 150mm to 400mm, and automatic sprinkler system, when it exceeds 400mm; and
- (m) 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.

Provision
for
concealed
spaces
between
floor or
roof and
suspended
ceilings

133. The Relevant Authority may consent to exempt from provision of cavity barriers within the concealed spaces of suspended ceiling, provided the following requirements are complied with-

- (a) the concealed space shall not be used for storage purpose;
- (b) the supporting elements shall be constructed of non-combustible material;
- (c) the exposed surfaces within the concealed space is of Class '0' refer regulation 142 flame spread, excluding surfaces of any pipe, cable, conduit or insulation of any pipe;
- (d) in the case of a detector protected building, where the concealed space does not exceed 800mm in depth or if the concealed space is fitted with detectors which comply with the requirements of Part VI;
- (e) in the case of a sprinkler protected building:
 - (i) where the concealed space does not exceed 400mm in depth;

- (ii) where the concealed space exceeds 400mm and does not exceed 800 mm in depth and no combustible material is used within the concealed space;
 - (iii) where the concealed space exceeds 400mm and does not exceed 800 mm in depth and has combustible material in small quantity, which the relevant authority, may, at its discretion, considers irrelevant; or
 - (iv) where the concealed space is fitted with an automatic sprinkler system which complies with the requirements of Part VI; or
- (f) in the case of other buildings, where the concealed space does not exceed 800mm in depth.

Exemption of cavity barriers in ceiling space

134. Where the concealed space of suspended ceiling is fitted with an automatic sprinkler system which complies with the requirements in Part VI-

- (a) the concealed space may be exempted from provision of cavity barriers; and
- (b) 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 refer Regulation 142.

Suspended ceiling over protected areas

135. 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-

- (a) the ceiling supporting elements and the ceiling

shall be constructed of non-combustible materials;

- (b) the exposed surfaces within the concealed space shall be of Class '0' surface flame spread; refer regulation 142 and
- (c) where sprinkler system is installed within the concealed spaces at smoke-stop lobby or fire-fighting lobby, the ceiling supporting elements and its exposed surface may have a surface spread of flame not lower than Class 2 refer regulation 142.

Exemption
of cavity
barrier in
buildings

136.-(1) Buildings under Purpose Group I are not required to comply with the requirements on the provision of cavity barrier in concealed spaces.

(2) 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.

General
provision
on fire
stopping

137. Except for a part which does not serve as a fire resisting barrier, openings for pipes, ducts, conduits or cables which pass through any part of an Element of Structure or Cavity Barrier, shall be:

- (a) kept as few in number as possible;
- (b) kept as small as practicable, and
- (c) all gaps shall be filled with fire stopping materials.

Fire
stopping

138. Fire stopping shall be of material having the necessary fire resistance when tested to BS 476: Part 20 or other acceptable standards.

Suitable
fire
stopping
systems
and
materials

139.-(1) Proprietary fire stopping and sealing systems shall include those designed for service penetrations which have been shown by test to maintain the fire resistance of the wall or other element, subject to approval by the Relevant Authority.

- (2) Suitable fire stopping materials include-
 - (i) cement mortar;
 - (ii) gypsum based plaster;

- (iii) cement or gypsum based vermiculite or perlite mixes;
- (iv) glass fibre, crushed rock, blast furnace slag or ceramic based products with or without resin binders; and
- (v) intumescent mastics.

(3) The method of fire stopping and choice of materials shall be appropriate to the situation and its application.

Require-
ments for
Class "0"

140. Any reference to a surface being Class '0' refer regulation 142 shall be construed as a requirement that-

- (a) the material of which the wall or ceiling is constructed shall be non-combustible throughout; or
- (b) the surface material or, where it is bonded throughout to a substrate, the surface material in conjunction with the substrate shall have a surface of Class 1 and when tested in accordance with BS 476: or other acceptable standards Part VI shall have an index of performance (I) not exceeding 12 and a sub-index (i) not exceeding 6.

Require-
ments for
a Class
other
than class
"0"
Classifica-
tion

141. Any reference to a surface being of a Class other than Class '0', refer regulation 142, 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 or other acceptable standards Part VII.

Order of
classes

142. 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-

- (a) Class '0' are surfaces of no flame spread, that conform to the requirements of Regulation 140;
- (b) Class '1' are surfaces of very low flame spread,

- on which not more than 150mm mean spread of flames occurs under the relevant test conditions;
- (c) Class '2' are surfaces of low flame spread, which during the first one and half 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;
 - (d) Class '3' are surfaces of medium flame spread, which during the first one and half 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;
 - (e) Class '4' are surfaces of rapid flame spread, which during the first one and half minutes of test the mean spread of flame is more than 375mm and during the first ten minutes of test is more than 825mm under the relevant conditions.

Class of flame spread to be not lower than specified

143. The surface of a wall or ceiling in a room or space shall be of a Class not lower than specified as relevant in the Table 14, provided that-

- (a) where an automatic sprinkler system is fitted throughout in the building in compliance with the requirements in Part VI, there is no control on the surface of flame rating in room or space, except for the following occupancies or usage-
 - (i) health care facilities, including hospital, nursing home for handicapped, disabled, aged or persons with mental and or mobility impairments;
 - (ii) detention facilities; or
 - (iii) exit staircase exit passageway and smoke-stop or firefighting lobbies.
- (b) 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 under

Regulation 144;

- (a) where 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 fifty percent of the whole surface area of the side walls of the auditorium.

Where
class of
flame
spread
may be
of any
class not
lower
than class
3

144. Any part of the surface of a wall in a room or compartment may be of any Class not lower than Class '3' refer regulation 142 where the area of that part, or when there are two or more such parts, the total area of those parts, does not exceed the following-

- (i) in the case of a building or compartment of Purpose Group III, 20m²; or
- (ii) in any other case, 60m².

(2) Any part of the surface of a ceiling may be of any Class not lower than Class '3' refer regulation 142 where 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-

- (a) 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 the area of that part does not exceed 2.5m², and the distance between that part and any other such part is not less than 3.5m;
- (b) the ceiling is that of a room in a building or compartment of Purpose Group VI or VIII, and the area of that part does not exceed 5.0m², and the distance between that part and any other such part

is not less than 1.8m;

- (c) 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 twenty percent of the floor area of the room;
- (d) 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
- (e) 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 40m².

Excep-
tion to
require-
ment of
surface of
flame

145. Wall and ceiling finishes in the form of thin sheet of not more than 1.0 mm thickness mounted on a non-combustible substrate shall not be subject to the requirement of surface spread of flame provisions provided that this exception shall not apply to smoke-stop or firefighting lobbies, exit staircases and passageways.

Roof
construc-
tion

146. Surface of materials for roof covering and roof construction shall have a surface spread of flame rating not lower than Class '1' refer regulation 142, or Class A when tested in accordance with ASTM E108 or other acceptable standards, except in the case of Purpose Groups I and II, and in buildings that are protected throughout with automatic sprinkler system in compliance with Part VI.

Provision
for
buildings
not
exceed-
ing four
storeys

147. The Relevant Authority 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:

- (a) building does not exceed four storeys;
- (b) roof space between the roof and the ceiling shall be sub divided by cavity barriers where required to comply with the relevant provisions of

Regulation 125, and openings in cavity barriers shall be fire stopped to comply with the requirements of Regulation 126; and

- (c) where the underside of the roof serves as the ceiling to a room or space and the elements of the underside of the roof shall comply with the relevant provisions of Regulation 127 for restriction of spread of flame.

Roof junction with separating wall and compartment wall

148. At the junctions with separating wall or compartment wall, roof construction shall comply with the relevant requirements under Regulation 93 and Regulation 99 respectively.

Roof terrace

149. Roof terrace shall not be roofed over, when it is either partially or fully roofed over, it shall be considered as a habitable floor.

Materials for construction

150. Materials used in the construction of building elements shall comply with the Regulations stated under these Regulations to the performance of the requirements such as for fire resistance and limit to spread of flame as stipulated in other relevant provisions of these Regulations.

(2) Intumescent paints may be used for protection of structural steel members of all buildings provided-

- (a) 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 or other acceptable standards; and
- (b) coating of intumescent paint onto structural steel, and subsequent maintenance shall conform to BS 8202: Part 2 or other acceptable standards.
- (3) 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 the Relevant Authority.

(4) Flame retardant chemicals shall be 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:

- (a) the chemical treatment process is part and parcel of the manufacturing process to produce the finished product ;
- (b) the chemical treatment is by means of pressure impregnation conforming to BS 5268 Part 2 respectively; and
- (c) the treated materials or products have been subjected to fire test as required under Regulation 81 or 140.

(5) All elements of structure shall be constructed of non-combustible materials in addition to the relevant provisions as follows:

- (a) Regulation 74 for fire resistance of elements of structure;
- (b) Regulation 85 and Regulation 83 for External Walls;
- (c) Regulation 91 (c)(d) and Regulation 95 for Separating Walls;
- (d) Regulation 96 (c)(d), Regulation 100 and Regulation 101 for Compartment Walls and Compartment Floors;
- (e) Regulation 107, Regulation 109, Regulation 112, Regulation 113 and Regulation 114 for Protected Shafts.

(6) Materials used for the protection of openings shall comply with the relevant requirements of Regulation 133 and the Code of practice for protection of openings.

(7) Exit staircases shall be constructed of non-combustible materials to comply with the provisions of

Regulation 134.

(8) Materials used for the construction of raised floors shall comply with the provisions of Regulation 132(a) and (e).

(9) Materials used for construction of ceiling and its supports shall comply with these Regulations, except for supports that are required to comply with Regulation 133 (b).

(10) Construction of ceilings and ceiling supports located within sprinkler protected building shall comply with the provision of Regulation 134 (b).

(11) Materials used for fire stopping shall comply with the relevant requirements of Regulation 138 and Regulation 139.

(12) 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 Regulation 140.

(13) Materials used for roof construction shall comply with the provisions of Regulations 146 and 147.

(14) Internal non-load bearing walls in buildings shall comply with Table 15 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 requirements of Regulation 140.

Construct-
ion of
ceiling
internal
and
external
walls

151.-(1) 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 the Relevant Authority.

(2) Materials with surface flame spread rating of not lower than Class '2' refer regulation 142 shall be permitted to be used for the construction of partition for toilet cubicles.

(3) Where the material used is of Class '3' refer regulation 142 surface flame spread rating, total exposed surface area of the partitions within the toilet shall not be more than 60m².

A use of
fire rated
glass

152. Fire rated glass wall or 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 may 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-

- (a) the walls and doors shall have the necessary fire resistance, including insulation, when subject to test under BS 476 or other acceptable standards Part 20-23 ; and
- (b) the walls and doors shall meet the Class A of the impact performance requirements when subject to test under BS 6206 or other acceptable standards.

Prohibit-
ion of use
plastic
material

153. Walls, ceilings, roof covering and finishes shall not contain any plastic material.

Use of
non-
combust-
ible
partitions

154. For additions and alterations to existing buildings, non-combustible partitions shall be used for separation of areas undergoing works from other occupied areas of the building.

PART IV SITE PLANNING AND EXTERNAL FIRE FIGHTING PROVISION

General
provision
on site
planning
and
external
fire
fighting

155. This Part makes provisions for space around buildings to enable effective mounting of rescue and external firefighting operations.

(2) The Third Schedule contains figures expressing fire safety requirements.

External
access to
the
building

156. For the purposes of providing accessibility of site to firefighting appliances, the following requirements shall be complied with-

- (a) to permit fire-fighting appliances to be deployed, the access way shall have a minimum width of 6m throughout its entire length;
- (b) access openings shall be provided along the external walls of buildings fronting the access way to provide access into the building for fire-fighting and rescue operations; and
- (c) access way shall be provided within 18m of breeching inlet for buildings that exceed the habitable height of 10m.

Access
way for
firefight-
ing
appli-
ances

157.-(1) In buildings under Purpose Group I, access way shall not be required, irrespective of the building height, but, 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.

(2) In buildings under Purpose Group II, no access way shall be required for buildings that do not exceed the habitable height of 10m, but, 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.

(3) The requirement for fire engine access road provided under this regulation shall not apply to non-residential standalone building, such as clubhouse, car-park, that are located within the housing development.

(4) The non-residential standalone building that is not located within the housing development shall comply with provisions of sub regulations (1) and (2).

(5) In 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 are

provided in accordance with Regulation 171.

(6) The fire engine access road shall have a minimum 4m width and designed to sustain the load of stationary 30 tonnes fire engine fighting appliance, and shall be provided within 18m of dry riser breaching inlets of the building.

(7) The breaching inlets shall be located at the exterior, readily visible and accessible from the fire engine access road.

(8) In buildings under Purpose Groups III, IV, V and VII not exceeding the habitable height of 10m, access way shall not be required, but, 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.

(9) 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 in accordance with Regulation 171 and the measurement of 18m shall be between the fire engine access road and the entrance of exit staircase.

(10) In buildings under Purpose Groups III, IV, V and VII exceeding the habitable height of 10m, access way shall be located directly below the access openings to provide direct outreach to the access openings.

(11) The access way shall be provided based on the largest gross floor area of the following-

- (a) any floor including first storey; or
- (b) where there are more than one floor interconnected, the aggregate areas of all the floor interconnected shall be as follows-

Minimum	1/6 perimeter (min 15m)
2000m ² to 4000m ²	1/4 perimeter
>4000m ² to 8000m ²	1/2 perimeter
>8000m ² to 16,000m ²	3/4 perimeter
>16000m ²	island site access

(c) for buildings protected by an automatic sprinkler system, the floor area shall be doubled as follows:

Minimum	1/6 perimeter (min 15m)
4000m ² to 8000m ²	¼ perimeter
>8000m ² to 16,000m ²	½ perimeter
>16,000m ² to 32,000m ²	¾ perimeter
>32,000m ²	island site access.

(12) In buildings under Purpose Groups VI and VIII, access way shall be provided for firefighting appliances, and the provision of access way shall be calculated based on the following gross cubical extent of the building as follows:

Minimum	1/6 perimeter (min 15m)
>28,400m ³	¼ perimeter
>56,800m ³	½ perimeter
>85,200m ³	¾ perimeter
>113,600m ³	island site access.

(13) For buildings protected by an automatic sprinkler system, the cubical extent of the building may be doubled as follows:

Minimum	1/6 perimeter (min 15m)
>56,800m ³	¼ perimeter
>113,600m ³	½ perimeter
>170,400m ³	¾ perimeter
>227,200m ³	island site access.

(14) Access way shall comply with the following requirements-

- (a) access way shall be metalled or paved or laid with strengthened perforated slabs to withstand the loading capacity of stationary 30 tonnes fire-fighting appliance, as provided under Second Schedule for technical data on firefighting

- appliance;
- (b) the access way shall have a minimum width of 6m throughout and must be able to accommodate the entry and manoeuvring of fire engine, extended ladders pumping appliances, turntable and or hydraulic platforms;
 - (c) access way 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;
 - (d) access way shall be laid on a level platform or if on an incline, the gradient shall not exceed 1:15 and access road shall be laid on an incline not exceeding a gradient of 1:8.3;
 - (e) dead end access way 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 16;
 - (f) the outer radius for turning of access way and fire engine access road shall comply with the requirements as shown in Figure 13;
 - (g) overhead clearance of access way and fire engine access road shall be at least 4.5m for passage of firefighting appliances;
 - (h) public roads can serve as access way provided the location of such public roads is in compliance with the requirements of distance from access openings;
 - (i) access way 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 access way and access openings;
 - (j) all corners of access way shall be marked and the mark shall be in contrasting colour to the ground surfaces or finishes;
 - (k) access way provided on turfed area shall be marked with contrasting object that is visible, and the markings shall be provided on both sides of the

access way at an interval not more than 3m apart.

- (1) sign post displaying the wordings “Fire Engine Access Keep Clear” shall be provided at the entrance of the access way, and the size of wordings shall not be less than 50mm.

Access
opening
to
building
for fire
fighting

158.-(1) For the purpose of this regulation access openings shall include unobstructed external wall openings, windows, balcony doors, glazed wall panels or access panels.

(2) Windows, doors, wall panels or access panels shall be readily openable from the inside and outside.

(3) Inside and outside of access openings shall be unobstructed at all times during the occupancy of the building.

(4) Where an external wall which faces the access way has external openings on each storey level that meet the requirements of sub-regulations (1), (2), (3), (7), (8) and (9), there is no need to designate any access opening.

(5) An external wall which faces the access way and is windowless or a blank wall shall be provided with access openings at each storey level.

(6) 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.

(7) 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.

(8) The access opening shall not be placed at plant or store room, staircase, smoke-stop lobby or dead space, but it shall be placed against an occupied space.

(9) Number and position of access openings for buildings other than residential-

- (a) in case of buildings under Purpose Groups III, IV, V and VII exceeding the habitable height of 10m up to 60m, access opening is required at every

storey level, other than first storey, opening directly onto access way;

- (b) in case of buildings under Purpose Groups VI and VIII, access openings located over access way shall be provided and evenly distributed along the external walls up to a habitable height of 60m;
- (c) access openings shall be remote from each other and located along the side of the building and 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;
- (d) in case of 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.

(10) 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.

Access to buildings with rising mains

159. Buildings fitted with rising mains and automatic sprinkler system shall have access ways for pumping appliances within 18m of the breeching inlet, and the breeching inlets shall be visible from the access ways.

Private fire hydrant requirement

160.-(1) Every part of a fire engine access road and or an access way in a private lot shall be within an unobstructed distance of 50m from a hydrant, and where a public hydrant conforming to such requirement is not available, private hydrant(s) shall be provided as shown in Figure 12.

(2) 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, except for a one-way or two-way lanes road.

(3) Where more than one private hydrants are required, the hydrants shall be located along the fire engine access road and or an access way such that every part of the access road and or access way is within an unobstructed distance of 50m from any hydrant as shown in Figure 11.

(4) Siting and types of fire hydrants shall comply with the requirements stated in NFPA 25.

(5) For a building that is required to have island site access way under Regulation 157(2) the hydrant pipe shall be a ringed system, and isolation valves shall be provided on the hydrant ring such that any section of ring, with a maximum of one fire hydrant, can be isolated when required for maintenance without affecting the water supply, both designed pressure and flow, to the other fire hydrants.

(6) Subject to sub regulation (5), locking device shall be provided to lock the valves in open position during normal operation.

Water
supply
for
private
hydrant

161. Provision of water supply for private hydrant system where required by these Regulations shall comply with one of the following requirements:

- (a) private fire hydrants installed at reduced level 125m and below may receive direct supply from public water main, unless the flow and pressure from the public water mains cannot meet the hydrant requirements, a storage tank of sufficient capacity with the requisite pumping facilities shall be provided;
- (b) private fire hydrants receiving direct supply from public water mains shall comply with:
 - (i) the nominal bore of the hydrant pipe and the bulk water meter shall not be less than 150mm in diameter; and
 - (ii) the running pressure or flow at the hydraulically most unfavourable hydrant of the private hydrant system shall comply with the following:

- (aa) running pressure $\geq 0.9 \times$ (running pressure of the nearest public hydrant – pressure drop across the bulk water metre); and
 - (bb) flow Rate $\geq 0.9 \times$ water flow of the nearest public hydrant or \geq total flow demand as required in Table 16 of the private hydrant system, provided the running pressure at the remotest private hydrant is greater than 2 bars;
 - (cc) in calculating the frictional loss for the private hydrant system, the design flow rates shown in Table 16 shall be used, and pressure drop across bulk water metre shall not be more than 1bar.
- (c) where there is only one private hydrant in the plot that is located above reduced level 125m, and this hydrant is not the sole hydrant within 50m from any breeching inlet(s) feeding into fixed water based firefighting system(s) including automatic sprinkler systems, dry riser systems, and wet riser systems for the building(s) standing on this plot of land; this hydrant can be in the form of a dry hydrant;
- (d) ‘a dry hydrant shall be connected to a 150mm diameter dry pipe, which shall be connected at the other end to a four way breeching inlet., this breeching inlet shall be within 18m from any access way or fire engine access road having minimum 4m width and within 50m from any wet hydrant, private or public;
- (e) the private dry pillar shall be painted in yellow and labeled dry on the hydrant pillar, and a signage indicating the location of breeching inlet shall be positioned next to the dry private hydrant;
- (f) where more than one private hydrants are located

above reduced level 125m within the same plot, storage and pumping arrangements of water supply to these specified hydrants shall comply with those for wet rising mains stipulated in NFPA 25;

- (g) the water supply for hydrants serving residential and non-residential developments shall be as shown in Table 15.

Protec-
tion of
hydrant
mains in
buildings

162. All hydrant mains which pass through a building shall have its full length within the building protected with fire resistance construction of at least 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 and 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 labeled with the words hydrant main of minimum 50mm height at suitable intervals.

PART V

ELECTRICAL POWER SUPPLIES

163. The installation, control and distribution of wiring of electrical equipment in buildings shall be in accordance with IEC 60364 and BS 7430 respectively.

(2) The provision of the Second Schedule stipulates the technical fire safety requirements.

Primary
and
Second-
ary
supplies

164. Where any of the following installations is required by these Regulations or other Regulations, its primary and secondary source of power supplies shall comply with-

- (a) where electrical passenger or goods lift is required, its electrical installations, inclusive of battery and other form of secondary power supply, shall comply with BS ISO 4190 or acceptable standards. and where the provision of fire lift is required by these Regulations, installation of the primary and secondary supplies shall also comply with the mentioned Code of Practice;
- (b) where electrical fire alarm system is required, its primary power supply as well as type and capacity of battery shall comply with NFPA 72
- (c) where exit or emergency lighting system is required, its electrical wiring, type and capacity of battery or other form of secondary power supply shall comply with BSEN 50172
- (d) where an emergency voice communication system is required, its electrical wiring shall be fire rated or otherwise fire protected in accordance with BS 5839 Part 8
- (e) where a wet rising main system is required, the relevant electrical supply shall be installed in accordance with NFPA 25, and a secondary source of power supply with capacity stipulated in NFPA 25, shall be provided for the wet rising main pumps;
- (f) installation of electrical supply for sprinkler system shall comply with NFPA 13, where required, shall satisfy the operation requirements under the respective hazard category;
- (g) mechanical ventilation where required for the following rooms or spaces shall be provided with secondary source of supply in accordance with BS 5720:
 - (i) exit staircase and exit passageways;
 - (ii) smoke-stop and firefighting lobbies;
 - (iii) areas of refuge within the same building;
 - (iv) basement car parks;
 - (v) fire command centres;

- (vi) flammable liquid or gas storage rooms;
 - (vii) emergency power generator room, and engine driven fire pump room;
 - (viii) car park smoke purging system;
 - (ix) powered smoke control systems; and
 - (x) any other fire precautionary measure.
- (h) where mechanical ventilation is installed to provide air for the operation of the following equipment, secondary source of supply shall be provided:
- (i) emergency generator; and
 - (ii) engine driven fire pump.
- (2) Power supply cables for equipment that is required to operate during a fire emergency shall be of fire resistant type.

System requiring secondary source of supply

165. The following systems shall be provided with secondary source of supply:

- (a) atrium smoke control system, including associated AHUs forming part of the system;
- (b) all smoke control systems where required these Regulations.

Emergency generator

166. Where emergency generators are provided as a secondary source of supply, they shall comply with CC CP 31.

PART VI FIRE FIGHTING SYSTEMS

Portable extinguishers

167.-(1) All Purpose Groups, except Purpose Groups I and II residential floors shall be provided with portable fire extinguishers.

(2) Portable fire extinguishers where required to be provided shall be constructed in conformity with specifications stipulated under Specification for Portable Extinguishers.

(3) 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 NFPA 10.

Type,
size and
siting of
portable
fire
extingui-
shers

168. Classification of portable fire extinguishers provided shall be selected in accordance with criteria specified under NFPA 10.

(2) The size, quantity and siting of these portable fire extinguishers shall comply with the requirements in NFPA 10 or other acceptable standards under the respective Class of occupancy hazard.

Install-
tion,
Marking
of
portable
fire
extingui-
shers

169. Portable fire extinguishers provided shall be installed and conspicuously marked in accordance with requirements by NFPA 10 or acceptable standards.

Type of
rising
main

170. The type of rising main system shall be provided appropriate to the building as follows:

- (a) dry rising main shall be installed in buildings under Purpose Groups II, III, IV, V, VI, VII and VIII where the habitable height is more than 10m, but does not exceed 60m;
- (b) wet rising main shall be installed in buildings with habitable height exceeding 60m;
- (c) separate dry and wet rising main systems in a building are permitted.

(2) Notwithstanding the requirements in sub-Regulation (1)(a), dry rising main conforming to NFPA 25 or other acceptable standards shall be provided to any part of a single or multiple level basement.

(3) Where the building has access from more than one ground level or road level, the height measurements for the

purpose of this code shall be taken from the level of access way or fire engine access road applicable to buildings under Purpose Group II provided.

Number,
location
and size
of rising
mains

171.-(1) The number and distribution of rising mains shall comply with the requirements stipulated in NFPA 25 or other acceptable standards.

(2) Position of rising mains and the associated landing valves shall be kept free of obstruction both physically and visually and shall be located-

- (a) within smoke-stop lobby or external corridor, immediately outside the door of the exit staircase;
- (b) in the case where there are no smoke stop lobby or external corridor, inside exit staircase; or
- (c) in the common area and within a protected shaft, immediately outside the door of the exit staircase.

(3) Size of rising mains shall comply with NFPA 25 or other acceptable standards.

(4) Location and provision for landing valves shall comply with NFPA 25 or other acceptable standards as follows-

- (a) landing valve is not required to be provided at the first storey level to buildings under Purpose Group II when the breaching inlets are installed in accordance with Regulation 172 (3);
- (b) where all the exit staircases in a building under Purpose Groups III to VIII are installed with rising mains and standby fire hoses, and yet part of a floor space is beyond 38 m coverage of any landing valve, an additional standby fire hose shall be provided at the landing valve nearest to this floor space;
- (c) installation of rising main shall comply with NFPA 25 or other acceptable standards.

Breech-
ing inlets
and

172.- (1) All buildings fitted with rising mains shall have access ways or fire engine access road applicable to

access
ways

buildings under Purpose Group II for pumping appliances within 18m of the breeching inlet, and the breeching inlets shall be visible from the access ways or fire engine access road.

(2) Requirements and provisions for breeching inlets for the rising main system shall be in accordance with the NFPA 25 or other acceptable standards and connecting pipe between the inlets and the vertical run of the rising main, where applicable, shall be kept as short as possible.

(3) In buildings under Purpose Group II, the breeching inlet to each rising main, either dry or wet, shall be located on the external wall above ground level nearest to the vertical run of the riser stack.

Wet
rising
main

173-(1) Capacity of the water supply from the public mains and the storage capacity for a wet rising main system shall comply with the requirements in NFPA 25 or other acceptable standards.

(2) Flow requirements for wet rising main system shall comply with those stipulated in NFPA 25 or other acceptable standards.

(3) Running pressure at each discharging landing valve on the wet rising main system shall be maintained between the minimum and maximum values as stipulated in NFPA 25 or other acceptable standards.

(4) Static pressure in any line of hose connected to a landing valve in a wet rising main system shall not exceed the specified value in NFPA 25 or other acceptable standards.

(5) The location of storage tank and capacity of break tank where required, shall comply with the requirements in NFPA 25 or other acceptable standards.

(6) Where pumps are required for wet rising main system, requirements specified in NFPA 25 or other acceptable standards shall be incorporated, and arrangements for the power supplies, both normal and emergency, shall be in accordance with mentioned Code of Practice.

Standby
fire hose
for rising
main

174.-(1) Standby fire hose shall be provided for every rising main except for those in buildings under Purpose Group II.

(2) Where standby fire hose are provided for every rising main the following requirements shall be complied with-

(a) the type and folding method shall be of the following description-

(i) the fire hose must be of 63.5mm nominal internal diameter in order to ensure that the hose coupling will fit existing coupling tail pieces;

(ii) the fire hose must be rugged and capable of carrying water under substantive pressure in accordance with BS 6391 or other acceptable standards;

(iii) the fire hose must be type 3 as stipulated in the BS 6391 or other acceptable standards;

(iv) each hose must have a standard length of 30m and must be kept stowed in a Dutch Rolled position and housed in a glass fronted in Figure18.

(v) the fire hose couplings must be manufactured according to BS specification or other acceptable standards and of light alloy or gunmetal;

(g) the fire hose coupling must be of type 63.5mm and be of the instantaneous type with standard double-pull release mechanism;

(h) the fire hose couplings must be tied in by binding with galvanized mild steel wire and applied over a hose guard of synthetic fibre;

(i) the fire hose coupling must be able to withstand a minimum working pressure of 15 bars.

(b) the position of the Fire Hose shall be as follows:

(i) the fire hose shall be installed just next to,

- but not more than 2 meters from the landing valve as shown in Figure 17; and
- (ii) the entire fire hose and cabinet shall be out of direct sunlight.
 - (iii) fire hose must be clean, dry, compact rolled Dutch Roll with the Velcro strap secured as shown in Figure 17 and 18, and must be placed in the cabinet.
- (c) the wall mounted fire hose and cabinet shall be as follows:
- (i) the cabinet must be firmly mounted on the wall and rigid to take either one or two fire hose weight;
 - (ii) the cabinet must be constructed of non-combustible material and maintenance free;
 - (iii) the cabinet lock, where provided, must be one of the type that could be operated manually from the inside without the use of a key when the front plain glass or plastic minimum 300mm x 300mm is broken by the fire fighter;
 - (iv) the cabinet swing door must be openable such that it will not obstruct the retrieving of the fire hose by the fire fighter;
 - (v) the depth of the cabinet must not exceed 250mm for one fire hose or 350mm for two fire hoses.
 - (vi) the cabinet must be painted in a contrasting colour such that it is conspicuous and easily identified;
 - (vii) the wording, "Fire Hose", with letter height of at least 50mm and marked in contrasting colour, must be painted directly on the front panel as shown in Figure 17;
 - (viii) in *lieu* of the cabinet, simple wall mounted cradle for the fire hose may be provided, but only in the riser main shaft, and the cradle must be constructed and positioned to

facilitate the retrieving of fire hose by the fire fighter;

- (ix) the cradle in *lieu* of the cabinet must be maintenance free;
- (x) the fire hose installation height must be limited as shown in Figure 17.

(3) Without prejudice to the requirement under sub regulation (2), the quality acceptance standards of the fire hose shall comply to BS 6391 or other acceptable standards.

Building
under
construc-
tion

175.-(1) When a building is required to be equipped with rising mains pursuant to Regulation 170, such rising mains shall be installed progressively as the building attains height during the course of construction, and 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 so as to be readily operational in case of fire.

(2) The installation of rising mains under sub regulation (1) shall be in accordance with provisions of the Second Schedule.

Foam
inlets

176.-(1) Where boiler rooms or storage rooms containing highly-combustible materials are located in basement or not easily accessible for firefighting, foam inlets and pipe works shall be provided for the purpose of delivering foam solution to an area close to the rooms concerned.

(2) A two way breeching inlet shall be provided at ground level with pipe run of minimum 100mm bore terminating in landing valve just outside the high fire risk rooms.

The provision of the breeching inlet shall comply with the relevant clauses NFPA 25 or other acceptable standards.

(3) In a situation where boiler or storage rooms have access openings along access way, provision of foam solution inlets and outlets shall not be required.

(4) Hydraulic hose reel conforming to the requirements in NFPA 25 or other acceptable standards shall be provided in every storey of every building regardless of building height, except the following-

- (a) purpose Group I buildings;
- (b) non- residential occupancy at the first storey of a residential building, and fulfilling the following conditions:
 - (i) floor area of the shop or office unit does not exceed 150m²;
 - (ii) compartmented from the residential floors and other parts of the building;
 - (iii) not being used as an eating establishment or storage of flammable materials;
 - (iv) not being used as public entertainment outlet;
 - (v) not belonging to Purpose Group VI and VIII.
- (c) any other small standalone single-storey guardhouse, bin centre, electrical sub-station and open-sided shed not exceeding 200m² excluding those in Purpose Group VI and VIII.

(2) The hose reel should be of 20mm or 25mm nominal diameter, non-kinking reinforced rubber or reinforced PVC to either BS3169 or other acceptable standards type A, not exceeding 30 m in length and terminating in shut-off branches with 4 mm or 6 mm nozzles.

(3) Water supply for hose reels in terms of flow rate and minimum running pressure shall comply with the requirements in NFPA 25 or other acceptable standards.

(4) Siting and details of installation for hose reels shall comply with the requirements in NFPA 25 or other acceptable standards.

(5) The use of copper or stainless steel pipings is permissible for the connection of the hose reel to the Water Authorities mains.

Installation of hydraulic hose reels

177.-(1) Every building or part of a building, except that of Purpose Group I or II residential floors, having a total floor area of more than that specified in Column B of Table 16 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 as indicated in Column C of Table 16, which shall be an electrically supervised system complying with the requirements of the NFPA 72 or other acceptable standards and shall be connected to a fire station through an approved alarm monitoring station where is required under Regulation 184.

(2) In building of mixed commercial-cum-residential usage, the residential floors located on the upper storeys of the building shall be provided with manual alarm system at the common area, and where 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.

(3) 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 16, 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.

(4) Notwithstanding the provision of sub regulation (1), where the total floor area per storey of a 2 to 4 storey building of any of the Purpose Group III to VIII exceeds the sizes as stipulated in Column (2) of Table 7, the building shall be provided with an automatic fire alarm system.

(5) Electrical fire alarm system in dormitories shall be provided as follows-

- (a) dormitories not exceeding four storey, manual fire alarm system shall to be provided to comply with NFPA 72 or other acceptable standards;
- (b) dormitories exceeding four storey, automatic fire alarm system shall be provided to comply with NFPA 72 or other acceptable standards.

Electrical
fire alarm

178.-(1) An electrical fire alarm system of the automatic or manual type shall be provided with a fire indicator board to indicate the location of the alarm which has been actuated or operated, and such indication of location shall be accurate to the maximum allowed alarm group area limitations specified in NFPA 72 or other acceptable standards.

(2) The associated control and supervisory equipment, indicating equipment, wiring and arrangement of power supplies for the fire indicator board, shall comply with the requirements in NFPA 72 or other acceptable standards.

(3) All automatic systems which are activated through the general building alarm shall be connected directly to the fire indicator board.

(4) The fire indicator board shall be located near the main entrance of the building, in the fire command centre, in the guardhouse or in the firefighting lobby, where provided, or as may be required by the Relevant Authority.

(5) Sub-fire indicator board, where provided, shall comply with the requirements in NFPA 72 or other acceptable standards.

Fire
Indicator
Board

179.-(1) In a manual alarm system, except as otherwise exempted in Regulation 178 the manual call points shall be provided on every storey of the building or part of the building and shall be so located that no person need travel more than 30m from any position within the building to activate the alarm.

(2) 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, and in the case where an automatic fire alarm system is provided, grouping for indication of location of the manual call points shall comply with the requirements in NFPA 72 or other acceptable standards.

(3) Manual call points should be fixed at a height of 1.4 m above the floor and shall be located at easily accessible

and conspicuous positions free from obstructions, and the installation of the sounding device shall be in accordance with NFPA 72 or other acceptable standards.

(4) Manual break-glass alarm call points may be omitted in car parks, irrespective whether the parking facility is standalone type or forms part of a building.

Manual
alarm call
point

180. Where an automatic fire alarm system is required by these Regulations, the type, location, spacing and installation of the detectors shall comply with the requirements in NFPA 72 or other acceptable standards.

Autom-
atic fire
alarm

181. The alarm device, which normally issue an audible signal unless specifically allowed or required otherwise by the Relevant Authority, shall be actuated where the electrical fire alarm system is activated or operated, and the type, number and location of the alarm device shall comply with the requirements in NFPA 25 or other acceptable standards.

(2) The fire alarm sounder shall have a sound that is readily distinguishable from any other alarm system.

(3) All sounders in the building shall be actuated simultaneously in the event of activation, but, in cases permitted or required by the Relevant Authority, where the operation of alarm sounders are grouped or activated in stages, the arrangement shall comply with the requirements in NFPA 72 or other acceptable standards.

(4) In places of entertainment outlets or areas where audible alarms may be ineffective due to excessive noise, visual alarm signals shall be provided, and the intensity of the light shall be sufficient to draw the attention of people in the vicinity, but visual signals shall not be used in place of audible alarms.

(5) The sound system in entertainment 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.

Alarm device

182. 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;
- (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.

Alarm system for cinema connection to fire station

183.-(1) The electrical fire alarm system required to be installed in a building or premises under this regulation 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 Regulation 183, or
- (d) a building required under the provisions of these Regulation to be protected by an automatic fire alarm or fire extinguishing system.

(2) Notwithstanding the provision in sub Regulation 180(4), where 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.

Sprinkler
protected
building

184. Where sprinkler system is required by these Regulations, provision of automatic thermal or smoke detectors in sprinkler protected premises may be exempted except where such detectors are required to activate or operate the sprinkler or other systems.

Sprinkler
installa-
tion

185.-(1) The automatic sprinkler system shall be provided as follows:

- (a) whenever compartmentation requirements under Part III of these Regulations cannot be complied with;
- (b) every storey of a building, except that of Group I or 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 Group II occupancy forming the upper storeys of a building of mixed occupancy with habitable height exceeding 24m, every storey of the non-residential portion only;
- (d) all basement storeys, except for those used as Purpose Groups I or II, shall be provided with an automatic sprinkler system irrespective of compartment size, and 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-Regulation (a), (b) and (c) of this provision.

(2) 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.

(3) 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 by the Relevant Authority unless the

following conditions are satisfactorily fulfilled:

- (a) basement car parking consist of one level only;
 - (b) external openings are 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:
 - (i) 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;
 - (ii) no point is 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 is at least 600mm in height;
 - (c) total aggregate area of these voids and vertical openings are not less than twenty percent of the total basement floor area;
 - (d) automatic fire alarm system are provided to the basement car parks with extension of alarm bells to the common or lobby areas of the upper storeys in accordance with Regulation 178.
- (4) Save for industrial buildings, such as factories Purpose Group VI, warehouses and storage depots Purpose Group VIII, the following areas are exempted from sprinkler protection in a sprinklered building-
- (a) canopies or car porches;
 - (b) external corridors not exceeding 4m in width, provided there is no commercial activities or storage within these areas;
 - (c) atrium ceilings which exceed the height of 12m, measured from the finished floor level of the atrium floor to the ceilings of the atrium roof or to the level of half the vertical height of the ceilings of the atrium roof in the case of irregular roof profile; and

(d) external open-sided linkways not exceeding 5m in width, provided there is no commercial activities or storage within these areas.

(5) Without prejudice to the provision of sub regulation (4), approved effective detectors shall be installed in accordance with the approved standards and there shall be no commercial activities or storage within the floor spaces below the atrium roofs.

(6) Installation of the sprinkler system and its associated water supply, control and testing requirements shall comply with the NFPA 13 or other acceptable standards.

(7) The sprinkler system shall be electrically monitored so that on the operation of any sprinkler head, the fire signal is automatically transmitted to a fire station through an approved alarm monitoring station.

Special
purpose
rooms

186.-(1) Where a building is required to be provided with an automatic sprinkler system under these Regulations, parts of the building which are used for purposes stipulated in Table 17 shall be compartmented in accordance with columns 3(a) and 3(b) of the table, and exception to sprinkler provision for such rooms or spaces are indicated “Ex” in column 3(c) of the Table.

(2) Where a building is not required to be provided with an automatic sprinkler system under these Regulations, special purpose rooms stipulated in Table 17 shall be compartmented in accordance with columns 2(a) and 2(b) of the Table.

(3) 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-

(a) it must be constructed to have minimum one hour fire resistance rating;

- (b) any door opening must be protected with minimum one hour fire door;
- (c) it must not be provided with more than two exits;
- (d) the direct travel distance to any exit door of the enclosure must not exceed 15m; and
- (e) the fire extinguishing system using clean agent must conform to Regulation 191(2).

Water mist system

187. 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 is of appropriate design that has been tested to meet the performance requirements of a standard acceptable to the Relevant Authority;
- (b) design and installation of water mist system conforms to NFPA 750 Standard for the Installation of Water Mist System or AS 4587 or other acceptable standards Water Mist Protection System – System Design, Installation and Commissioning; and
- (c) components of water mist system are listed by a recognised testing laboratory.

Sprinkler installation to car park

188. In multi-storey buildings under Purpose Groups II, IV, V and VII, where any car parking area above ground is provided with natural ventilation in accordance with Regulation 72(c), the provision of automatic sprinkler to the car parking area shall not be required provided-

- (a) an automatic fire alarm system is provided to the car parking area under Purpose Groups IV, V and VII subject to Table 7 and Table 16; and
- (b) manual fire alarm system is provided to the car parking area under Purpose Group II subject to Table 16.

Sprinkler installation in new

189. Guidelines on reduced water storage for automatic fire sprinkler system in buildings given in Second

and existing buildings Schedule, provide an acceptable design approach for the installation of sprinkler systems in both new and existing buildings under ordinary hazard category Classification under NFPA 13 or other acceptable standards.

Installation of other fire extinguishing system 190. Installation of any fixed automatic fire extinguishing systems which are not provided under these Regulations shall not be accepted as substitute of any provision stipulated in these Regulations unless otherwise approved as such by the Relevant Authority, but such systems shall be considered as additional protection for property safety and their installation shall not adversely affect the performance of the stipulated systems.

(2) Design and installation of such automatic fire extinguishing systems shall comply with corresponding Codes of Practice acceptable to the Relevant Authority.

Hoist way ventilation 191. Lift hoist ways shall be vented in accordance with the BS 150 4190 Part 1 or other acceptable standards.

Emergency power supply 192.-(1) Emergency power supply for lighting, ventilation and alarm systems for all passenger lifts shall comply with the requirements in BS 150 4190 Part 1 or other acceptable standards.

(2) Buildings which require the provision of standby generating plant for special emergency operations for lifts shall include-

- (a) public buildings;
- (b) buildings under Purpose Group II exceeding the habitable height of 60m;
- (c) buildings under Purpose Group II where the passenger lifts serve the upper storey residential floors and the non-residential basement;
- (d) mixed developments where the passenger lifts serve both the residential and non-residential floors;
- (e) industrial buildings under Purpose Group VI and

VIII, which are multi-storey; and

(f) all basement occupancies.

(3) In any public building or part thereof, in which the habitable height exceeds 60 m, the emergency power supply shall be so sized and arranged such that-

(a) at least one lift other than the fire lift with access to every storey, or

(b) one lift from each vertical zone where the lifts are arranged to serve different zones in the building, shall remain operative in the event of power failure or fire;

(4) A manual overriding switch with the same function as the fire switch shall be provided for each of the designated lifts under sub regulation (3), and the fire switch shall be located in a designated location such as the fire command centre.

Fire lift

193.-(1) In any building or part thereof, in which the habitable height exceeds 24m, or the depth of the basement is more than 9m below the average ground level, there shall be provided at least one fire lift, which 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 firefighting lobby, which is required by the provisions of Regulation 18(1) (b) of these Regulations.

(2) A fire lift shall have access to every habitable floor above or below the designated floor and shall be adjacent and accessible to an exit staircase and be approached by a fire fighting lobby at each storey.

(3) Fire lift shall be provided with an operational feature that will enable firemen to cancel first or earlier call which had been inadvertently made to the fire lift during an emergency, and this operational feature may be built into the lift control system or alternatively a separate by-pass switch may be provided, but where the operational feature is built into the lift control, it is not mandatory to provide a separate by-pass switch.

(4) A lift mainly intended for the transport of goods shall not be designated as a fire lift.

194.-(1) The installation of the fire lift shall be in accordance with BS 150 4190 Part 1 or other acceptable standards.

(2) The power supply to the lift shall be connected to a sub-main circuit exclusive to the lift and independent of any other main or sub-main circuit, and the power cables serving the lift installation shall be routed through an area of negligible fire risk.

Homing
of lifts

195.-(1) During fire emergency in 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 designated floor and park there with the lift landing doors remaining opened.

(2) In the event of power failure or power interruption in the buildings with standby generating plant, the power 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.

(3) Operation of one or more fire lifts may depend on the capacity of the emergency generating plant but normal operation of lifts shall be automatically reset on the return of normal power supply.

(4) All passenger lifts, including hydraulic lifts, for buildings which are not required to have standby generating plant, shall be provided with Automatic Rescue Device (ARD), and the ARD shall permit the lifts to move and park at the nearest lift landing floor with the lift or landing doors in the opened position in the event of power failure.

(5) Without prejudice to the provisions of this regulation, homing of any of the lifts to a basement storey is not permitted.

(6) In mixed developments comprising residential and non-residential components-

- (a) 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;
- (b) the lifts shall be provided with secondary power supplies from standby generating plant of sufficient capacity;
- (c) where the passenger lifts serve only the residential floors and by-pass the non-residential floors in a protected shaft, the lifts shall be required to be installed with Automatic Rescue Device (ARD), provided the habitable height of the highest floor does not exceed 60m;
- (d) where the passenger lifts serve the upper residential floors and the basement non-residential floors, 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; and
- (e) in case of fire emergency, the passenger lifts shall be brought to the designated floor when any of the fire alarm system in the basement non-residential floors is activated.

(7) Where the lifts open directly into an occupancy area in a designated floor, a shopping floor or an office floor, an alternative designated floor second storey shall also be identified.

(8) 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.

(9) The activation of any detector or sprinkler head covering the lift landing space at the designated floor may cause the lift to be re-directed to home to the alternative floor.

(10) In building which are not provided with sprinkler or automatic fire alarm system, suitable sensors shall be provided at ceiling level to cover the lift landing space, and the

activation of any sensor would cause the lifts to be re-directed to home to the alternative floor.

(11) The alternative floor shall have minimum fire hazard and pre-selected for the homing of passenger lifts, where people can escape to safety in an exit staircase or other exit from the lift landing door.

(12) The requirements provided under this regulation on homing of lifts to an alternative floor shall not be applied to standalone open-sided car park and residential buildings under Purpose Group I and II.

PART VII MECHANICAL VENTILATION AND SMOKE CONTROL SYSTEMS

Air-conditioning and mechanical ventilation systems

196. Where air-conditioning system is provided in lieu of mechanical ventilation system during emergency, all the requirements specified in this part shall apply to the air-conditioning system.

Construction of ductwork

197.-(1) Ducts for air-conditioning and mechanical ventilation systems shall be constructed in compliance with the following requirements-

- (a) 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.
- (b) all air-conditioning or other ventilation ducts shall be adequately supported.
- (c) duct covering and lining should be non-combustible, but if it is necessary to use combustible material, it shall:
 - (i) when tested in accordance with methods specified in these regulations, have a surface flame spread rating of not lower than Class '1' refer regulation 142, but in areas of building where Class '0' refer regulation 142 flame spreading rating is

required for the ceiling construction under these regulations, a Class '0' refer regulation 142 rating for the covering and lining materials shall be required; and

- (ii) when involved in fire generate a minimum amount of smoke and toxic gases, and be at least 1.0 m away from a fire damper.
- (d) flexible connections at the extremity of ventilation ductwork connecting terminal units, extract units and ventilation grilles shall not exceed 4 m;
- (e) flexible joints, which are normally provided to prevent and or allow for thermal movements in the duct system, shall not exceed 250 mm in length; and
- (f) flexible joints shall be made of material Classified as not easily ignitable when tested under BS 476: Part 5 or other acceptable standards.

Pipework
Insulation

198-(1) Insulation for pipework associated with the air-conditioning and mechanical ventilation systems shall comply with the following requirements-

- (a) insulation material for pipework together with vapour barrier lining and adhesives shall, when tested in accordance with the methods specified in these Regulations, have a surface flame spread of not lower than Class '1' refer regulation 142 but in areas of buildings where Class '0' refer regulation 142 flame spread is required for the ceiling construction under these Regulations, a Class '0' rating for the insulation material shall be required
- (b) notwithstanding the requirements of sub Regulation (2) (a), the use of plastic and foam rubber insulation materials of a lower Classification may be permissible where-
 - (i) the material is the self-extinguishing type acceptable to the Relevant Authority;
 - (ii) the insulation material is covered by or

encased in a metal sheath or hybrid plaster or other non-combustible cladding materials acceptable to the Relevant Authority, 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, and fire rated proprietary pipework system may be used when it is tested in the manner acceptable to the Relevant Authority.

(2) Enclosure of ducts shall comply with the requirements in Regulation 112(1).

(3) Ventilation ducts should not pass through smoke-stop or firefighting lobby, but 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, and such construction shall be in masonry,

(4) When other form of fire resisting construction is used, fire damper shall be fitted where the duct penetrates the lobby enclosure.

(5) A concealed space between the ceiling and floor above it, ceiling and roof, or raised floor and structural floor of a building may be used as a plenum provided that-

(a) the concealed space contains only:

- (i) 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 2m, or metal-clad cables;
- (ii) 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;

- (iii) other ventilation ducts complying with sub Regulation 197;
- (iv) communication cables for computers, television, telephone and inter-communication system;
- (v) fire protection installations; or
- (vi) pipes of non-combustible material conveying non-flammable liquid.

(b) the supports for the ceiling membrane are of non-combustible material.

(6) Notwithstanding any of the provisions of these Regulations, no air conditioning or ventilation ducts shall penetrate separating walls.

(7) Any fire damper shall be of the type approved by the relevant authority and 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.

(8) Ventilation ducts which pass directly through a compartment wall or compartment floor shall comply with the following-

- (a) 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; and
- (b) 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.

(9) Installation of fire dampers shall comply with the following requirements-

- (a) fire dampers must be installed so that the casing completely penetrates through the compartment

wall or floor and the casing must be retained either, 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 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;

- (b) flanges must be butted against the face of the compartment wall or floor and fixed to the damper casing;
- (c) ductwork connected to the damper must 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;
- (d) the clearance between the damper body and the sides of the penetration must not be less than that of the tested prototype and not greater than half the width of the angle section of the collar;
- (e) the space between the damper body and the opening in the wall or floor must be fire stopped;
- (f) vertically positioned fire dampers must be installed in such a manner that the direction of air flow assists the closure of the damper;

- (g) the distance between the plane through a closed fire damper and ducting, flexible connections, duct coverings, internal linings and the like, must be not less than 1 m when such parts are made of materials with fusing temperatures less than 1000°C, and 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;
- (h) each fire damper installation must be provided with an inspection access door either upstream or downstream as appropriate, and the access door

dimension must preferably measure 450 mm (length) × 450 mm (width); and

- (i) for smaller ducts, the access door width dimension may be reduced to the width or depth of the duct, and access doors must be hinged and fitted with sash locks, and constructed of minimum 1.25 mm sheet steel suitably braced, and openings in ducts must be stiffened by sheet steel frame.

(10) Fire dampers shall not be fitted in the following locations:

- (a) openings in walls of a smoke extract shaft or return air shaft which also serves as a smoke extract shaft;
- (b) openings in walls of a protected shaft when the openings have a kitchen exhaust duct passing through it;
- (c) anywhere in an air pressurising system; or
- (d) where explicitly prohibited in these Regulations.

(11) Where a fire damper is required under these Regulations to be installed in the air-conditioning and mechanical ventilation system, its type, details of installation, connection of accessories, inspection door, shall be in accordance with Specifications of Fire Dampers.

(12) Fire resisting floor ceiling shall comply with the following requirements-

- (a) the space above a suspended ceiling which forms part of a fire-rated floor ceiling or roof-ceiling construction must not contain ducting unless ducting was incorporated in a prototype that qualified for the required fire-resistance rating, where the ducting is required to be identical to that incorporated in the tested prototype;
- (b) openings in the ceiling, including openings to enable the ceiling to be used as a plenum, must

be protected by fire dampers identical to those used in the tested prototype and such openings in the ceiling must be so arranged that-

- (i) no opening is greater in area than that corresponding in the prototype test panel;
- (ii) the aggregate area of the openings per unit ceiling area does not exceed that of the prototype test panel; and
- (iii) the proximity of any opening to any structural member is not less than that in the prototype test panel.

(13) The use of fire rated duct shall comply with the following requirements-

- (a) 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;
- (b) proprietary fire rated duct shall be tested to BS 476 Part 24 or other acceptable standards and its usage be approved by the Relevant Authority;
- (c) 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 10N/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; and
- (d) fans forming part of a fire rated duct shall also be enclosed in the same fire rated enclosure.

(14) 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, and 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.

Air handling unit rooms, smoke detectors and stop switch

199.-(1) Air handling systems shall not use protected shaft of exits, smoke-stop lobbies, including its concealed space for supply, exhaust or return air plenums.

(2) 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, but, 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 Regulation 197(6).

(3) Smoke detectors of approved type shall be incorporated in the return air stream immediately adjacent to-

- (a) air handling units serving more than one storey or compartment;
- (b) a single unit in excess of 15000 m³/h; or
- (c) any AHU as may be required by the Relevant Authority.

(4) The function of smoke detectors where required by these Regulations is to initiate action to shut down the AHU automatically when the smoke density in the return-air system has become unacceptable for recycling, and details of the requirements shall be in accordance with BS 5720 or acceptable standards.

(5) Where the air handling units in a building are not centrally controlled, each air-handling unit exceeding

8,500 m³/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, and this switch shall preferably be located on the wall next to the door opening of the air-handling equipment room.

Exit

200-(1). 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.

(2) Mechanical ventilation system for each exit staircase and internal exit passageway, where provided, shall be an independent system of supply mode only exclusive to the particular staircase, and it shall comply with the following requirements-

- (a) for exit staircase serving more than four storeys, supply air shall be conveyed via a vertical duct extending throughout the staircase height and discharging from outlets distributed at alternate floor;
- (b) 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 Regulation 112(4) of at least the same fire resistance as the elements of structure and it shall not be fitted with fire dampers;
- (c) the ventilation system shall be of supply mode only of not less than four air changes per hour; and
- (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 centre, or at the fire indicating board where there is no fire command centre, and visual indication of the operation status of the mechanical ventilation system shall be provided.

- (e) supply air for the system shall be drawn directly from the external, with intake point not less than 5m from any exhaust discharge openings;

Mechanical ventilation smoke-stop lobbies and fire fighting

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

- (a) the ventilation system shall be of supply mode only of not less than ten 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 firefighting lobby which it serves shall either be enclosed or constructed to give a fire resistance rating of at least one hour, but the Relevant Authority may at its discretion require a higher fire resistance rating where the duct passes through an area of high fire risk; and
- (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 centre, or at the fire indicating board where there is no fire command centre, visual indication of the operation status of the mechanical ventilation system shall be provided.

Engine driven fire pump and emergency generator

202. Where mechanical ventilation is installed to provide a smoke free environment for the room housing the Engine driven fire pump and generator; such system shall be independent of each other and any other system serving other parts of the building, and the following requirements must be comply with-

- (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, and 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, and the rating shall apply to fire exposure from both internal and external of the duct or structure;
- (c) where the duct risers are required to be enclosed in a protected shaft constructed of masonry or drywall complying with Regulation 114(a) and (b), they shall be compartmented from the rest of the shaft space containing other ducts or services installations;
- (d) no fire damper shall be fitted in either supply or exhaust duct required under these Regulation; and
- (e) duct serving areas other than rooms housing equipment stated in this regulation shall not pass through such rooms.

Fire
command
centre

203. Where mechanical ventilation is required in fire command center, the following requirements shall apply-

- (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 centre, 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;
- (c) where the duct risers are required to be enclosed in a protected shaft constructed of masonry or drywall complying with Regulation 114, they shall be compartmented from the rest of the shaft space containing other ducts or services installations;
- (d) no fire damper shall be fitted in either supply or exhaust duct required under this Regulation; and
- (e) duct serving areas other than the fire command centre shall not pass through the room.

Mechanical
exhaust
system in
Kitchens

204. 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 and shall also comply with the following requirements:

- (a) the hood and ducts for the exhaust shall have a clearance of 500 mm from unprotected combustible materials;
- (b) the exhaust shall be discharged directly to the external and shall not be less than 5m from any air intake openings;
- (c) 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, and the rating shall apply to fire exposure from both internal and external of the duct or structure;
- (d) where the duct riser is required to be enclosed in a protected shaft constructed of masonry or drywall complying with Regulation 114(a) and (b), it shall be compartmented from the rest of the shaft space containing other ducts or services installations; and
- (e) no fire damper shall be fitted in kitchen exhaust ducts.

Rooms involving use of flammable and explosive substances

205. 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, and shall comply with the following requirements:

- (a) ventilation system must consist of exhaust and supply part with a rate of 20 air-change per hour or any other rates acceptable to the Relevant Authority, and the exhaust must be direct to the external and must not be less than 5 m 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, and the rating shall apply to fire exposure from both internal and external of the duct or structure;
- (c) subject to paragraph (b), where the duct risers are required to be enclosed in a protected shaft constructed of masonry or drywall complying with Regulation 114(a), they shall be compartmented from the rest of the shaft space containing other ducts or services installations;
- (d) no fire damper shall be fitted in either supply or exhaust duct required under this Regulation; and
- (e) ducts serving other areas shall not pass through rooms involving use of flammable and explosive substances.

Basement car park

206. Where mechanical ventilation system is required for car parking areas in basements with total floor area exceeding 2000m², 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, and the following requirements must be comply with-

- (a) the smoke purging system shall be activated automatically by the building fire alarm system;
- (b) a remote manual start-stop switch shall be located at fire command centre, or at main fire alarm panel on first storey where there is no fire command centre in the building;
- (c) visual indication of the operation status of the smoke purging system shall also be provided with the remote control;
- (d) supply air shall be drawn directly from the external and its intake shall not be less than 5m from any exhaust discharge openings, and outlets for the supply air shall be adequately distributed over the car park area;
- (e) where there is natural ventilation for such basement car park based upon openings equal to not less than 2.5 percent 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, and the openings shall be evenly distributed over the car park areas;
- (f) exhaust air shall be discharged directly to the external and shall not be less than 5m from any air intake openings;
- (g) exhaust ducts shall be fabricated from heavy gauge steel 1.2mm thick for the basement car park smoke purging system; and
- (h) exhaust fans of the basement car park smoke purging system shall be capable of operating effectively at 2500c for two hours.

Pressurisation for exit staircases

207.-(1) In any building of which the habitable height exceeds 24 m, any internal exit staircases without adequate provision for natural ventilation shall be pressurised to comply with the requirements in these Regulations.

(2) Building comprising more than four basement

storeys, exit staircase connected to firefighting lobby in basement storeys shall be pressurised to comply with the requirements in these Regulations.

Pressurisation level

208. When in operation, the pressurisation system shall maintain a pressure differential of not less than 50 Pa between the pressurised exit staircase and the occupied area when all doors are closed.

(2). Where a smoke stop lobby is also pressurised, the pressure at the exit staircase shall always be higher.

(3) The force required opening any door against the combined resistance of the pressurising air and the automatic door-closing mechanism shall not exceed 110 N at the door handle.

Egress velocity

209.-(1) When in operation, the pressurisation system shall maintain an air flow of sufficient velocity through open doors to prevent smoke from entering into the pressurised area.

(2) 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.

Leakages

210.-(1) The rate of supply of pressurised air to the pressurised areas shall be sufficient to make up for the loss through leakages into the unpressurised surroundings.

(2) Adequate relief of leaked air out of the occupied area shall be provided to avoid a pressure build-up in this area, and the relief may be in the form of perimeter leakages or purpose-built extraction systems.

Distribution of pressurising air

211.-(1) The number and distribution of injection points for supply of pressurising air to the exit staircase should ensure an even pressure profile complying with Regulation 208.

(2). The arrangement of the injection points and the

control of the pressurisation system shall be such that when opening of doors or other factors cause significant variations in pressure difference, condition in Regulation 208 should be restored as soon as practicable.

Operation of Equipment in the event of fire

212.-(1) All the equipments and the relevant controls associated with the pressurisation system shall be so designed and installed to ensure satisfactory operation in the event of and during a fire.

(2) Supply air for pressurisation system shall be drawn directly from the external and its intake shall not be less than 5m from any exhaust discharge openings.

(3) The pressurisation system shall be automatically activated by the building fire alarm system, and in addition, a remote manual start-stop switch shall be made available to firemen at the fire command centre, or at the fire indicating board where there is no fire command centre, and visual indication of the operation status of the pressurisation system shall be provided.

Pressurisation of internal corridors in hotels

213. Where internal corridors in hotels are required to be pressurised in compliance with Regulation 49(c), 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.

Basement smoke control system

214. Where the total aggregate floor area of all basement storeys does not exceed 2000m², smoke vents in accordance with Regulation 215 shall be provided.

(2) Where the total aggregate floor area of all basement storeys exceeds 2000m², engineered smoke control system that complies with the requirements stipulated in Regulation 216 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 car park, Regulation 206 can be adopted to the car park provided it is compartmented from rest of the basement;

- (ii) plant or equipment room with floor area not exceeding 250m² and compartmented from rest of the basement, and provided with two doors for better reach in firefighting operation;
- (iii) plant or equipment room with floor area exceeding 250m² but not exceeding 2000m², smoke vents in accordance with Regulation 215 or smoke purging system of at least 9 air-change per hour shall be provided; and
- (iv) service areas such as laundries, office, storeroom and workshops restricted to staff only which are compartmented, smoke venting provision in accordance with Regulation 215 or smoke purging system of at least 9 airchange per hour may be accepted for those areas in lieu of the engineered smoke control system, and automatic fire alarm or extinguishing system in accordance with Table 16 shall be provided where required.

Smoke
vents
distribution
and
installation

215.-(1) Smoke vents shall be adequately distributed along perimeter of basement and their outlets shall be easily accessible during firefighting and rescue operations.

(2) Smoke vents installation pursuant to sub regulation (1) shall comply with the following requirements-

- (a) the number and their sizes must be aggregate effective and vent openings must not be less than 2.5 percent of the basement floor area served;
- (b) the vent outlets where covered under normal conditions must be openable in case of fire;
- (c) the position of all vent outlets and the areas they serve must be suitably indicated adjacent to such outlets;
- (d) where ducts are required to connect the vent to outlets, the ducts must either be enclosed in structure or be constructed to give at least one hour fire resistance; and

- (e) separate ducts and vent outlets must be provided for each basement storey.

Engineered
smoke
control

216. Where engineered smoke control system is required, it shall be provided as specified under Regulation 219.

Smoke
purge
system for
non-car
park
occupancy

217. Where smoke purging systems permitted under these Regulations in buildings for basement occupancies of plant or equipment room and service areas such as laundries, office, 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, and a remote manual start-stop switch shall be located at fire command centre, or in the absence of a fire command centre in the building, at the main fire alarm panel on the first storey;
- (c) visual indication of the operational status of the smoke purging system shall be provided with the remote control;
- (d) horizontal ducts shall be fabricated from heavy gauge steel 1.2 mm thick;
- (e) the exhaust fan shall be capable of operating effectively at 250°C for two hours and supplied from a secondary source of supply; and
- (f) replacement air shall be provided and when it is supplied by a separate mechanical system, such a system shall be connected to a secondary source of power.

Smoke
control
system

218. A smoke control system specified in Regulation 217 shall be provided where-

- (a) the requirements for compartmentation specified in Regulation 66 and are relaxed under the conditions in Regulation 70 for 'Atrium spaces'

- in a building; and
- (b) the total floor area of any compartment in a building or part of a building exceeds 5000m².

Engineered smoke control system and acceptable design guidance

219. The engineered smoke control system shall be in the form of a smoke ventilation system by natural or mechanical extraction designed in accordance with:

- (a) BRE 186 or acceptable standards.
- (b) BRE 258; or
- (c) other acceptable standards.
- (2) The building to be provided with an engineered smoke control system shall be sprinkler protected.
- (3) 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.
- (4) The capacity of an engineered smoke control system shall be capable of handling the largest demand for smoke exhaust from the worst case scenario.
- (5) The design smoke layer base shall be above the heads of people escaping beneath it. The minimum height shall be 2.5m.
- (6) 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.
- (7) For cases where smoke is removed from the room of origin the smoke reservoir size for a smoke ventilation system shall not exceed:
 - (a) 2000m² for natural smoke ventilation system.
 - (b) 2600m² for mechanical smoke ventilation system.
- (8) 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- :
 - (a) 1000m² for natural smoke ventilation system.
 - (b) 1300m² for mechanical smoke ventilation

system.

(9) For cases where smoke is removed from the circulation space or atrium space, the rooms discharging smoke into the circulation space or atrium spaces shall either-

- (a) have a floor area of not exceeding 1000m² for natural ventilation system or 1300m² for mechanical ventilation system; or
- (b) be subdivided such that smoke is vented to the circulation space or atrium only from part of the room with floor area not exceeding 1000m² for natural ventilation system or 1300m² for mechanical ventilation system that are adjacent to the circulation space or atrium, but, the remainder of the room needs to be provided with an independent smoke ventilation system.

10. The maximum length of the smoke reservoir shall not exceed 60m.

(11) Adequate arrangement shall be made in each smoke reservoir for the removal of smoke in a way that will prevent the formation of stagnant regions.

(12) Owing to practical limitation, a smoke ventilation system shall have-

- (a) a maximum mass flow not exceeding 175 kg/s; and
- (b) a minimum smoke layer temperature of 18⁰C above ambient.

(13) Replacement air shall be by natural means drawing air directly from the external as follows-

- (a) the design replacement air discharge velocity shall not exceed 5.0m/s to prevent the escapees being hindered by the air flow;
- (b) replacement air intake shall be sited at least 5 m away from any exhaust air discharge;
- (c) replacement air shall be discharged at a low level, at least 1.5m beneath the designed smoke layer, to prevent fogging of the lower clear zone;
- (d) where the inlet cannot be sited at least 1.5m

below the smoke layer, a smoke curtain or a barrier shall be used to prevent replacement air distorting the smoke layer; and

- (e) 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.

(14) For cases where the smoke reservoir is above the false ceiling, the ceiling shall be of perforated type with at least twenty five percent opening.

(15) The smoke ventilation system shall be provided with secondary source of power supply.

(16) The smoke ventilation system shall be activated by smoke detectors located in the smoke control zone, and 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.

(17) Provision of activating smoke detectors shall comply with NFPA 72 or other acceptable standards.

(18) 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 centre and where there is no fire command centre, at main fire indicator board.

(19) Except for ventilation systems in Regulation 164 (1) (g) 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.

(20) 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 and the standby fan shall be automatically activated in the event the duty fan fails.

(21). Fans under sub regulation (20) shall be capable of operating at 250°C for two hours.

(22) The fans and associated smoke control equipment shall be wired in protected circuits designed to ensure continued operation in the event of the fire.

(23) 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 and the cables shall be of at least one hour fire resistance in accordance with BS 6387.

(24) Smoke ventilation ducts both exhaust and replacement air ducts shall be of at least one hour fire resistance, and 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, and the rating shall apply to fire exposure from both internal and external of the duct or structure and the duct shall also comply with Regulation 196.

(25) Fire damper shall not be fitted in the smoke ventilation system.

(26) The time taken for the smoke ventilation system within a smoke zone to be fully operational shall not exceed sixty seconds from system activation.

(27) For natural smoke ventilation system the natural ventilators shall be-

- (a) in the open position in the event of power or system failure; and
- (b) positioned such that they will not be adversely affected by positive wind pressure.

(28) Natural exhaust ventilation shall not be used together with powered smoke exhaust ventilation.

(29) All smoke curtains where required, unless permanently fixed in position, shall be brought into position automatically to provide adequate smoke-tightness and effective depth.

(30) 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.

(31) 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 withstand the design highest temperature.

(32) All smoke control equipment including smoke curtains shall be supplied and installed in accordance with the accepted standards BS 7346 or other acceptable standards.

(33) Provision of smoke vents having 2.5 percent of the floor area shall be provided to auditorium which is not sprinkler protected and to auditorium having floor area more than 500m², but where sprinkler is protected, the opening of the smoke vents shall be by automatic device.

(34) Place of smoke vents, an engineered smoke control system may be considered as acceptable.

PART VIII OTHER SYSTEMS

Exi Ligting
and Exit

220.-(1) Exits of all buildings, except for Purpose Group I, shall be provided with artificial lighting facilities to the satisfaction of the requirements under these Regulations.

(2) The minimum illuminance to be provided for all exits and the spacing for luminaries shall be in accordance with the requirements in BS EN 50172 or other acceptable standards.

(3) The delay between the failure of the electrical supply to normal lighting and the energization of the exit lighting shall not exceed one second.

Emergency
lighting for
corridors
and lobbies

221. Emergency lighting shall be provided in all corridors and lobbies of all buildings except Purpose Group I.

(2) The minimum level of illuminance, the spacing of luminaires and the maximum delay for emergency lighting required in this Regulation shall be the same as that for the exit lighting.

Emergency
lighting for
occupied
areas

222.-(1) For all buildings except Purpose Group I or II, emergency lighting shall be provided in the occupied areas following the guidelines below-

- (a) 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
- (b) over the whole of such area, if there are no explicit paths leading to corridors, lobbies and exits.

(2) Notwithstanding the requirements in sub regulation (1) above, emergency lighting shall be provided in the following locations-

- (a) lift cars as stipulated in this Regulation;
- (b) fire command centres;
- (c) generator rooms;
- (d) basement car parks;
- (e) fire pump rooms; and
- (f) areas of refuge within the same building.

(2) The minimum level of illuminance shall comply with the requirements in BS EN 50172 or other acceptable standards.

(3) 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 fifteen seconds.

Firefighting
facilities

223. Emergency lighting for firefighting facilities shall comply with the following requirements-

- (a) fire alarm panels, fire alarm call points and firefighting equipment shall be adequately illuminated at all times so that they can be readily located;
- (b) the minimum level of illuminance shall comply with the requirements in BS EN 50172 or other acceptable standards; and

- (c) the delay between the failure of the electrical supply to normal lighting and the energization of the emergency lighting for firefighting facilities shall not exceed fifteen seconds.

Secondary source of power supply

224.-(1) 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 Regulations.

(2) Duration of the secondary source of power supply shall comply with the requirements in BS EN 50172 or other acceptable standards.

(3) 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 BS EN 50172 or other acceptable standards.

Luminaire

225. All exit and emergency luminaires required by this Regulation shall be of approved type as specified in BS EN 50172 or other acceptable standards

Exit and Directional signs

226.-(1) In all buildings, except for Purpose Group I and II, the entrance to every exit on every floor shall be clearly indicated by an exit sign placed over the exit door, and such signs shall be placed so as to be clearly visible at all times.

(2) 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.

(3) Additional low level or floor mounted exit and exit directional signs shall be provided in hotel accommodation floors including boarding houses.

(4) Where the Relevant Authority has allowed under Regulation 24 (4), upper storey staircase to be continuous with that serving the basement, appropriate signages, including pictorials shall be placed at strategic location inside the staircase to direct occupants out of the building in

times of emergency.

(5) The legends, dimensions, design and installation of the exit signs and directional signs shall comply with BS EN 50172 or other acceptable standards.

(6) Self-illuminating exit and directional signs with letters in green and powered by radioactive material are allowed for use in buildings, provided the signs comply with BS 5499 Part two under sub regulation (5) with respect to the design of signage, either graphic or text is acceptable.

(7) Where the direction of travel to exit discharge is upward, the staircase signage required under Regulation 20 (4) and (5), shall comply with BS 5499 – Specification for Fire Safety Signs.

Voice
communi-
cation
system and
fire
command
centre

227.-(1) One way emergency communication system and a fire command centre shall be provided as follows-

- (a) for all large buildings under Purpose Groups III not applicable to primary school, secondary school and colleges, IV, V and VII gross floor area greater than 5000m² or having a total occupant load exceeding one thousand persons and large industrial buildings under Purpose Group VI and VIII gross floor area greater than 5000m²;
- (b) for all buildings belonging to Purpose Groups III, IV, V, VI, VII, and VIII of more than 24m in habitable height; and
- (c) for hotel or health care occupancies of less than 24m in habitable height, loudspeakers for the public address system shall be provided in every lift lobby, staircase enclosure and other strategic positions within audible distance of all parts of all storeys of the building.

(2) Two way emergency communication system shall be provided between the Fire Command Centre, under

- sub regulation (1) (a) and (b), and the following area-
- (a) every firefighting lobby, including first storey;
 - (b) all firefighting related mechanical equipment rooms inclusive of sprinkler pump room, wet rising main pump room, hose reel pump room, switch rooms and generator rooms;
 - (c) all rooms housing smoke control equipment;
 - (d) all lift machine rooms;
 - (e) firelift, but where the lift car is equipped with built-in intercom system that complies with BS 5839 Part 8
 - (f) each area of refuge; and
 - (g) air-handling control rooms, but where AHU can be remotely monitored and controlled at the Fire Command Centre, and cannot be by-passed locally, and the electrical cabling between AHU rooms and Fire Command Centre are fire rated, the two-way communication system can be exempted.
- (3) For building of mixed commercial cum residential usage, the requirements of sub regulation (1)(b) of this Regulation shall be applicable provided that-
- (a) 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; and
 - (b) where a commercial component of the building is located above any residential occupancies, the provisions of sub regulation 1(b) shall be applicable if the habitable height of the building exceeds 24m
- (4) Where a one way or two way emergency communication system is required by these Regulations, it shall comply with the requirements stipulated in BS 5839 or other acceptable standards.

Fire
command
centre

228.-(1) A Fire Command Centre shall be provided in any building, with the exception of buildings under Purpose Groups I and II, which requires any of the following installation-

- (a) fire lift;
- (b) emergency voice communication system; and
- (c) engineered smoke control system.

(2) A Fire Command Centre shall be of adequate size to house all the terminals and supervisory or control equipment, the building's fire protection or detection systems and a free working space of at least 6m².

(3) A Fire Command Centre shall be located adjacent to the fire lift lobby at the designated storey of the building or at any other location as may be designated by the Relevant Authority.

(4) The construction of enclosure, facilities and lighting of a Fire Command Centre shall comply with the BS 5839 or other acceptable standards

(5) 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.

Two-way
communica
tion system

229. 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-

- (a) every firefighting lobby, including first storey, where building comprising two, three or four basements, one of the smoke stop lobbies shall be designated as a fire fighting lobby;
- (b) all firefighting related mechanical equipment rooms, inclusive of sprinkler pump room, wet rising main pump room, hose reel pump, switch rooms, generator rooms, and lift machine room;
- (c) all rooms housing smoke control equipment;

- (d) fire lift, except where the lift car is equipped with built-in intercom system that complies with each area of refuge; and
- (e) BS 5839 or other acceptable standards.
- (f) air-handling control rooms, except where AHU can be remotely monitored and controlled at the Fire Command Centre, and cannot be by-passed locally, and the electrical cabling between AHU rooms and Fire Commanding Center (FCC) are fire rated.

Exception to two-way communication system

230.-(1) 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.

(2) 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

PART IX MISCELLANEOUS PROVISIONS

Fire safety during building construction and demolitions

231.-(1) Every building under these Regulations, undergoing construction or demolition operations shall comply with these regulations

(2) Every dwelling house shall have portable fire extinguishers and smoke detectors.

(3) Subject to section 24 of the Act, a fire protection plan shall be established where required by the Relevant Authority.

(4) Where required by the fire authority, a telephone shall be provided at the construction site for the purpose of emergency notification, the street address of the construction site shall be posted adjacent to the telephone together with the emergency telephone number.

Water
supply fire
protection

232.-(1) In all buildings, water supply for the fire protection, either temporary or permanent shall be made available as soon as combustible material accumulates, and there shall be no delay in the installation of fire protection equipment.

(2) Where underground water means and hydrants are to be provided, they shall be installed, completed and in service prior to combustible materials being brought into the construction work.

(3) In buildings required to be provided with a standpipe system in accordance with these regulations, not less than one standpipe shall be provided and kept in service during construction, and such standpipe shall be-

- (a) installed when the progress of construction is not more than 12m in height above ground;
- (b) provided with approved fire department hose connections at accessible locations adjacent to usable stairs;
- (c) designed to furnish 2000 litres of water per minute at the top most outlet at 448kPa;
- (d) extended as construction progresses to within one floor of the highest point of construction having secured decking or flooring; and
- (e) provided with conspicuous marked and readily accessible fire department connections on the outside of the building at the street level and shall have at least one standard hose outlet at each level.

(3) Subject to sub regulation (3) where the standpipe is temporary, it shall be designed to furnish 400 litres of water per minute at 448kPa with a standpipe size of not less than 10cm and shall remain in service until the permanent standpipe installation is complete.

Scaffolding,
shoring and
forms

233. In buildings undergoing construction or demolition, accumulations of unnecessary combustible forms of lumber shall be prohibited, but they may be brought into the building only when needed.

(2) The portions of the building under sub regulation (1) where combustible forms are present shall not be used for the storage of other combustible building materials.

(3) During forming and stripping operations, portable fire extinguishers or charged hose lines shall be provided to protect adequately the additional combustible loading.

Storage of flammable and combustible liquids

234.-(1) Storage of flammable and combustible liquids in buildings undergoing construction or demolition shall be in accordance with this regulation, and storage shall not exceed 200 litres.

(2) The storage area shall be kept free of weeds, debris and combustible materials not necessary to the storage.

(3) Open flames and smoking shall not be permitted in flammable and combustible liquid storage areas.

Fire safety during demolition

235.-(1) Demolition operations involving the use of cutting and welding shall be in accordance with these regulations.

(2) Combustible waste material shall not be burned at the demolition site unless approved by the Relevant Authority, and they shall be removed from the site as often as necessary to minimize the hazards there from.

(3) Where in the opinion of Relevant Authority the demolition site is of a hazardous nature, qualified personnel shall serve as an onsite fire protection manager.

(4) Where explosives are used in demolition work, hose lines at least two 1½ inches or one 2½ inches shall be provided in the immediate vicinity of the demolition site during actual detonation, and these lines must be of sufficient length to be capable of extinguishing any incipient fire anywhere on the demolition site after detonation.

Fire protection manager

236.-(1) For the purpose of section 24 of the Act, all Public and industrial buildings which have a gross floor area of 2000m² or more or an occupant load of two hundred

persons or more, are required to have a Fire Protection Manager.

(2) The owners or occupiers of which the provisions of these Regulation apply shall-

(a) within ninety days from the time the premises are specified or fall within the Class of premises specified by the Commissioner General appoint a fire protection manager;

(b) provide the fire protection manager appointed by him with such facilities, equipment and information as are necessary to enable the fire safety manager to discharge his duties effectively and efficiently;

(a) permit or let the fire safety manager to attend such courses of instruction and received such training relating to the work of the fire protection manager as may be required by the Commissioner General;

(b) within thirty days of the termination appointment of his Fire Protection Manager appoint another person to be his Fire Protection Manager; and

(c) within fourteen days of the appointment or termination of appointment of any fire protection manager notify the Commissioner General in writing of such fact.

(3) In assisting the building owner in ensuring fire safety in the building, the fire protection manager shall perform the following functions:

(a) enforce the fire safety Regulations as stipulated in the fire emergency plan;

(b) exercise supervision over maintenance of all fire safety measures within the premises;

(c) ensure that the number of people in any part of the premises does not exceed the authorized maximum number of people for whom means of escape have been provided in accordance with the fire protection regulation;

- (d) detect and remove or cause removal of fire hazards within the premises;
- (e) prepare and formulate a fire emergency plan for the premises and organize regular fire drills in order to ensure that all persons employed in or using the premises or part thereof, are familiar with all means of escape in case of fire;
- (f) prepare and formulate fire safety guide books for the premises;
- (g) train staff and persons in the premises in firefighting and evacuation;
- (h) coordinate and supervise staff and persons in the premises in firefighting and evacuation in the event of fire or other emergencies;
- (i) assist the operation of the fire command centre in the event of fire or other emergencies;
- (j) appoint responsible person to take over his duties in his absence; and
- (k) to prepare and submit fire safety report to Relevant Authority
- (l) perform any other works necessary for fire safety.

(4) Pursuant to sub regulation (3) (k) annual fire safety report shall contain-

- (a) project description or information of the building or premises.
- (b) fire safety design concept;
- (c) fire engine accessibility;
- (d) means of escape;
- (e) structural fire precaution;
- (f) control and exhaust of smoke and toxic fumes;
- (g) firefighting systems;
- (h) fire alarm systems;
- (i) emergency fire supply;
- (j) emergency evacuation lighting;
- (k) emergency voice communication system;
- (l) two way emergency communication system
- (m) emergency lift control;

- (n) areas of fire risk;
- (o) fire scenario;
- (p) fire safety management;
- (q) the kind of training conducted either internal or external, for tenants occupants, fire wardens, in house fire fighters, management and staff;
- (r) fire safety activities conducted for the reporting period as well as schedule of fire safety activities for the next twelve month;
- (s) improvement and other fire safety measures; and
- (t) any other relevant matter required to be reported on request by the Relevant Authority.

Qualifica-
tion of fire
protection
manager

237.-(1) A person shall qualify to be appointed as Fire Protection Manager, if he possesses basic certificate, diploma, degree, or any higher qualification, in firefighting after undergoing a training course at Fire Training College or any other recognized Fire training institution.

(2) In addition to qualifications under sub regulation (1), a fire protection manager may have either of (following as an added advantage-

- (a) certificate in fire engineering;
- (b) diploma in building services;
- (c) diploma in fire and safety management;
- (d) a fireman who has been in a managerial or supervisory position for more than one year.

Fire
protection
equipment

238. Save where stated otherwise by these Regulations or any other relevant law, the design, installation or maintenance of Fire Protection equipment shall be done by a qualified person in firefighting and safety management.

Operation
of building
after
approval

239. The operation of a factory, high rise building and high flammable material storage building shall be approved by the Relevant Authority before operation.

Hazard
grade
classifica-
tion

240.-(1) Storage of compressed gases Class '2', flammable liquid Class '3', flammable solid Class '4.2' and '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.

(2) Solid materials Class '4.1' shall be allowed to be stored at aboveground floors of habitable height not more than 24m and the storage quantity shall be limited to 1,200kgm² of floor area.

(3) Compressed gas cylinders Class '2' shall be 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.

(4) For Class '2' hazardous materials, no stacking is allowed, and the hazardous materials shall be laid directly on the floor.

(5) Storage, use and handling of compressed gases Class '2' shall be in compliance with NFPA 55 and it may allow be located at aboveground floor.

(6) For sprinkler protected warehouse, the storage height shall be limited to 18m for single storey warehouse and 15m for warehouse that is located at first storey of a multiple-storey building.

(7) For non-sprinkler protected warehouse storing Class '3' hazardous materials, the storage height shall be in compliance with NFPA 30 basing on the flashpoints of the hazardous materials, subject to a maximum height of 3.6m.

(8) Storage of oxidizers Class '5.1', solid or liquid shall be in compliance with NFPA 430.

(9) Storage of organic peroxide Class '5.2' shall be in compliance with NFPA 432.

(10) No compartment in the chemical or hazmat warehouse shall comprise of more than one storey

(11) Recommendations made within the individual Material Safety Data Sheet (MSDS) shall be complied with.

(12) An approved layout plan with the relevant Temporary Fire Permit or Fire Safety Certificate with such

2. (3) For type K3 and K4 compartment, at least one external wall shall be directly fronting an engine access road or access way, and at least two exit access doors minimum 15m apart shall be provided along this external wall for ease of fire-fighting.

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

(5) For type K1 compartment, the distance from the external loading or unloading area may be roofed over to the access door of the compartment and shall not be more than 10m for no sprinkler protection building, and 15m for sprinkler protection building.

(6) 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

(7) For storage of Class '4.1' hazardous materials aboveground level, fire engine accessway and the associated FAPs shall be provided for the full stretch of the external wall of the storage area.

Water supply for private hydrant

242-(1) . Water supply for hydrant system shall comply with the following requirements:

(a) hydrant fed by pub mains is allowed for type K1 and K2 compartments, and the water supply requirement shall comply with the Section 13 of the Act; and

(b) hydrant with dedicated pumping and storage facilities shall be provided for type K3 and K4 compartment, and the water supply requirement shall have a minimum running pressure of 3.5 bars.

(2) The spillage control and retention basin for firefighting water for warehouse storage hazardous substances shall be in accordance with NFPA 30.

(3) Gate valve shall be provided from the second

containment such as bund wall at a safe location to allow the fire-fighters to operate during emergency and, the outlet shall be directly drained to a safe area or storm drain.

Mechanical
ventilation
system

243.-(1) The ventilation systems for warehouse storing Class '3' hazardous materials shall comply with NFPA 30 and the smoke control system shall comply with the requirements for general warehouse.

(2) The ventilation system for Class '2' shall comply with NFPA 55;

(3) 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.

(4) The ventilation system shall be designed to provide air-movement across all portions of the room to prevent the accumulation of vapours and short-circuiting of the mechanical ventilation system shall be avoided.

(5) Fresh air inlets and exhaust outlets shall be properly located according to the type of gases or vapours to be exhausted and the air-conditioning system and Mechanical Ventilation system for the storage area of hazmat shall not be shared with other occupied area.

Fire
extingui-
sher

244.-(1) Fire extinguisher shall be provided complying with NFPA 10 and other related standards.

(2) Notwithstanding sub regulation (1), 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 and 4.

(3) Subject to sub regulation (2), the access from any remote point of the loading or unloading area including the parking lots area to the 50kg fire extinguishers shall not be more than 15m.

(4) For type K1 compartment size, mobile type 50kg fire extinguisher shall only be required when the overall

Hazmat storage area is more than 100m².

(5) Any building containing an occupancy given hereunder, for the relevant occupancy and floor area, shall be provided with portable fire extinguishers in approved positions-

- (a) high risk commercial service, high risk industrial, moderate risk industrial, high risk storage moderate risk storage, low risk storage. Number of portable fire extinguishers relative to floor area shall be 1 per 100m²;
- (b) entertainment and public assembly, theatrical and indoor sport, places of instruction, moderate risk commercial service, exhibition hall, museum, low risk industrial, prisons, hospital, residential, shops, offices, hotel and dormitory. Number of portable fire extinguishers relative to floor area shall be 1 per 200m²;
- (c) workshop, outdoor sport, low risk commercial service, plant room, domestic residence and parking garage. Number of portable fire extinguishers relative to floor area shall be 1 per 400m²;
- (d) the type of fire extinguisher shall, for the occupancy in which it is installed have a capacity or mass rating as follows; for the following occupancies, entertainment and public assembly, theatrical and indoor sport, places of instruction, workshop, outdoor, sport, prisons, hospital, residential, shops, offices, hotel, dormitory and domestic residence:
 - (i) water extinguisher 9kg;
 - (ii) foam extinguisher 9kg;
 - (iii) carbon dioxide extinguisher 5kg;
 - (iv) dry chemical extinguisher 9kg;
 - (v) wet Chemical extinguisher 9kg;
- (e) for the following occupancies; high risk commercial service, moderate risk commercial service, low risk commercial service, exhibition

hall, museum, high risk industrial, moderate risk industrial, low risk industrial, high risk storage, moderate risk storage, low risk storage and parking garage;

- (i) water extinguisher 9kg;
 - (ii) foam extinguisher 9kg;
 - (iii) carbon dioxide extinguisher 5kg;
 - (iv) dry chemical extinguisher 9kg;
 - (v) wet Chemical extinguisher 9kg;
- (f) an approved mobile fire extinguisher may replace half the portable fire extinguishers provided that:
- (i) the capacity of any such mobile fire extinguisher shall be at least equal to the combined capacity of the number of portable fire extinguishers it replaces;
 - (ii) it contains the same extinguishing medium as required for such portable extinguishers;
 - (iii) it replaces such portable extinguishers only in the floor and within the division concerned; and
 - (iv) such mobile fire extinguisher is kept in a readily accessible position;
- (6) Specification requirements for all extinguishers:
- (a) the classification of extinguishers shall consist of a letter that indicates the class of fire on which an extinguisher has been found to be effective;
 - (b) portable extinguishers shall be maintained in a fully charge and operable condition and kept in their designated places at all times when they are not being used;
 - (c) extinguishers shall be conspicuously located where they will be readily accessible and immediately available in the event of fire. Preferably they shall be located along normal paths of travel including exits from areas;
 - (d) extinguishers shall be installed on the hangers or in the brackets supplied, mounted in cabinets, or

set in shelves unless extinguishers are of the wheeled type; and

- (e) extinguishers having a gross weight not exceeding 18 kg shall be installed so that the top of the extinguisher is not more than 1.0m above the floor. Extinguisher having a gross weight more than 18 kg (except wheeled types) shall be so installed that the top of the extinguisher is not more than 1.0m above the floor. In no case shall be clearance between bottom of the extinguisher and the floor be less than 10cm.

(7) Inspection, maintenance and recharging-

(a) General

- (i) the owner of designated agent of property in which extinguishers are located shall be responsible for such inspection, maintenance and recharging;
- (ii) maintenance, servicing and recharging shall be performed by the trained persons having available the appropriate servicing manuals(s) the proper types of tools, recharge materials, lubricants, and manufacturer's recommended replacement parts or parts specifically listed for use in the extinguisher; and
- (iii) extinguishers shall be inspected when intricately placed in service and thereafter at approximately 30 day intervals. Extinguishers shall be inspected at more frequent intervals when circumstances require.

(b) Maintenance:

- (i) extinguishers shall be subjected to maintenance not more than one year apart or when specifically indicated by an inspection;
- (ii) each extinguisher shall have a tag or label securely attached that indicates the month

and year the inspection, maintenance and recharging were performed and shall identify the person performing the services;

- (iii) each extinguisher shall have a tag or label securely attached that indicates the month and year the inspection, maintenance and recharging were performed and shall identify the person performing the services;
- (iv) all rechargeable type extinguishers shall be recharged after any use or as indicated by an inspection or when performing maintenance;
- (v) hydrostatic testing shall be performed by persons trained in pressure testing procedures and safeguards and having available suitable testing equipment, facilities and appropriate servicing manual(s); and
- (vi) if, at any time, an extinguisher shows evidence of corrosion or mechanical injury, it shall be hydrostatically tested.

(c) Examination of cylinder condition:

- (i) where an extinguishing cylinder or shell has one or more conditions listed in this subdivision, it shall not be hydrostatically tested, but shall be destroyed by the owner as per directive from the Relevant Authority within a given time;
- (ii) where there exist repairs by soldering, welding, brazing or use of patching compounds;
- (iii) where the cylinder or shell threads are damaged;
- (iv) where there exists corrosion that has caused pitting, including under removable

- nameplate band assemblies;
- (v) where the extinguisher has been burned in a fire;
- Determina-
tion of exit
requirement
- 245.-(1) The determination of travel distance in chemical or hazmat warehouse shall be in compliance with the Codes for high hazard occupancy, 10m/20m for non-sprinkler building and 20m/35m for sprinkler protected building.
- (2) All exit and access doors shall be provided with the proper hazard and warning sign on both sides of the doors.
- Other fire
safety
requirement
246. The following standards and codes of practices shall be complied with for the proposed chemical or hazmat warehouse:
- (a) BS 5839-1:2013;
 - (b) NFPA 25: Inspection, Testing and Maintenance of Water-Based Fire Protection Systems;
 - (c) NFPA 13: Standard for the Installation of Sprinkler System;
 - (d) NFPA 10: Standard for Portable Fire Extinguishers;
 - (e) NFPA 704: Standard System for the Identification of the Hazards of Materials for Emergency Response;
 - (f) BS EN 60079 – 0:2006: Electrical Apparatus for explosive Gas Atmospheres;
 - (g) NFPA30: Flammable and Combustible Liquids Code;
 - (h) NFPA 16A : Foam-Water Sprinkler and Spray Systems;
 - (i) NFPA 45 : Fire Protection for Laboratories Using Chemicals
(refer to Table 2 & 3 for the MAQ);
 - (j) NFPA 55 : Compressed Gases & Cryogenic Fluids;
 - (k) NFPA 70 : National Electrical Code;
 - (l) NFPA 430 : Liquid and Solid Oxidizers;

- (m) NFPA 432 : Storage of Organic Peroxide;
- (n) NFPA 495 : Explosive Materials Code;
- (o) NFPA 704 : Identification of the Hazards of Materials;
- (p) NFPA 400 : Hazard Materials Code; and
- (q) NFPA 430: Code for Storage of liquids and solid oxidizers.

Location of
two-way
escape exist

247.-(1) 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 minimise the possibility that more than one can be rendered unusable by any one fire or other emergency condition.

(2) Where 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 as shown at Figure 3, subject to:

- (a) 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
- (b) the separation distance measured in a straight line between the furthest edges of the doors of the two exits and shall not be less than 7m.

(3) In buildings protected throughout by an approved automatic sprinkler system which complies with the requirements of Part VI, the minimum separation distance between two exits or exit access doors measured in accordance with sub regulation (1) shall be not less than one third the length of the maximum overall diagonal dimension of the building or area to be served, and the separation distance measured in a straight line between the furthest edges of the doors of the two exits shall not be less than 7m.

(4) 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, and the exit access corridor connecting the exit staircases, exit passageways or exit ramps shall be protected by minimum one hour fire rated enclosures.

(5) Doors opening into the corridor shall have minimum half hour fire resistance rating as shown at Figure 1.

(6) 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 shall not be less than 7m.

(7) For the purpose of this regulation, 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.

(8) The travel distance from the most remote point to the splitting point shall not exceed the permissible one-way travel distance allowed in Table 6, and 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.

(9) 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 6.

Buy to
Consult fire
Authority
before
passing
plans

248.-(1) Where is proposed to erect a building, or to make any extension of or structural alteration to a building and, in connection with the proposals, plans are, in accordance with building regulations, deposited with a Local Authority, the Local Authority must consult the Fire

Authority before passing those plans.

(2) Where it is proposed to change the use to which a building or part of a building is put and, in connection with that proposal, plans are, in accordance with building regulations, deposited with a Local Authority, the authority must consult with the Fire Services before passing the plans.

(3) It is the responsibility of the applicant to ensure-

- (a) that the construction documents include all of the fire protection requirements;
- (b) that the shop drawings are correct and in compliance with the applicable Regulations and standards;
- (c) three full set paper prints marked "Fire Protection Plans" and indicating the site plan and floor plan layouts must be submitted;
- (d) all the fire escape routes shall be colored in green and the direction of travel to a safe area shall be indicated by arrows drawn at short intervals along the route; and
- (e) all firefighting equipment to be highlighted in red.

(4) The construction documents and shop drawings shall clearly indicate the following-

- (a) fire resistance of walls for emergency routes, occupancy separating walls and partition walls;
- (b) fire resistance of floors, and floor coverings for an emergency route, suspended and combustible floors.
- (c) type of roof assembly and covering;
- (d) type of material for ceiling;
- (e) class of fire doors and shutters;
- (f) calculation of exit width and minimum number of exits;
- (g) type and percentage of ventilation in an emergency stairway in buildings under 30m in height;
- (h) pressurization of stairways in emergency route

- for a building exceeding 30 meters in height;
- (i) artificial lighting in the feeder and emergency route;
 - (j) fire detection and manually activated fire alarm system connected to enunciator panel required drawings include-
 - (i) general arrangement plan, layout and outline drawing, dimensional detail drawings, position plans and section installation details, including location of detection points and Zone Identification;
 - (ii) cabling diagrams, block diagrams, termination diagrams and zoning schedules.
 - (k) position of inlet breeching valve and fire hydrant at main vehicular entrance;
 - (l) position of lading valves and diameter of pipe;
 - (m) position of fire hose reels and diameter of pipe;
 - (n) position, size and type of fire extinguishers;
 - (o) sprinkler systems, information required on design drawings-
 - (i) dimensional drawings, giving sprinkler spacings, distance from walls to sprinklers and size of pipes;
 - (ii) key plan;
 - (iii) drawing grid;
 - (iv) section of building including height of the highest sprinkler;
 - (v) types and size of control valve;
 - (vi) number, type, size and temperature rating of sprinkler per valve;
 - (vii) reference to symbols used;
 - (viii) if extra high hazard system, pipe size table used;
 - (ix) distance of sprinkler deflector from roof or ceiling;
 - (x) hydraulic calculations, also design

- points marked in drawing;
- (xi) riser or drops show, size and length;
- (xii) location of alarm valve and alarm bell;
- (xiii) show wind bracing in drawing, giving distance from sprinklers and distance of sprinkler deflector from roof;
- (xiv) height of stacking and category of stored goods; and
- (xv) position and size of all beams.
- (p) position and size of water supply tanks and pumps for firefighting purposes;
- (q) type and position of automatic mechanical smoke extraction on emergency power or approved ventilators;
- (r) percentage of natural cross ventilation in parking basements which are not sprinkler protected;
- (s) firemans lift any building exceeding 30 meters in height;
- (t) position and type of flammable liquid and gas installation;
- (u) where symbols are used to signify details they shall be indicated as per the following list, provide that where the possibility of misunderstanding exists the description shall be written in full-
 - (i) symbols for site features;
 - (ii) symbols for building construction;
 - (iii) symbols related to means of egress;
 - (iv) symbols for water supply and distribution;
 - (v) symbols for sprinkler system;
 - (vi) symbols for piping, valves, control devices, and hangers;
 - (vii) symbols for extinguishing systems;
 - (viii) symbols for firefighting equipment, including standpipe and hose system;
 - (ix) symbols for special hazard system;

- (x) symbols for fire extinguishers;
- (xi) symbols for fire alarm, detection and related equipment;
- (xii) symbols for smoke/pressurization control;
- (xiii) miscellaneous symbols.

Offence
and penalty

249. Any person who fails to comply with the provisions of these Regulations commits an offence and upon conviction shall be liable for a fine not exceeding three million shillings or to imprisonment for the time not exceeding one year or both.

FIRST SCHEDULE

TABLES

(Under Regulation 3)

TABLE 1: Minimum Air-well size

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

TABLE 2: Number of exits from rooms and space

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
Rooms and spaces with occupancy of more than 50 persons shall comply with the requirements for 'Number and Width of Exits' under Regulation 56 for Assembly Occupancy.	

Note:	<ul style="list-style-type: none"> i. For residential occupancy, see Regulation 31 ii. For health care occupancy, see Regulation 46 iii. For office/shop/factory/warehouse occupancy, see Regulation 48 iv. For hotels, see Regulation 50. v. For assembly occupancy, see Regulation 56
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TABLE 3: Width of stair, landing width and depth

STAIR WIDTH	MIN LANDING WIDTH	MIN LANDING DEPTH
1000	2800	1900))) Allows mattress or stretcher evacuation only (ie no pedestrian passing).
1250	2800	1900)))
1500	3200	1550 Allows mattress or stretcher evacuation and

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1750	3600	* 1350)))	restricted ambulant passing.
2000	4000	* 1250	Allows mattress or stretcher evacuation and ambulant passing.

TABLE 4: Number and width of exit facilities

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

TABLE 5 Number of seats in a row

Seat way width mm	Maximum No of seats in a row	
	Gangway on one side	Gangway on two sides
300 to 324	7	14
325 to 349	8	16
350 to 374	9	18
375 to 399	10	20
400 to 424	11	22
425 to 449	11	24
450 to 474	12	26
475 to 499	12	28
500 or more		Limited by the travel distance

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TABLE 6 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 spr ink ler ed	Sp rin kle red	Un spr ink ler ed	Spri nkler ed	Door opening (c), (d) & (e)		(f) Sta irc ase s	(d) Ramps Corri dors Exits Passage ways	St air s	Co rri dors	Corridors	
					To out doo rs at grou nd level	Oth er exit & corri dor door s					Un spr ink ler ed	Sp rin - kle red
High hazard	10	20	20	35	50	40	30	50	1	1	15	20
Industrial buildings (factories, workshops, godown/warehouse)	15	25	30	60	100	80	60	100	1	1	15	20
Dormitories, hostels	15	30	45	75	50	40	30	50	1	1	15	20
Shops	15	25	45	60	100	80	60	100	1	1	15	20
Offices	15	30	45	75	100	80	60	100	1	1	15	20
Places of public resort & carparks	15	25	45	60	100	80	60	100	1(h)	1(h)	15	20
Schools & educational buildings	15	30	45	75	100	80	60	100	1	1/2(a)	15	20
Hospitals	15	25	30	45	30	30	15	30	1	2(b)	15	20
Hotels, boarding houses (k)	15	20	30	45	50	40	30	50	1	1	15	20
Blocks of flats/maisonettes (k)	15(g) 20(i)	30(g) 40	30 45(j)	75	50	40	30	50	1(i)	1	15	20

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	j)	(j)										
Detached, semi-detached and terrace house, including townhouses	N R	N R	N R	NR	NR	NR	N R	NR	0. 9	0.9	N R	N R

NR = No requirements. Maximum direct distance = $2/3 \times$ Maximum travel distance ...see Regulation 38.

(x) Unit of width = 0.5 metres.

(a) Applies to corridors serving Classrooms. Other corridors shall have a minimum width of 1 metre.

(b) Applies to corridors serving patients. Other corridors shall have a minimum of 1 metre.

(c) 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.

(d) See cl.2.2.15 regarding reduction of exit provision.

(e) For travel distance in single staircase flats ... see Regulation 30

(f) Refer to Regulation 53

(g) Staircase within maisonette serving as an internal access to be at least 0.9m width.

(h) Applies to external corridor ... see Regulation 38

(i) Measurement of travel distance is from the guestroom door or residential unit door to exit see Regulation 50 & 36 respectively.

TABLE 7: 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 ²	7500m ³
Compartments between average ground level and a height of 24m. No compartment to comprise more than 3 storeys.	4000m ²	15000m ³
Compartments above a height of 24m from average ground level. No compartment to comprise more than one storey.	2000m ²	7500m ³

TABLE 8: BUILDINGS OTHER THAN SINGLE STOREY BUILDINGS

(Minimum periods of fire resistance)

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 ²) (3)	Cubical Extent (in m ³) (4)	Above ground storey (5)	Basement 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

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II (Other residential) Building or part (+) having not more than two storeys Building or part (+) having 3-storeys Building having any number of storeys Building having any number of storeys	NL	500	NL	½	1
	NL	250	NL	1(b)	1
	28	3,000	8,500	1	1½
	NL	2,000	5,500	1½	2
III (Institutional)	28	2,000	NL	1	1½
	over 28	2,000	NL	1½	2
IV (Office)	7.5	250	NL	½	1(a)
	7.5	500	NL	½	1
	15	NL	3,500	1(b)	1
	28	5,000	14,000	1	1½
	NL	NL	NL	1½	2
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
	over 28	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

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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	NL	21,000	4(c)	4(d)
	over 28	1,000	NL	4(c)	4(d)

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 Regulation 2

“NL” means No limit applicable.

Notes to Table 8

For the purpose of Regulation 74 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 Regulation 77.
- (a) The period is half an hour for elements forming part of a basement storey which has an area not exceeding 50m²
- (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 car park storey, which is sprinklered protected, the element of structure can be reduced to half the minimum period of fire resistance.

TABLE 9: SINGLE STOREY BUILDINGS

(Minimum periods of fire resistance)

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

Notes to table 9

For the purpose of Regulation 74 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 car parking.

TABLE 10: Limitations on Fire Protecting 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 Class I (as to surface spread of flame). 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.
	Compartment	Less than 1 hour	
	Compartment	1 hour	
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 noncombustible.

Notes: (1) References to Classes in the above table are to Classes as specified in Regulation 141 and 142.

(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 11: 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	*	*	*	each side separately
(a) any part less than 1m from point on relevant boundary	*	*	15	
(b) any part of the wall of a building used for Assembly	*(max. 60)	*(max. 60)	*(max. 60)	from inside from outside

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<p>purposes which is 1m or more from the relevant boundary and is described in Note 2</p> <p>(c) any part 1 m. or more from the relevant boundary and is not a part described in (b) above</p>	*	*	15	from inside	
5 Separating wall	*(min. 60)	*(min.60)	*(min. 60)	each side separately	
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	No Provision	+ (min. 60)	no provision***	each side separately when fitted in its frame
	(b) in a compartment wall if it separates a flat or maisonette from a space in	No Provision	30	no provision***	each side separately when fitted in its frame

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common use (c) in a compartment wall or compartment floor not described in (b) above (d) 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 (e) in a protecting structure not described in (d) above (f) any other door (including a door in a cavity barrier and a door between a dwelling house and garage)	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	30	30	15	each side separately
(a) cavity barrier 1m x 1m or Larger				
(b) any other cavity barrier	30	30	no provision	each side separately

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(c) ceiling	30	30	30	from underside
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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 11.
- 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 12: Maximum Nominal Internal Diameter of Pipes

Situation	Pipe material and maximum nominal internal diameter [mm]		
	Non-combustible material ¹	Lead, aluminium or aluminium alloy, or uPVC ²	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) ³ 75 (branch pipe) ³	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 Regulation, approved fire collar shall be fitted at all positions where such pipes pass through constructions required to act as a barrier to fire.

TABLE 13: Class of Flame Spread on the Surface Wall and Ceilings

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 passage way	Room, compartment	Circulation space	Smoke-stop / fire-fighting lobby	Exit staircase & exit passage way
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

TABLE 14: Materials for Construction

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.

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*** 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.

TABLE 15 – Water Supply & 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 bars	2 bars	2 bars
Minimum flow rate	27 L/s	<1000m ² - 38L/s <5000m ² - 57L/s <10000m ² - 76L/s (57L/s if sprinkler protected) Additional 19L/s for subsequence 5000 m ²	500m ² - 38L/s <5000m ² - 57L/s <10000m ² - 76L/s (57L/s if sprinkler protected) Additional 19L/s for subsequence 5000 m ²
Minimum duration	45 mins	45 mins	90 mins

TABLE 16: Provision of Fire Alarms According to Purpose Group, Height & Size of the Building

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

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a - Single storey building	NR	
b - Building of 2 to 4 storeys		(m)
c - Building of more than 4 storeys	400*	(m)
VI (Factory)	200.‡	(a)
a - Single storey building	NR	
b - Building of 2 to 4 storeys		(m)
c - Building of more than 4 storeys	NR	(a)
VII (Place of Public Resort)	NR	(a)
(i) With stay-in facilities:	NR	
a - Single storey building		(m)
b - Building of 2 to 4 storeys	400*	(m)
c - Building of more than 4 storeys	200.‡	(a)
(ii) Without stay-in facilities:	NR	
a - Single storey building		(m)
b - Building of 2 to 4 storeys	2000*	(m)
c - Building of more than 4 storeys	1000.‡	(a)
VIII (Storage)	NR	
a - Single storey building		
b - Building of 2 to 4 storeys		
c - Building of more than 4 storeys		

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

+ 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 Regulation 178.

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, Regulation 178 shall be followed.

Table 17: Compartmentation requirements for special purpose rooms in buildings

Usage (1)	Non-sprinkler protected building (2)		Sprinkler protected building (3)		
	Compar- t- mentati on (2a)	Door rating (2b)	Compar- t- mentati on (3a)	Door rating (3b)	Sprinkle r (3c)
Store room 1	1 hr	1 hr	N	N	S

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AHU room	N	N	N	N	S
Kitchen2	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)	2 hr	2 hr	1 hr	1 hr	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	B	B	B	B	S
Electric Lift motor room	B	B	B	B	Ex
Hydraulic Lift motor room	B	B	B	B	S
Essential Fan room	B	B	B	B	S
Electrical room	B	B	B	B	Ex
Emergency lighting battery room	2 hr	2 hr	1 hr	1 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
MDF room	N	N	B	B	Ex
			N	N	S
PABX room	N	N	B	B	Ex
			N	N	B

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.

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

TABLE 18: Maximum Fire size for a Sprinkler controlled Fire

Occupancy (Sprinklered)	Fire Size	Perimeter of Fire (m)
	Heat Output (MW)	
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

PURPOSE GROUPS

Table 19 Occupancy Load Tables

Schedule 2	Purpose Group II	Residential.
Schedule 3.1	Purpose Group III	Health-Care Occupancy (Hospital, Clinic & Polyclinic).
Schedule 3.2	Purpose Group III	Student Hostel, Dormitory, Old Folks Home, Orphanage, Children's Home, Day-care Centre, Kindergarten, Infant Care, Army Camp, Detention/Correction Centre.
Schedule 3.3	Purpose Group III	Schools, Colleges, Commercial Schools, Vocational Institution, Polytechnic, University.
Schedule 4	Purpose Group IV	Offices, Banks, Publishers, Stock Brokers.
Schedule 5	Purpose Group	Shops, Shopping Centres & Arcades.

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	V		
Schedule 6	Purpose VI	Group	Factories, Industrial Plants.
Schedule 7.1	Purpose VII	Group	Hotels, Holiday Resorts, Boarding Houses, Service Apartments, Convention Centres, Private Clubs.
Schedule 7.2	Purpose VII	Group	Community Centres.
Schedule 7.3	Purpose VII	Group	Museums, Public Art Galleries, Exhibition Centres.
Schedule 7.4	Purpose VII	Group	Theatres, Cinemas, Concert Halls.
Schedule 7.5	Purpose VII	Group	Public Libraries.
Schedule 7.6	Purpose VII	Group	Religious Buildings.
Schedule 7.7	Purpose VII	Group	Public Sports Complex, Stadium, Public Swimming Complex.
Schedule 7.8	Purpose VII	Group	Recreational Buildings, Amusement Centres.
Schedule 7.9	Purpose VII	Group	Eating Houses, Restaurants, Coffee Shops, Hawker Centres, Fast Food Outlets.
Schedule 7.10	Purpose VII	Group	Bus Terminals, Train Station, Airport, Ferry Terminal.
Schedule 8	Purpose VIII	Group	Warehouses, Godowns, Car Parks.

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Table 20 Occupancy Load Tables

Purpose Group	Descriptive Title	Purpose for which building or part of the building is used or intended to be used
I	Small residential	Private dwelling house such as bungalows, semi-detached houses and terrace 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, holiday 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 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.

SECOND SCHEDULE
(Under regulation 163 (2))

FIRE SAFETY REQUIREMENTS AFFECTING SHOPHOUSES UNDER CONSERVATION SUBJECT	2-STOREY SHOPHOUSE	3-STOREY SHOPHOUSE	4-STOREY SHOPHOUSE
<p>1 TIMBER FLOOR JOISTS AND BOARDS WITHOUT ADDITION OF NEW ATTIC (There shall be no adjustment of floor levels)</p>	<p>1(a) Timber floor boards to be pressure impregnated with flame retardant chemicals. For timber floor joists that can fulfil the fire-rating requirements, they need not be pressure impregnated. For residential use, this condition does not apply. Existing timber floors may be retained provided there is no increase in floor areas or addition of a new attic.</p> <p style="text-align: center;">OR</p> <p>(b) Timber floor boards lined on the underside between the floor joists with non-combustible boards to achieve half an hour fire-rating. For fire-rating requirement, see attached sketch <u>(URA/CONSV/GL/FSB 1)</u>.</p>	<p>1(a) Timber floor boards to be pressure impregnated with flame retardant chemicals. For timber floor joists that can fulfil the fire-rating requirements, they need not be pressure impregnated. For residential use, this condition does not apply. Existing timber floors may be retained provided there is no increase in floor areas or addition of a new attic.</p> <p style="text-align: center;">OR</p> <p>(b) Timber floor boards lined on the underside between the floor joists with non-combustible boards to achieve half an hour fire-rating. For fire-rating requirement, see attached sketch <u>(URA/CONSV/GL/FS B 1)</u>.</p>	<p>1 Timber floor joists and boards lined on the underside between the floor joists with non-combustible boards to achieve one hour fire-rating. For residential use, method and duration of fire-rating would be evaluated by FSB on a case to case basis.</p>

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	<p>2 Architects are encouraged to apply 1(a) in order to expose the timber floor joists and boards to retain the existing characteristics of the shophouse.</p>	<p>2 Architects are encouraged to apply 1(a) in order to expose the timber floor joists and boards to retain the existing characteristics of the shophouse.</p>	
	<p>3 Timber floor joists and boards at the soffit of the five-footway ceiling may be left exposed.</p>	<p>3 Timber floor joists and boards at the soffit of the five-footway ceiling may be left exposed.</p>	<p>2 Timber floor joists and boards at the soffit of the five-footway ceiling may be left exposed.</p>
	<p>4 FSB's requirements on travel distances must be complied with.</p>	<p>4 FSB's requirements on travel distances must be complied with.</p>	<p>3 FSB's requirements on travel distances must be complied with.</p>

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FIRE SAFETY REQUIREMENTS AFFECTING SHOPHOUSES UNDER CONSERVATION SUBJECT	2-STOREY SHOPHOUSE	3-STOREY SHOPHOUSE	4-STOREY SHOPHOUSE
<p>2 TIMBER FLOOR JOISTS AND BOARDS WITH ADDITION OF NEW ATTIC There shall be no adjustment of floor level</p>	<p>1 Timber floor boards lined on the underside between the floor joists with noncombustible boards to achieve half an hour fire-rating. For fire-rating requirement, see attached sketch (URA/CONSV/GL/FSB 1).</p>	<p>1 Full protection for floor joists and boards of all floors, timber floor boards lined on the underside between the floor joists to achieve one hour fire-rating</p>	<p>1 Full protection for floor joists and boards of all floors, timber floor boards lined on the underside between the floor joists to achieve one hour fire-rating</p>
	<p>2 Timber floor joists and boards at the soffit of the five-footway ceiling may be left exposed.</p>	<p>2 Timber floor joists and boards at the soffit of the five-footway ceiling may be left exposed.</p>	<p>2 Timber floor joists and boards at the soffit of the five-footway ceiling may be left exposed.</p>
	<p>3(a) The floor level of the attic should not be lower than the highest point of the front facade window at the last storey, top of the window or fanlight. For guidelines on addition of new attic, see attached sketch (URA/CONSV/GL/FSB 2).</p>	<p>3(a) The floor level of the attic should not be lower than the highest point of the front facade window at the last storey, top of the window or fanlight. For guidelines on addition of new attic, see attached sketch (URA/CONSV/GL/FSB 2).</p>	<p>3(a) The floor level of the attic should not be lower than the highest point of the front facade window at the last storey, top of the window or fanlight. For guidelines on addition of new attic, see attached sketch (URA/CONSV/GL/FSB 2).</p>

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FIRE SAFETY REQUIREMENTS AFFECTING SHOPHOUSES UNDER CONSERVATION SUBJECT	2-STOREY SHOPHOUSE	3-STOREY SHOPHOUSE	4-STOREY SHOPHOUSE
	<p>3(b) The attic floor should be set-back a minimum of 1500 mm from the inner face of the front facade and rear walls to allow for visual connection to the storey below.</p>	<p>3(b) The attic floor should be set-back a minimum of 1500 mm from the inner face of the front facade and rear walls to allow for visual connection to the storey below.</p>	<p>3(b) The attic floor should be set-back a minimum of 1500 mm from the inner face of the front facade and rear walls to allow for visual connection to the storey below.</p>
	<p>4 The floor area of the attic shall not exceed fifty percent of the floor immediately below or 50 m², whichever is less, per compartment.</p>	<p>4 The floor area of the attic shall not exceed fifty percent of the floor immediately below or 50 m², whichever is less, per compartment.</p>	<p>4 The floor area of the attic shall not exceed fifty percent of the floor immediately below or 50 m², whichever is less, per compartment.</p>
	<p>5 An open connecting staircase to the attic may be considered. However, FSB's requirements on travel distances must be complied with.</p>	<p>5 An open connecting staircase to the attic may be considered. However, FSB's requirements on travel distances must be complied with.</p>	<p>5 An open connecting staircase to the attic may be considered. However, FSB's requirements on travel distances must be complied with.</p>
<p>3 PROTECTION OF STAIRCASES</p>	<p>1 Timber staircases, which serve as means of escape, shall be protected and comply with : (a)</p>	<p>1 Timber staircases, which serve as means of escape, shall be protected and comply with :</p>	<p>1 Timber staircases, which serve as means of escape, shall be protected and comply with :</p>

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FIRE SAFETY REQUIREMENTS AFFECTING SHOPHOUSES UNDER CONSERVATION SUBJECT	2-STOREY SHOPHOUSE	3-STOREY SHOPHOUSE	4-STOREY SHOPHOUSE
	<p>compartmentation requirements of minimum one hour rating and (b) pressure impregnation with flame retardant chemicals. For compartmentation requirements on protection of staircases, see attached sketch (URA/CONSV/GL/FSB 1).</p>	<p>(a) compartmentation requirements of minimum one hour rating and (b) pressure impregnation with flame retardant chemicals. For compartmentation requirements on protection of staircases, see attached sketch (URA/CONSV/GL/FSB 1).</p>	<p>(a) compartmentation requirements of minimum one hour rating and (b) pressure impregnation with flame retardant chemicals. For compartmentation requirements on protection of staircases, see attached sketch (URA/CONSV/GL/FSB 1).</p>
	<p>2 For residential shophouses, without addition of new attic and to be occupied by one family only, the timber staircase may be left exposed and need not be compartmentalised.</p>	<p>2 For residential shophouses, without addition of new attic and to be occupied by one family only, the timber staircase may be left exposed and need not be compartmentalised.</p>	
	<p>3 For non-residential shophouses, the timber staircase may be left exposed at the second storey level, provided the</p>		

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<p align="center">FIRE SAFETY REQUIREMENTS AFFECTING SHOPHOUSES UNDER CONSERVATION SUBJECT</p>	<p align="center">2-STOREY SHOPHOUSE</p>	<p align="center">3-STOREY SHOPHOUSE</p>	<p align="center">4-STOREY SHOPHOUSE</p>
	<p>following are complied with:</p> <p>(a) Travel distances on the second storey are complied with, the distance from the most remote point of the floor to the edge of the staircase landing is less than 13m or alternative escape staircase is available, e.g. rear escape staircase;</p> <p>(b) The timber staircase is pressure impregnated with flame retardant chemicals; and</p> <p>(c) The timber staircase is compartmentalised at the first storey by one hour fire-rated enclosures.</p> <p>(d) There is no attic level in the second storey.</p>		

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<p>4 AIRWELL 4.1 COVERING OVER AIRWELL</p>		
<p>4.1.1 Same usage for all floors</p>	<p>1 FIXED COVERING A fixed covering up to the level below the main roof eaves with materials approved by FSB is allowed. Some materials acceptable by FSB (Now FSSD)are: a Non-drip acrylic b Non-drip polycarbonate c Glass</p>	<p>1 FIXED COVERING A fixed covering up to the 3rd storey floor level with materials approved by FSB is allowed. Some materials acceptable by FSB (Now FSSD)are: a Non-drip acrylic b Non-drip polycarbonate c Glass</p>
	<p>2 OPENABLE COVERING A fully openable covering retractable or spring open type, by activation of smoke detectors and fire alarm system, up to the level below the roof eaves with materials approved by FSB is allowed. Some materials acceptable by FSB (Now FSSD)are: a Non-drip acrylic b Non-drip polycarbonate c Glass</p>	<p>2 OPENABLE COVERING A fully openable covering retractable or spring open type, by activation of smoke detectors and fire alarm system, up to the level below the roof eaves with materials approved by FSB is allowed. Some materials acceptable by FSB (Now FSSD)are: a Non-drip acrylic b Non-drip polycarbonate c Glass</p>
<p>4.1.2 Different usage for all floors</p>	<p>1 FIXED COVERING A fixed covering up to the second storey floor level with materials approved by FSB is allowed. Some materials acceptable by FSB (Now FSSD)are: a Non-drip acrylic b Non-drip polycarbonate c Glass</p>	<p>1 FIXED COVERING A fixed covering up to the second storey floor level with materials approved by FSB is allowed. Some materials acceptable by FSB (Now FSSD)are: a Non-drip acrylic b Non-drip polycarbonate c Glass</p>

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	<p>2 OPENABLE COVERING A fully openable covering retractable or spring open type, by activation of smoke detectors and fire alarm system, up to the level below the roof eaves with materials approved by FSB is allowed. Some materials acceptable by FSB Now FSSD are: a Non-drip acrylic b Non-drip polycarbonate c Glass</p>	<p>2 OPENABLE COVERING A fully openable covering retractable or spring open type, by activation of smoke detectors and fire alarm system, up to the level below the roof eaves with materials approved by FSB is allowed. Some materials acceptable by FSB Now FSSD are: a Non-drip acrylic b Non-drip polycarbonate c Glass</p>
<p>SUBJECT</p>	<p>FOR ALL SHOPHOUSES REGARDLESS OF THE NUMBER OF STOREYS</p>	
<p>4 AIRWELL COVERING OVER AIRWELL</p>	<p>1 The airwell shall not be enclosed. However, where it is necessary to enclose the airwell in order to comply with the requirements of FSB, only one side of the airwell is allowed to be walled up. This is applicable to all storeys.</p>	
<p>SUBJECT</p>	<p>FOR ALL SHOPHOUSES REGARDLESS OF THE NUMBER OF STOREYS</p>	
<p>5 AMALGAMATION OF SHOPHOUSE UNITS</p>	<p>1 Where the amalgamation of shophouses is more than two units, to provide fire shutters or fire doors to the openings at the party wall between every two units of shophouses subject to FSB's evaluation on a case to case basis.</p> <p>2 The size and the number of openings at the party wall should be kept to minimum necessary to comply with FSB's requirements and to retain the spatial quality of shophouses in amalgamated units.</p> <p>3 For amalgamation of a great number of shophouse units exceeding a gross floor area of 1,900 m², FSB requires sprinkler system to be provided for protection against rapid spread of fire due to higher fire load in a larger space.</p>	

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	<p>4 Timber floor joists and boards must be provided with full protection for all floors, covering the underside of the floor boards in between joists with non-combustible boards if the joist size is adequate.</p> <p>5 Addition of attic floor shall not exceed 50 m² per compartment.</p> <p>6 Where the units are to be used for public resort, such as restaurant, association, there should be a minimum of two protected staircases per floor.</p>
6 MEANS OF ESCAPE	<p>1 Waiver for insufficient means of escape will not be considered by FSB.</p> <p>2 Where there is only one escape route, the maximum travel distance shall not exceed 13m unsprinklered. For residential shophouses not exceeding three storeys and occupied by one family only, this condition does not apply.</p> <p>3 For back-to-back units, where the travel distance exceeds the fire requirement, alternative proposals may be considered by FSB on a case to case basis.</p>
7 ALARM SYSTEM	<p>1 For shophouses not exceeding three storeys and or amalgamation of not more than two shophouse units, manual alarm system is acceptable.</p> <p>2 For shophouses exceeding three storeys or having an amalgamation of more than 2 units, automatic alarm system must be provided.</p>
SUBJECT	FOR ALL SHOPHOUSES REGARDLESS OF THE NUMBER OF STOREYS
8 COVERING OF REAR COURT	<p>1 Where there is a protected staircase located at the rear court, the entire rear court space may be covered, up to the second storey floor level, provided the staircase discharges directly to the backlane.</p> <p>2 When the staircase does not discharge directly to the backlane but through the rear court, that part of the rear court forming the escape route from the staircase door to the back door shall be made a protected passageway to comply with FSB's requirements.</p>
9 DIRECTION OF DOOR SWING	<p>1 Door swings at the first storey are allowed to swing into the units so as not to obstruct the walkways.</p> <p>2 However, where the door serves more than a fifty person occupant load, it must then swing out. In order not to obstruct the walkway, the door should be recessed into the unit.</p>

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<p>10 ELECTRICAL/WATER/GAS METERS, TELECOMS TRUNKING AND HOSEREEL PIPES</p>	<p>1 For shophouses with a separate staircase enclosure at the front leading to the upper storeys, electrical and water meters and Telecoms trunking are allowed to be located within the staircase enclosure provided that they are boxed-up with non-combustible materials, non-combustible boards or metal casing. The meter box may be ventilated as required by Relevant Authority.</p> <p>2 All hosereel pipes are to be located within the shophouse and hosereels should be located near exit doorways.</p> <p>3 In order to maintain the facades of shophouses to be as uncluttered as possible with M and E installations, all M and E works should be located within the shophouse or at locations acceptable by FSB, PUB and URA such that they are least obtrusive from the exterior.</p>
<p>SUBJECT</p>	<p>FOR ALL SHOPHOUSES WITH NEW REAR EXTENSION</p>
<p>11 RETENTION OF TIMBER FLOOR IN MAIN BUILDING TO BE CONSERVED WITH NEW REAR EXTENSION OF R.C. FLOORS</p>	<p>Proposals to retain timber floors in the main building to be conserved with new extension of R.C. floors are subject to the following requirements of FSB : For fire safety aspects of the guidelines, see attached sketch (URA/CONSV/GL/FSB 3).</p> <p>(a) The old and new blocks are to be treated as separate buildings from the fire safety point of view;</p> <p>(b) Independent escape staircases are to be provided in each of the old and new block and the regulation on maximum travel distance is to be complied with;</p> <p>(c) A fire separation in the form of fire walls and fire doors is to be provided between the old and new blocks in compliance with the Fire Regulation; and</p> <p>(d) Airwells, unless provided, shall have a minimum distance of 4 m apart between window openings.</p> <p>(e) Where integration is such that it is considered as a single block, the building old and new shall be constructed of reinforced concrete.</p>

IDENTIFICATION OF HAZARDOUS MATERIALS (HAZMAT)

(i) Substances listed as hazardous materials are Classified as follows:

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)

Note: Consultation with FSSD shall be sought at the initial stage Quantitative Risk Assessment study may be required by the Hazmat Dept of SCDF and, at the stage of finalising for further comment and concurrence before the formal plan submission under the Self-Regulation Scheme. QP shall obtain the technical requirements from other relevant agencies first before consulting FSSD especially for the followings Classes of hazardous materials:

3 SIZE LIMITATION

3.1 For chemical or hazmat warehouses storing Class 3, 4 and 5 hazardous materials, the maximum floor area per compartment and type of fire protection system shall as follows:

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

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Type	Provision of Fire Protection System	
K1	Relatively small structure & low fire risk	Manual fire alarm with DECAMS system
K2	Automatic surveillance	Automatic fire detection with DECAMS system
K3	Automatic fire suppression system	Automatic sprinkler (CP52) with DECAMS system
K4	Automatic extinguishing system (foam system)	Automatic foam sprinkler with DECAMS system

Note:

- (i) Refer for hazard grade Classification;
- (ii) The required fire protection system is only restricted to the chemical or hazmat warehouse fire compartment. However, automatic fire detectors linked to DECAMS shall also be provided along the perimeter of the fire compartment wall where the building housing the hazmat warehouse is not protected with the automatic or the sprinkler system it is only applicable where the warehouse is directly connected to other occupied area within the building through access opening;
- (iii) The fire rating of the fire compartment wall shall be minimum two 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 two hours rating may use fire rated board but to comply fully with the M and E riser shaft requirements;
- (iv) Different Classes and incompatible hazmat shall be stored in separate fire compartment with minimum two hours fire rating;
- (v) No basement floor is allow to store Hazardous materials;
- (vi) The compartment size limit and type of fire protection system for Class 2 Hazmat shall follow Hazard Grade 1 requirements;
- (vii) 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;

No specific limit but to comply with the fire safety requirements for general warehouse.

- 3.2 Storage of compressed gases Class 2, flammable liquid Class 3, flammable solid Class 4.2 and 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;
- 3.3 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 m² of floor area.
- 3.4 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.
- 3.5 For Class 2 hazardous materials, no stacking is allowed. The hazardous materials shall be laid directly on the floor.
- 3.6 Storage, use and handling of compressed gases Class 2 shall be in compliance with NFPA 55 and it may allow be located at aboveground floor.
- 3.7 For sprinkler protected warehouse, the storage height shall be limited to 18m for singlestorey warehouse and 15m for warehouse that is located at first storey 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 basing on the flashpoints of the hazardous materials, subject to a maximum height of 3.6m.
- 3.8 Storage of oxidizers Class 5.1, solid or liquid shall be in compliance with NFPA 430 or AS 4326.
- 3.9 Storage of organic peroxide Class 5.2 shall be in compliance with NFPA 432 or AS 2714.
- 3.10 No compartment in the chemical or hazmat warehouse shall comprise more than one storey.
- 3.11 Recommendations made within the individual Material Safety Data Sheet (MSDS) shall be complied with.
- 3.12 An approved layout plan with the relevant TFP or FSC with such hazmat warehouse or storage clearly highlighted shall be kept within the premises to facilitate the inspection and emergency operation procedures.

Hazard Grade Classification

Hazard Classification		Hazard Grade				
		4	3	2	1	0
Liquids	Class 3	category 1 and 2 Flash point < 23° C	category 3 Flash point 23 - 60° C	category 4 Flash point between 60 - 150° C	Flash point > 150° C	Only burns with supporting fire
Solid Materials	Class 4	Ignites very easily and burns rapidly	Ignites and burns rapidly	Readily combustible	Moderately combustible	Combustible only with supporting fire
Oxidizing Agent	Class 5.1	Class 4 Vary strong oxidizing agent may be classified under explosive substance	Class 3 Strong oxidizing agent	Class 2 Weak oxidizing agent	-	-
Oxidizing Peroxide	Class 5.2	Class I	Class II	Class III	Class IV	Class V

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

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 ² 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 ² and not more than 250L {350L}	(i) - (ii) 3.2L/m ² 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 ² and not more than 500L {750L}
Laboratory (in hospital and health care occupancy)	(i) 10L or (ii) 0.4 L/m ² 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) 0.4 L/m ² and not more than 150L (250L)	(i) - (ii) 0.8L/m ² 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 ² and not more than 250L {500L}

- i) Individual lab unit shall be a fire compartment;
- ii) Each safety cabinet is still restricted to max of 250L (to comply with SS 532);
- 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.

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 gasses	(i) 170 L or (ii) 3.4 L/m ² per cluster
2	Oxidizing gasses	(i) 170 L or (ii) 3.4 L/m ² per cluster
3	Liquefied flammable gasses*	(i) 30 L or (ii) 0.6 L/m ² per cluster
4	Toxic gasses	(i) 8L or (ii) 0.16 L/m ² per cluster

- 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) To comply with NFPA 45 for others requirements such as the ventilation (4 and 8 A/C), hazard identification and "No Smoking" signs etc;
- vi) The provision of sprinkler system shall be designed under the Ordinary Hazard Group 3 Special (CP52);
- vii) No combustible materials shall be placed within 3m buffer range of the gas cylinder;
- viii) No flammable or combustible liquid shall be placed within 6m buffer range of the gas cylinder;
- ix) For storage and handling of Class 2 hazmat in enclosed space (including the concealed space of raised floor and ceiling), metal pipe sleeve and gas leak detection system shall be provided to reduce the accumulation of gases and vapours that may cause danger to occupant, building and emergency response

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- team. Oxygen-level monitoring system shall be provided to prevent the possibility of oxygen-deletion (Asphyxiation) within the room;
- x) 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.

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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	12,000 m ²	3,000 m ²	2,000 m ²
	Max. Cubical Extent per compartment	NC	12,000 m ³	7,500 m ³
	Max. Storage Height	18 m	+Ref Table 21(A) & (B) of CP52	12 m
Warehouse located on 1st storey of multi-storey warehouse	Max. Floor Area per Compartment	12,000 m ²	3,000 m ²	2,000 m ²
	Max. Cubical Extent per compartment	NC	12,000 m ³	7,500 m ³
	Max. Storage Height	15 m	+Ref Table 21(A) & (B) of CP52	12 m
Multi-storey warehouse with vehicular ramp (min. loading 24 tons with dry rising mains)	Max. Floor Area per Compartment	9,000 m ²	3,000 m ²	2,000 m ²
	Max. Cubical Extent per compartment	NC	12,000 m ³	7,500 m ³
	Max. Storage Height	15 m	+Ref Table 21(A) & (B) of CP52	12 m
Multi-storey warehouse without vehicular ramp	Max. Floor Area per Compartment	6,000 m ²	3,000 m ²	2,000 m ²
	Max. Cubical Extent per compartment	NC	12,000 m ³	7,500 m ³
	Max. Storage Height	15 m	+Ref Table 21(A) & (B) of CP52	12 m
Warehouse located in basement	Max. Floor Area per Compartment	3,000 m ²	NP	NP
	Max. Cubical Extent per compartment	12,000 m ³	NP	NP
	Max. Storage Height	12 m	NP	NP

NC = No Control

NP = Not Permit

* subject to full compliance of Regulation 72.

+ storage height not exceeding the limits for goods in the various categories suitable for ordinary hazard protection

Table 9: Smoke Control Requirements for General Warehouse

Location of Warehouse	Compartment Size	Provision of Sprinkler System	Smoke Control Requirement
Above ground level	<= 100 m²	no	NR
	> 100 m² and <= 400 m²	no	a Smoke vent (min % openings follow Table 2A)
	> 400 m² to size limit of Table 1	no	b Smoke vent (20% / 12m)
	<= 700 m²	yes	NR
	> 700 m² and <= 5,000 m²	yes	cSmoke vent or +purging system
	> 5,000 m²	yes	engineered smoke control system
Below ground level (*Basement)	<= 2,000 m²	yes	cSmoke vent or +purging system
	> 2,000 m²	yes	engineered smoke control system

NR = Not Required

- a smoke vent openings base on the Table 2A;
- b smoke vent shall be at least 20% of the floor area it served and shall not be more than 12m measured horizontally away from any part of the warehouse;
- c smoke vent shall comply with Regulation 215 (adequately and evenly distributed along the perimeter of the fire compartment or basement);
- + smoke purging system shall comply with Regulation 186(3) (adequately and evenly distributed within the fire compartment or basement);
- * smoke control system shall be provided for the entire basement except the protected exit shafts, lift shafts and M&E riser shafts;

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[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

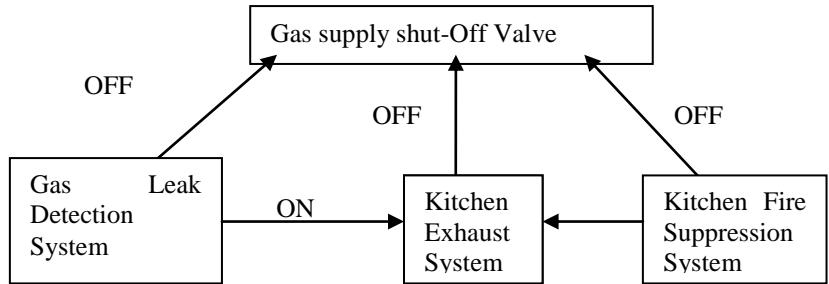
[Extract from Table 21(B) of CP52]

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

(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 vertical or horizontal smoke vent
2.5%	12m
5.0%	15m
10.0%	18m
15.0%	21m
20.0%	24m



- a. 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 (it may be used to facilitate the gas leak detection system).
 - b. Gas pipe running vertically shall be enclosed within a protected riser shaft & be fully fire separated from other M and E risers. Ventilation opening shall be provided for such gas riser.
1. List of Items to be included in the Plan Submission
- a. Endorsement on this guideline, NFPA 58, NFPA 54, other relevant and approved standards and the Fire Regulation.
 - 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. vapourizer, 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.

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- 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.)
- d. Hazard sign as indicated in ANNEX G and other relevant information associated with the LPG installation.

VARIOUS DISTANCES FOR OUTDOOR LPG INSTALLATIONS

LPG Quantity	Distance from boundary	No. of Cabinets per manifold	No. of cylinders per cabinet / cluster	No. of cylinders per manifold	Distance between cabinet / cluster	Distance from drains, pit, man hole, oil tank bund wall, base ment 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. (intake s below manifold system) 1.5 min. (intake s above manifold system)	3 min. (no fire rated wall) 1.5 min. (with 2-hr fire rated wall)	3.0 min.
600kg 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. (intake s below manifold system) 1.5 min. (intake s above manifold system)	6 min. (no fire rated wall) 3 min. (with 2-hr fire rated wall)	3.0 min.

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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 ³ / min	m	m
Separate Compartment	400 max. (8 x 50kg or 8 x 15 kg) Maximum 8 cylinders	2	Not applicable	Sprinkler required else only max. 200kg of LPG is allowed If no sprinkler or if airconditioned, gas leak detector is required	a) 300cm ² opening per m ² of compartment floor area b) high and low vents shall be provided c) min. length of external wall : 6m	0.3 per meter square of compartment floor area	1.5	1.5 min. (intakes above manifold system) 5 min. (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 airconditioned, gas leak detector is required (excluding recessed area)	a) 300cm ² opening per m ² 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. (intake above manifold system) 5 min. (intakes below manifold system)

THIRD SCHEDULE
(Under regulation 155 (2))
FIGURES

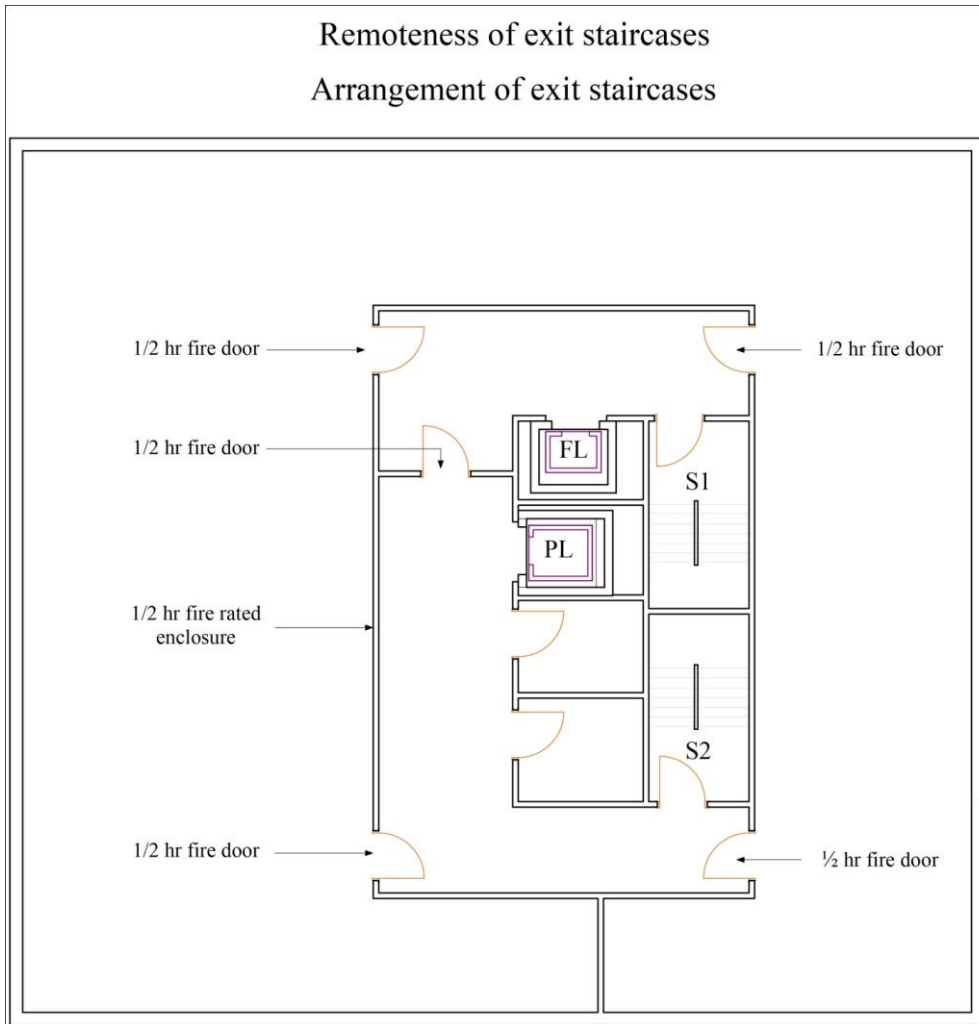


Fig 1: Arrangement of exit staircases

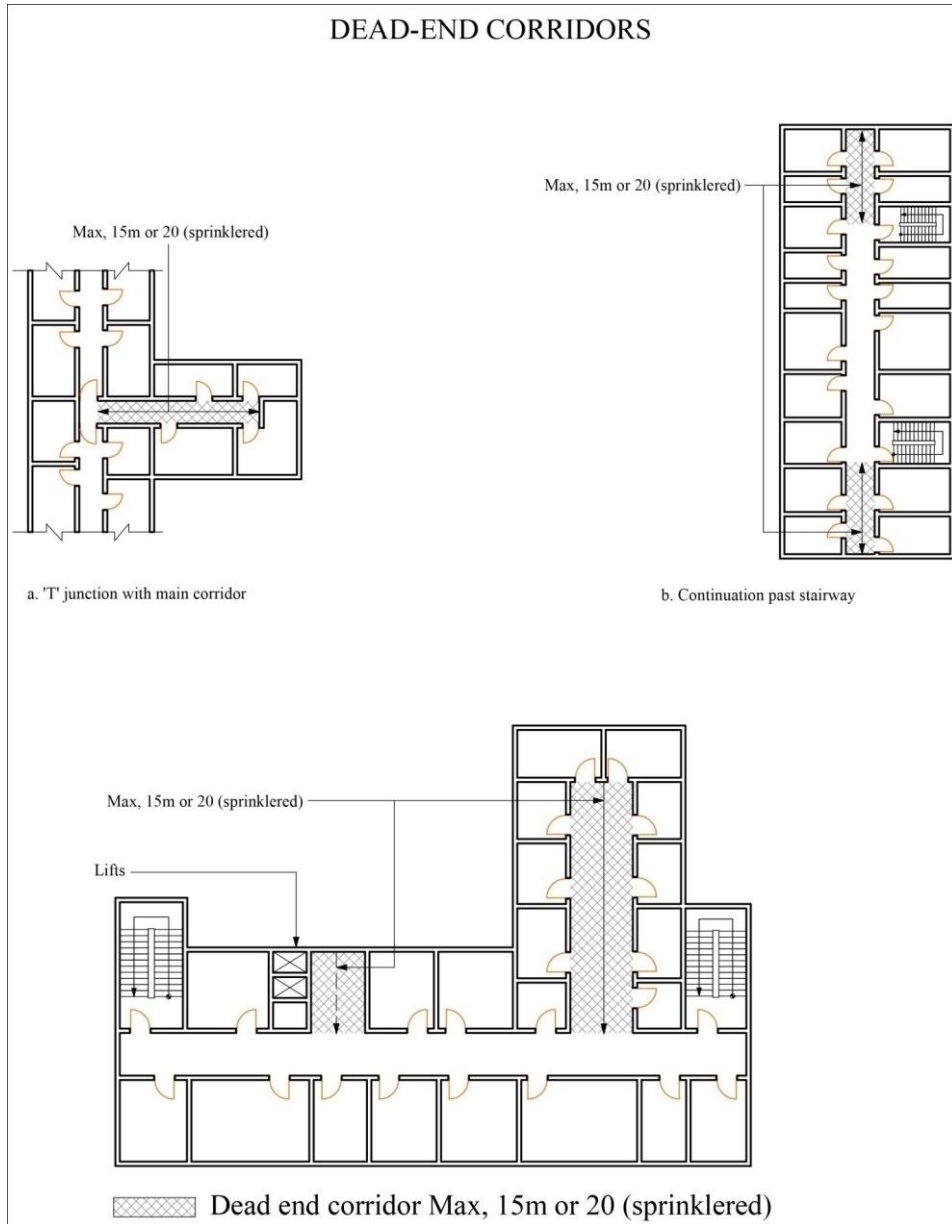


Fig 2: Dead end corridor

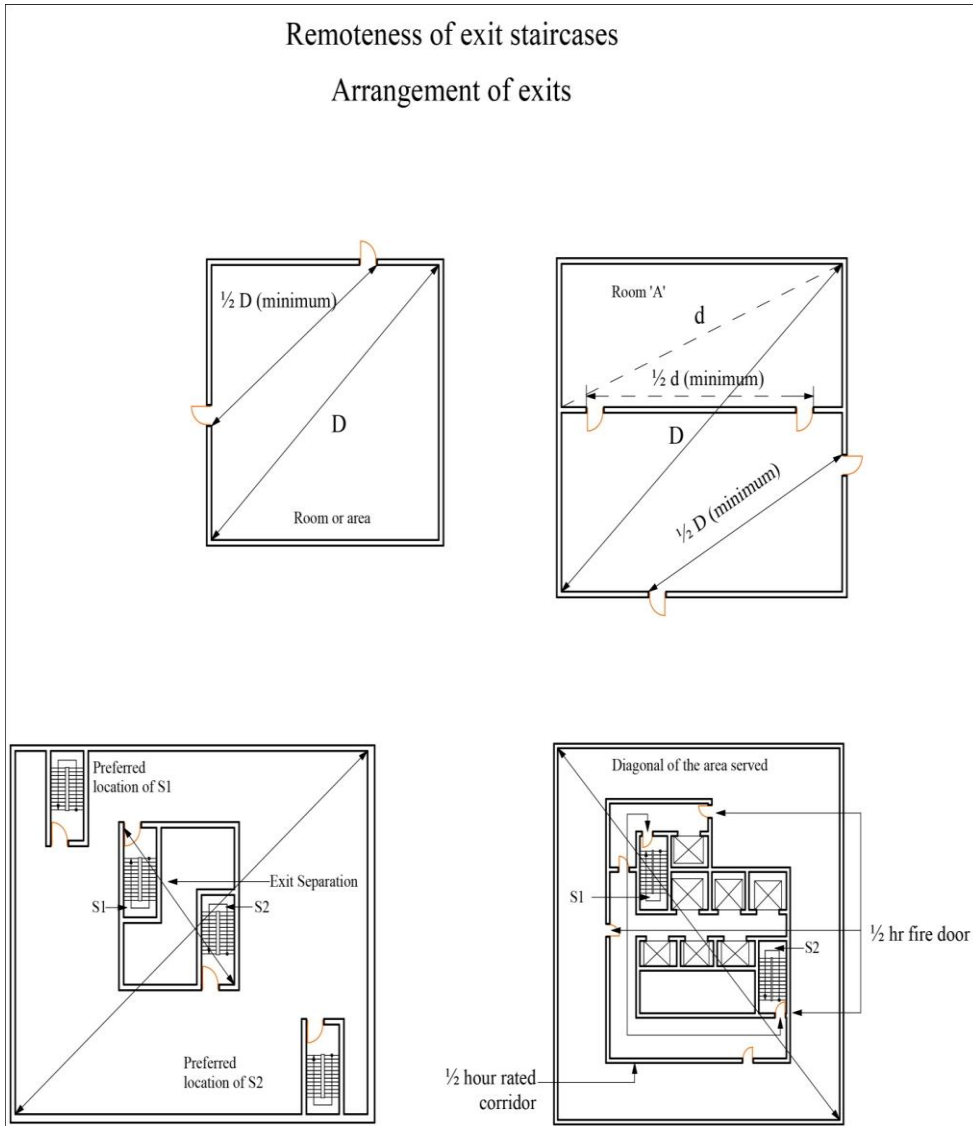


Fig 3: Arrangement of exits

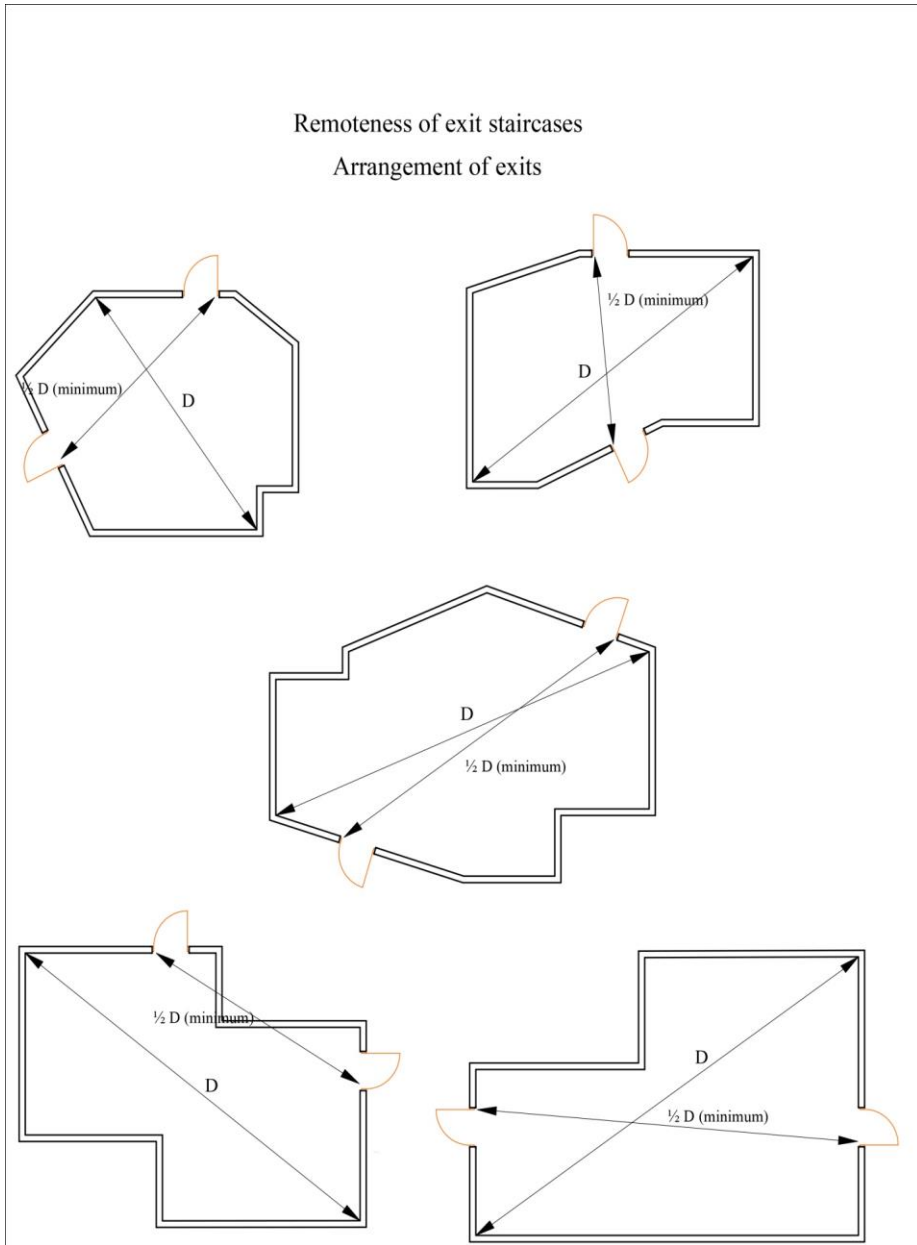


Fig 4: Arrangement of exits

Determination of Seatway Width

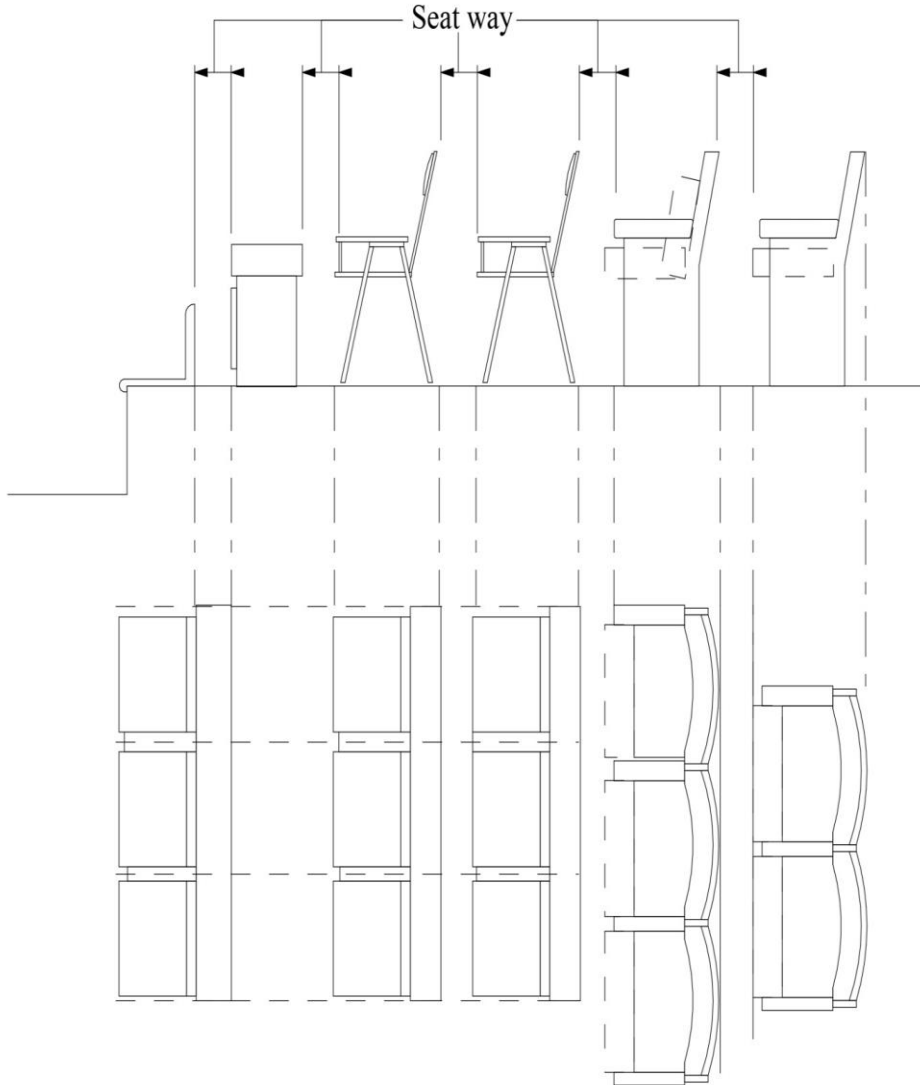


Fig 5: Determination of seat way width

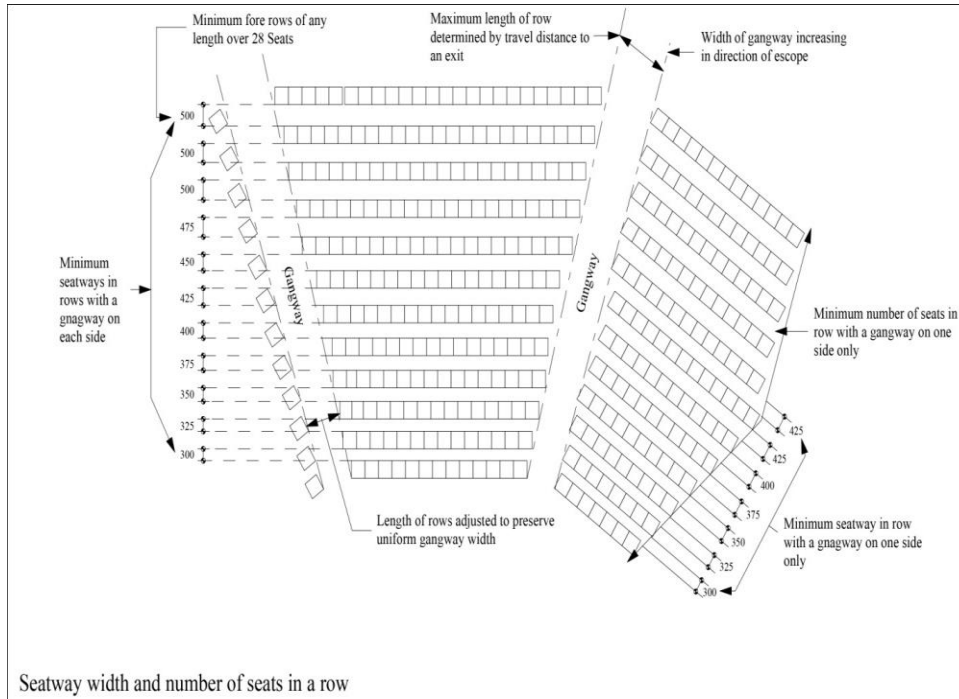


Fig 6: Seatway width and number of seats in a row

Exit Staircase

For residential apartment or maisonette

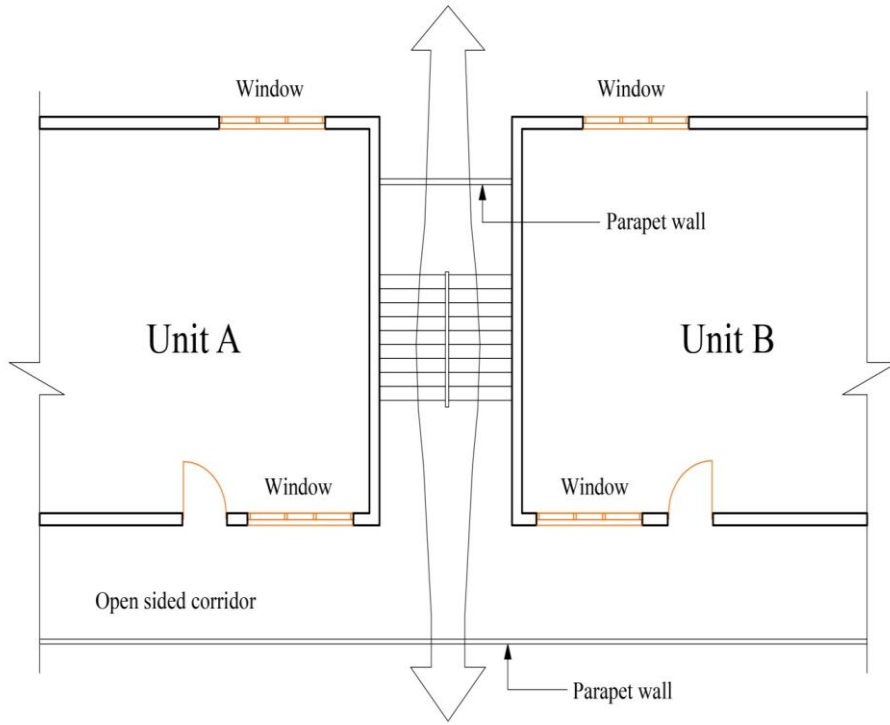
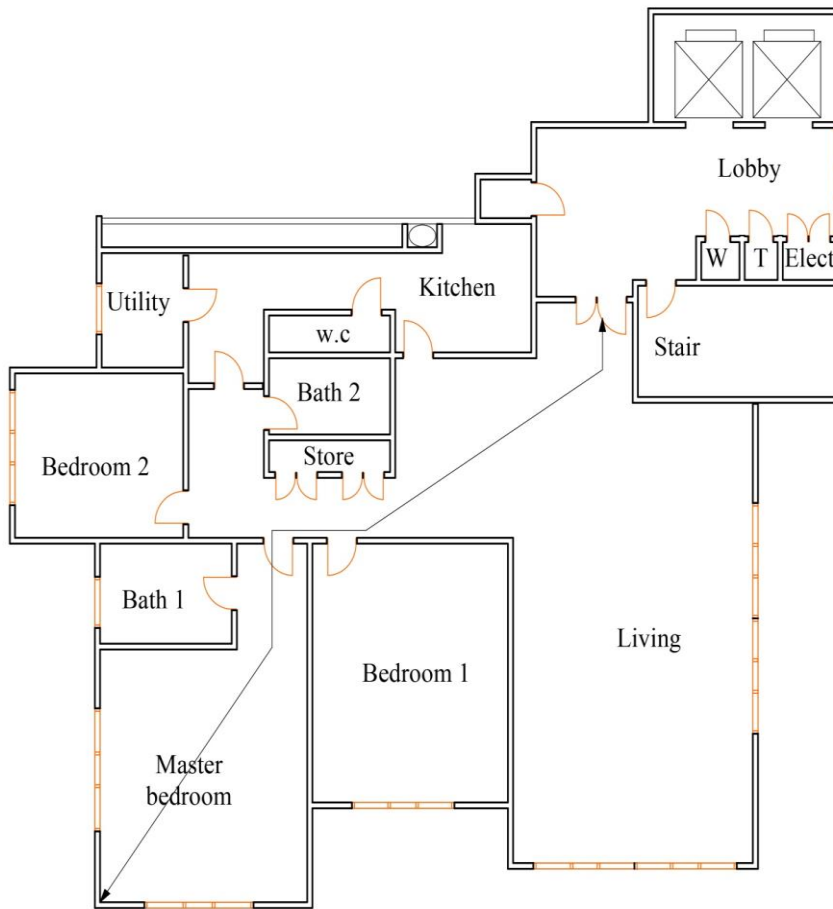


Fig7: Exit staircase for residential apartment or masonette

Provision of Exit from Apartment Unit



Legend

←→ Travel distance from any point within unit to the exit door (max. 20m)

Fig 8: Provision of exit from apartment unit

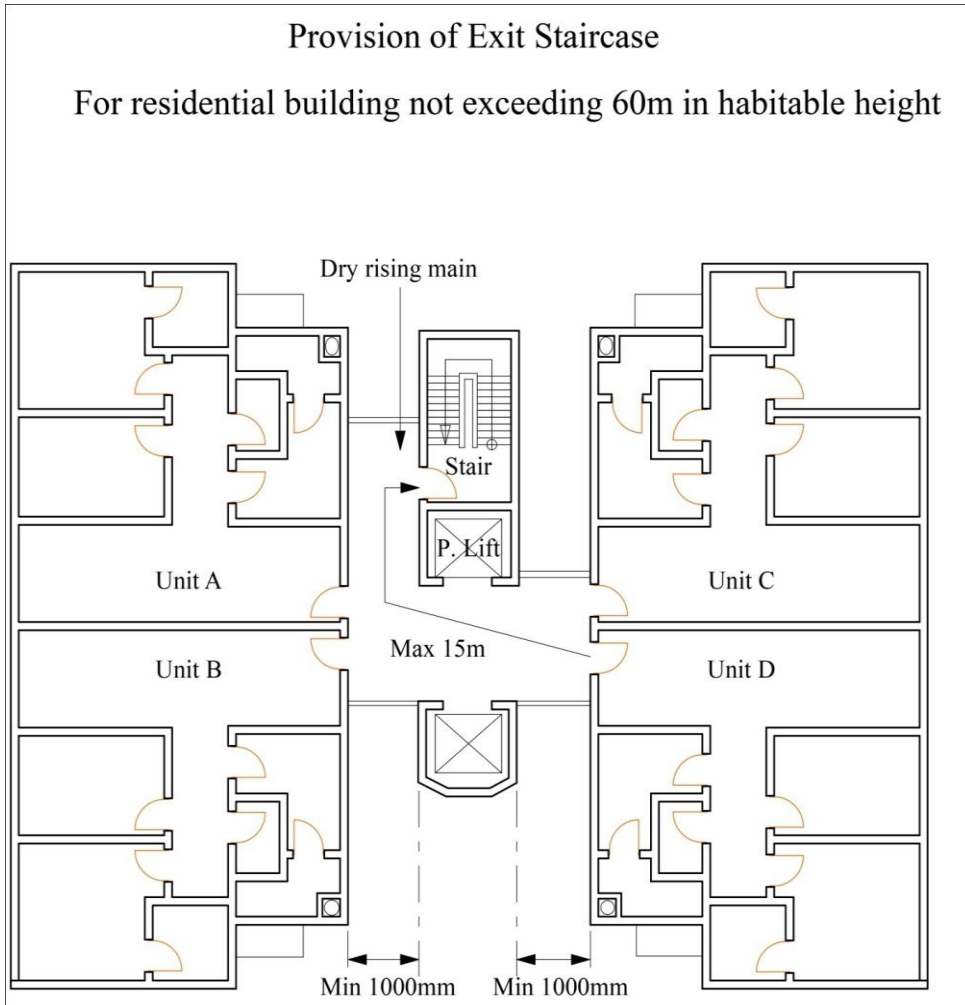
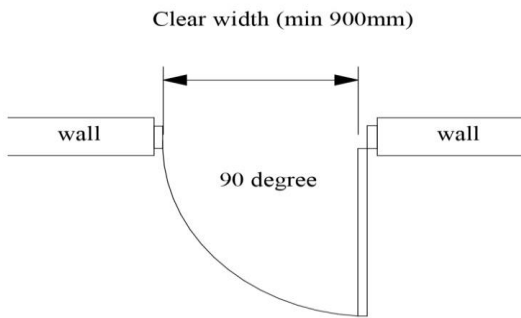
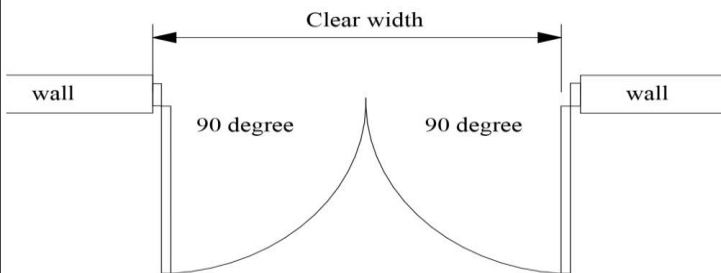


Fig 9: Provision of exit staircase for residential building not exceeding 60m in habitable height.

Measurement of width of exit doors

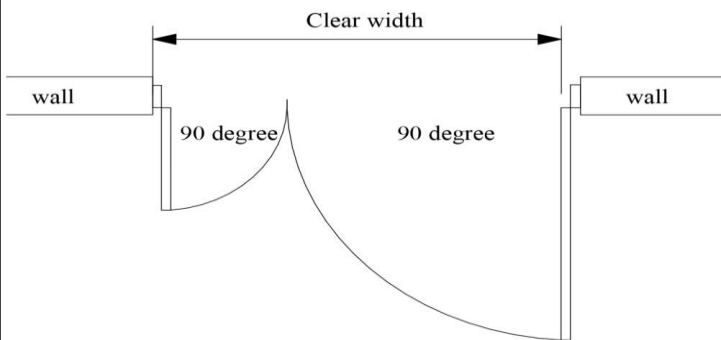


SINGLE LEAF DOOR



2 LEAF DOOR

Sequential door closer shall be provided to both leaves



MULTI-LEAF DOOR

Sequential door closer shall be provided to both leaves

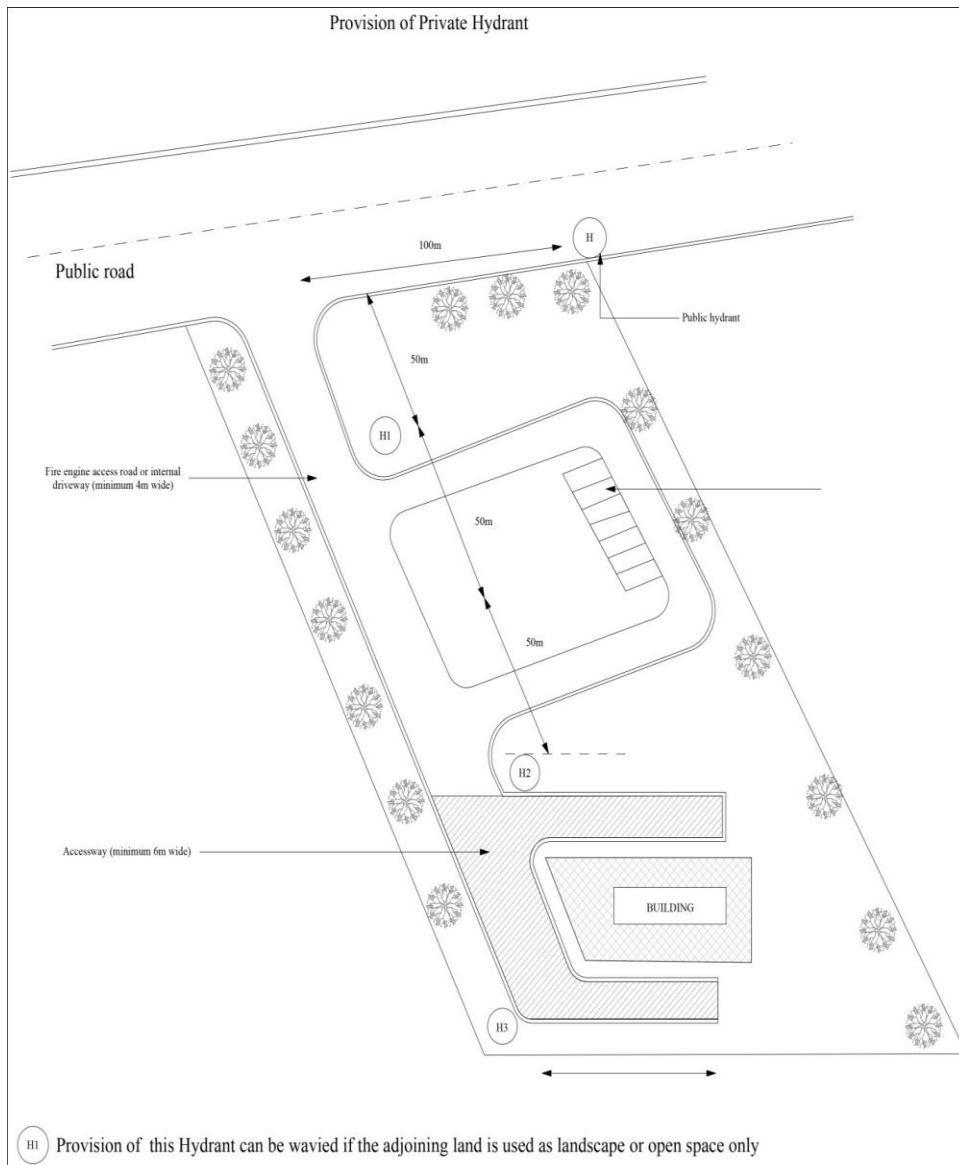


Fig 11: Provision of private hydrant

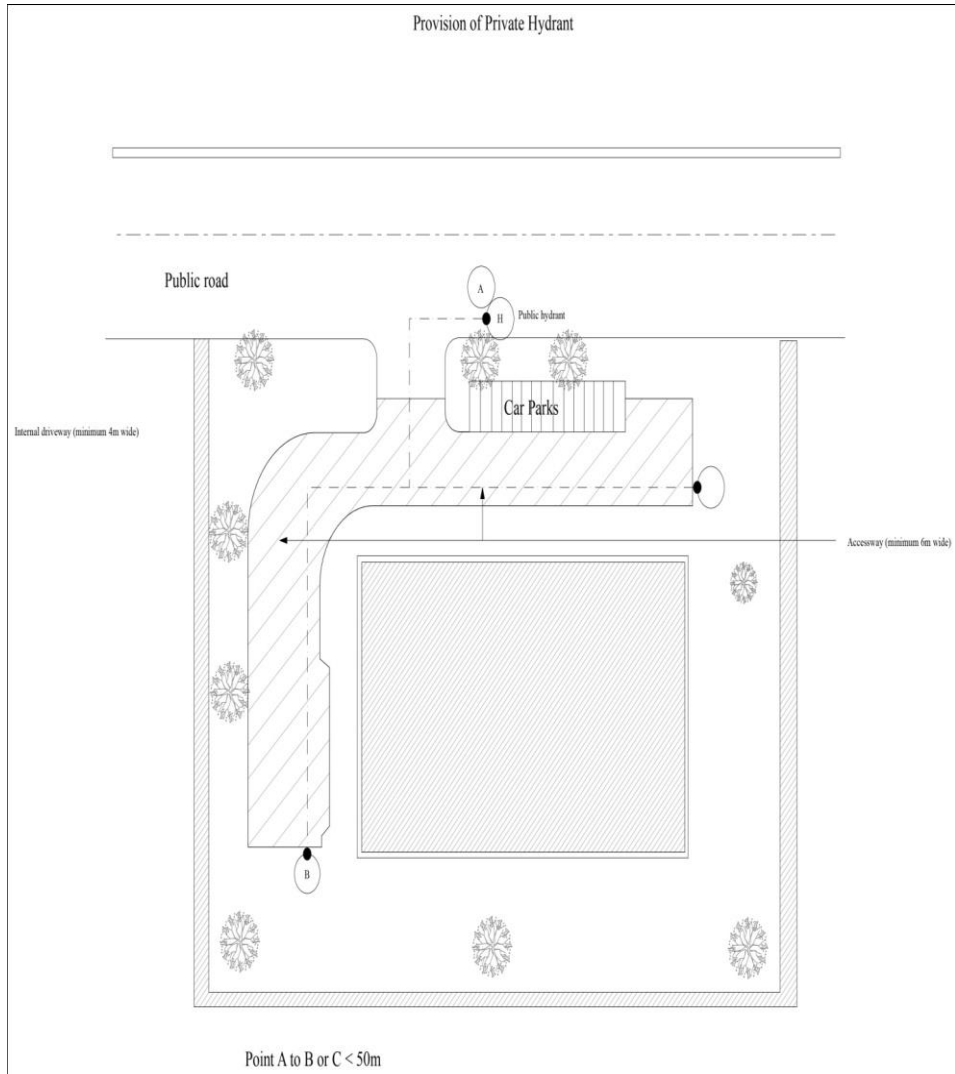


Fig 12: Provision of private hydrant

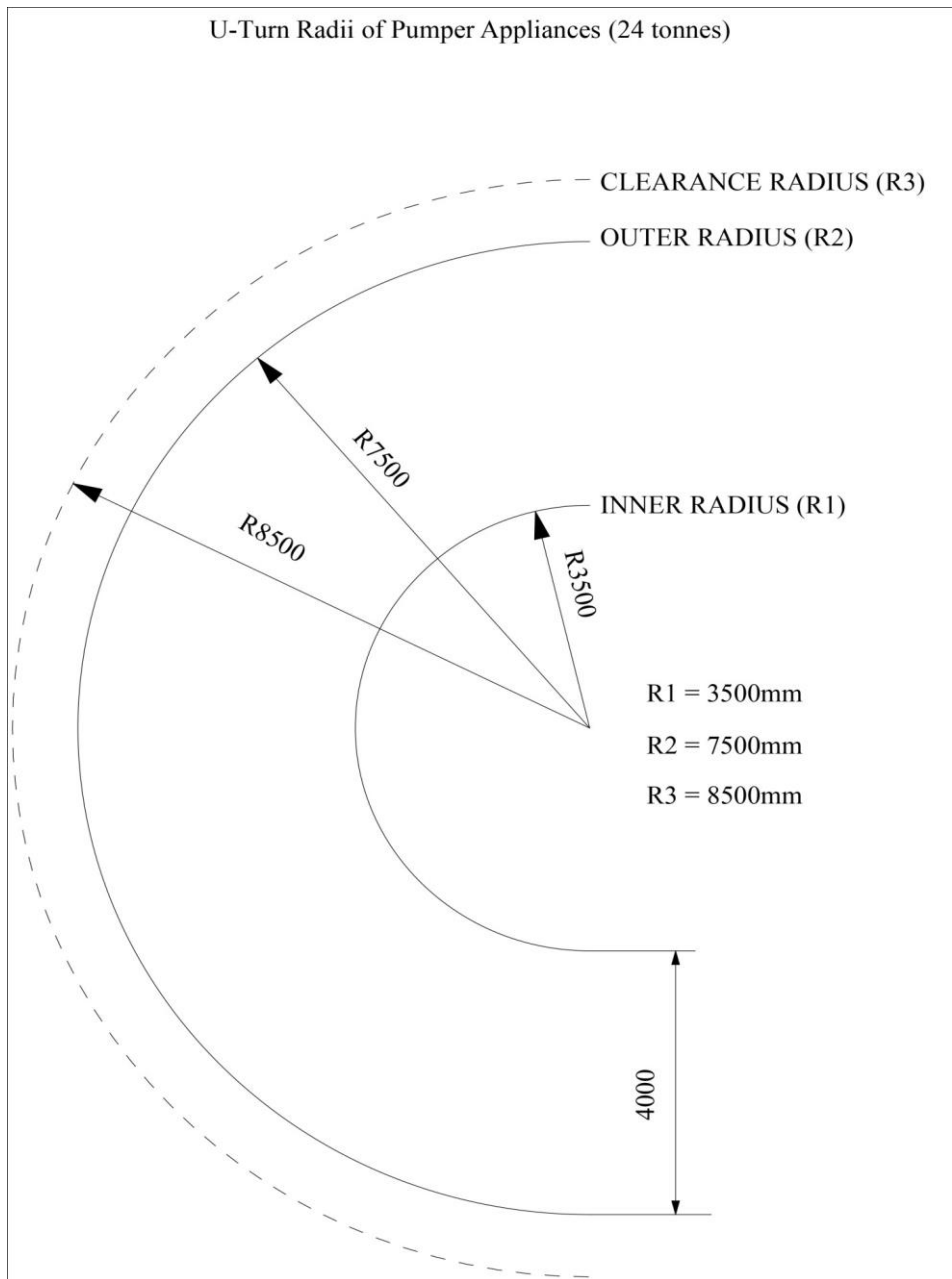


Fig 13: U-Turn radii of pumper appliance (24 tonnes)

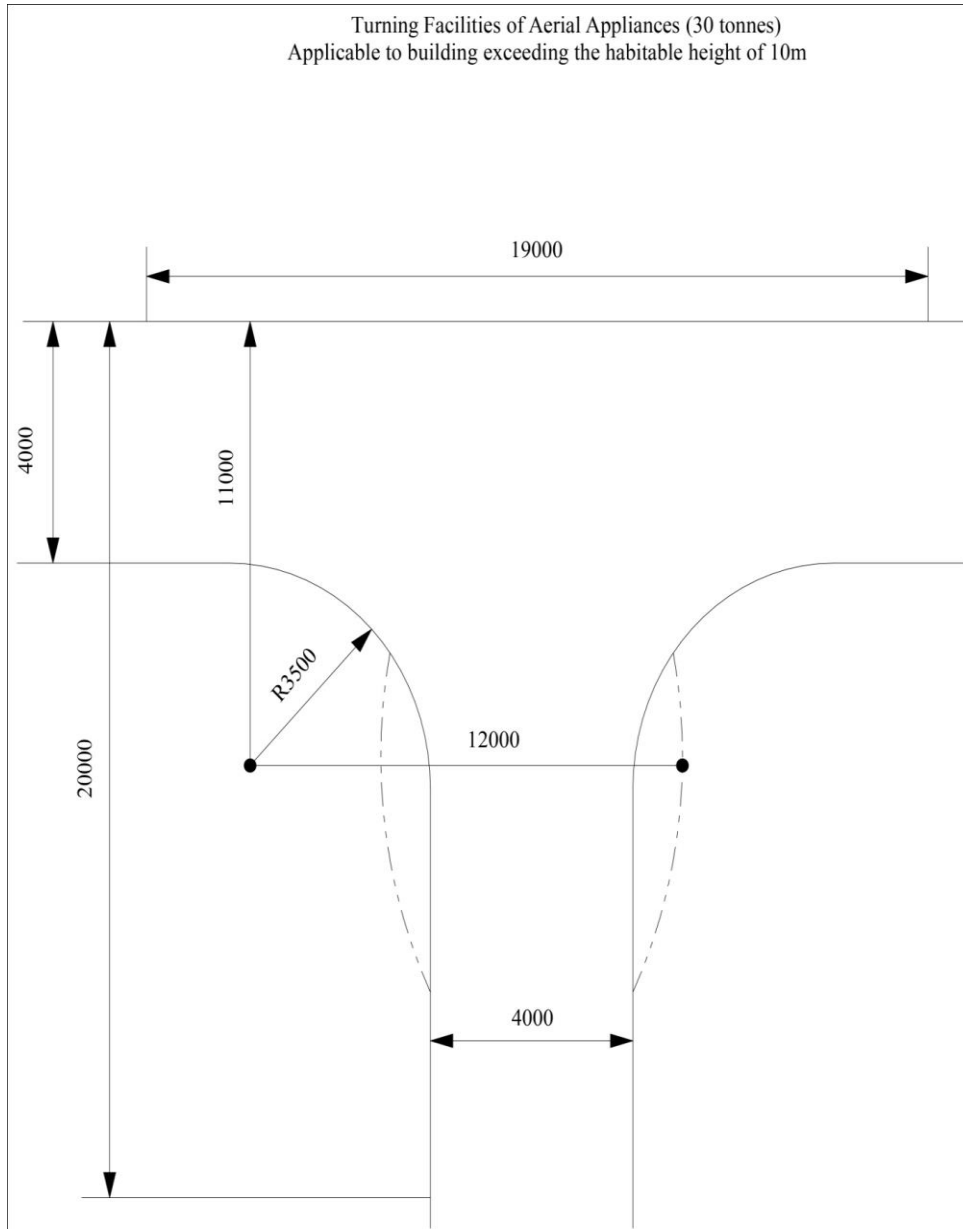


Fig 14: Turning facilities of appliance (30 tonnes) Applicable to building exceeding the habitable height of 10m

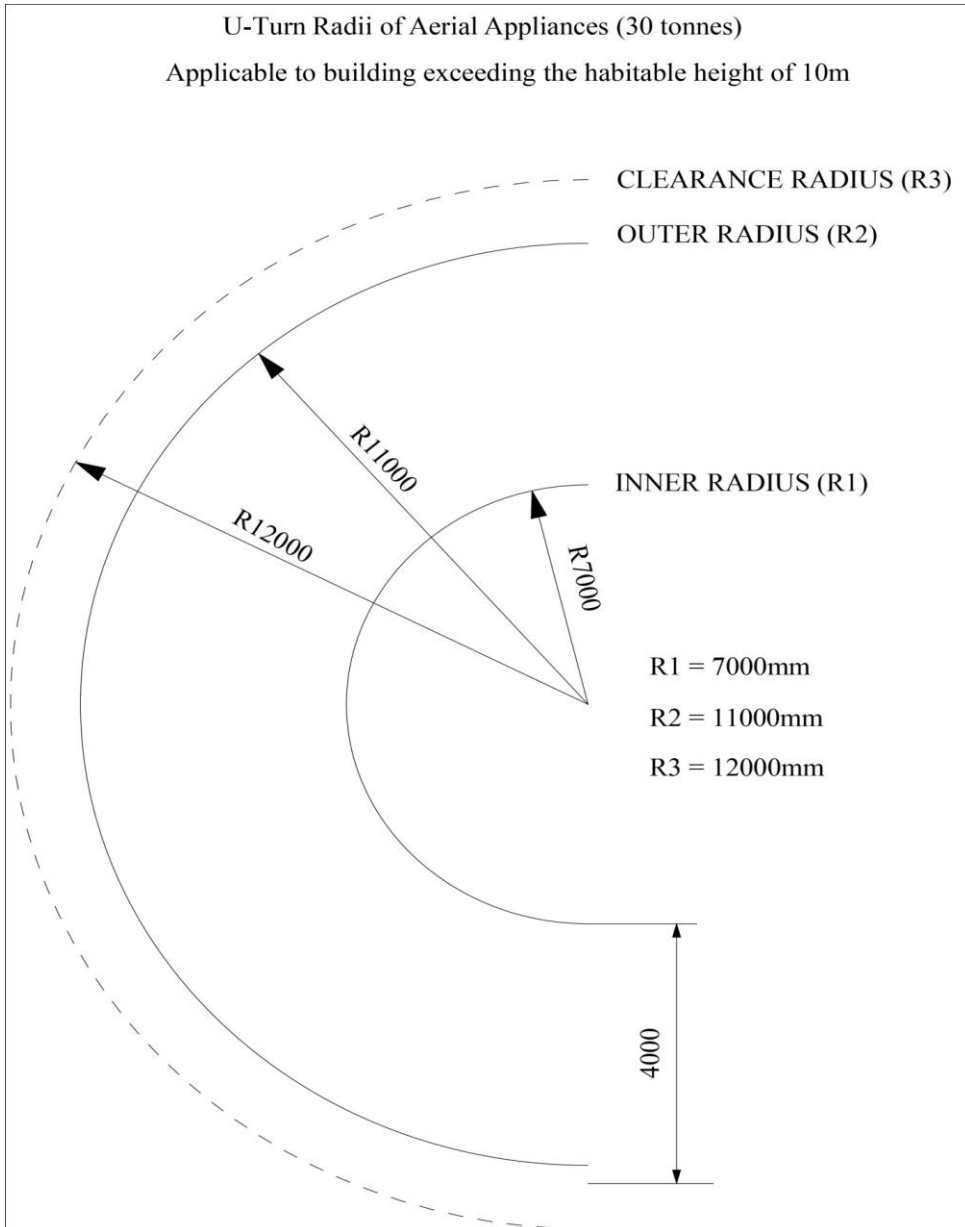


Fig 15: U-Turn radii of aerial appliance (30 tonnes) Applicable to building exceeding the habitable height of 10m

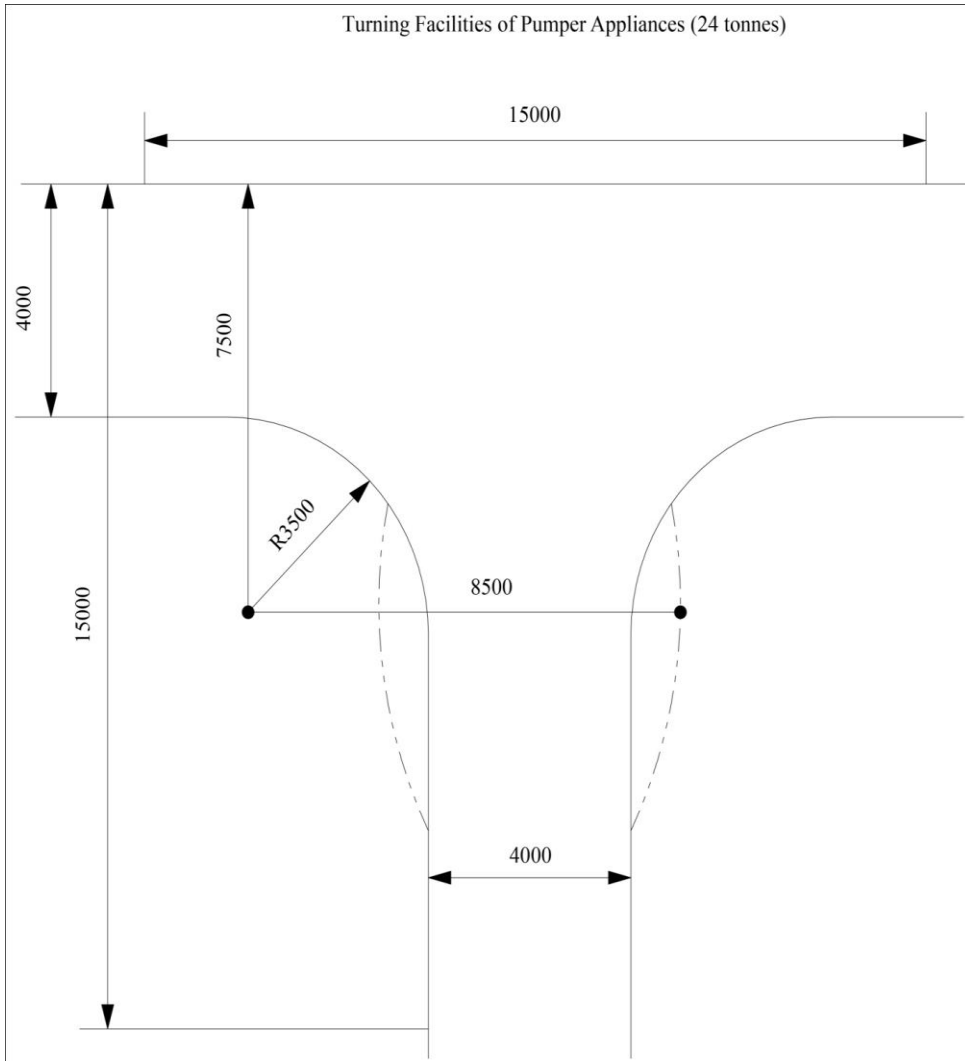


Fig 16: Turning Facilities of pumper appliance (24 tonnes)

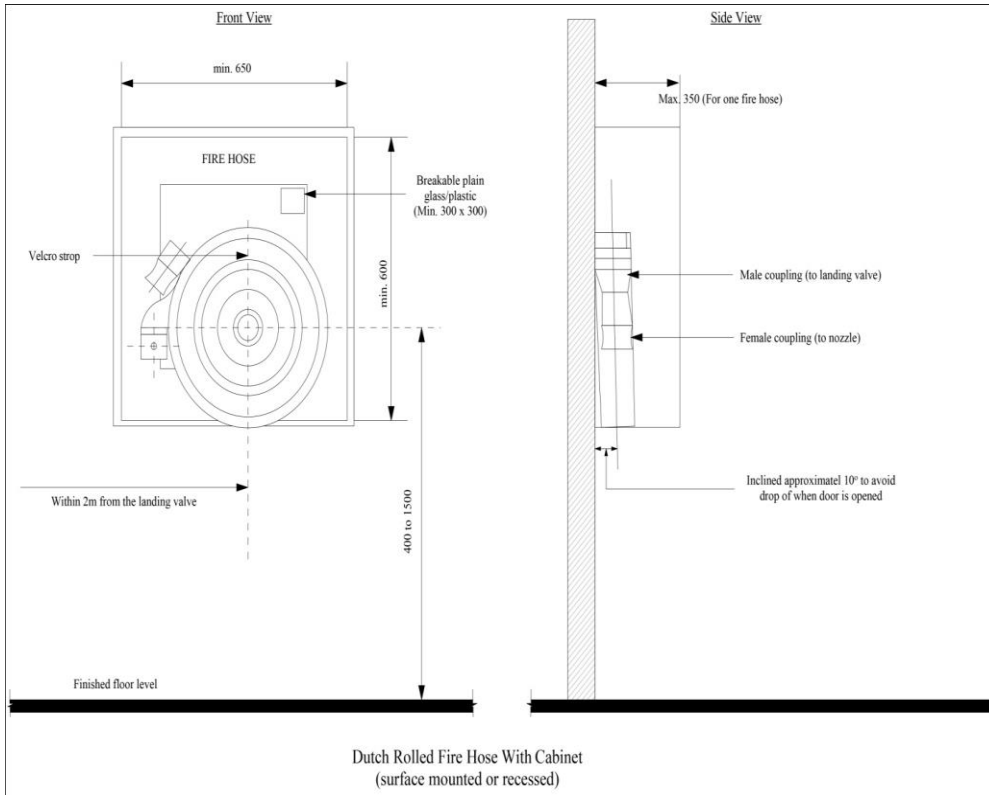


Fig 17: Dutch Rolled Fire Hose With Cabinet

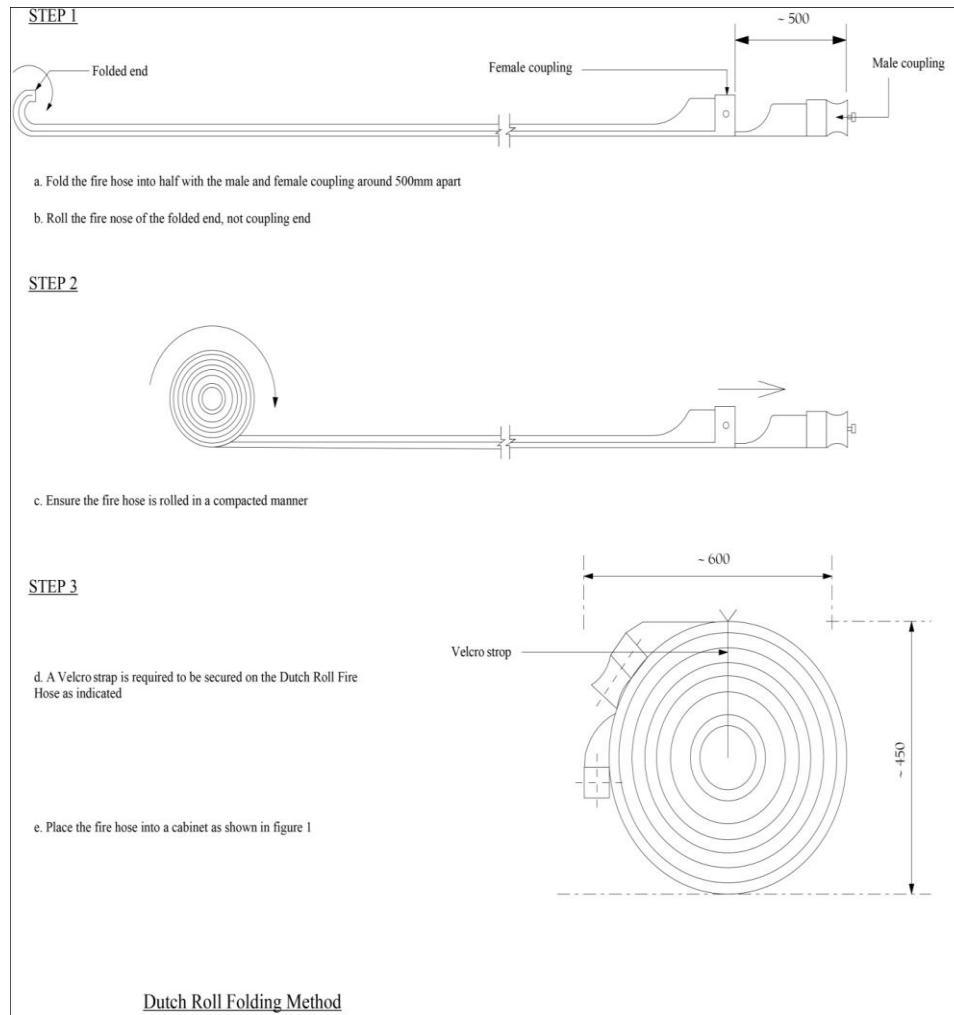


Fig 18: Dutch Roll Folding Method

Dar es salaam,
5 August 2015

MATHIAS M. CHIKAWA,
Minister for Home Affairs