



DIRECTORATE GENERAL OF CIVIL DEFENCE

BUILDINGS FIRE PREVENTION AND PROTECTION REQUIREMENTS

PART ONE

Introduction

Based on the authorization from the Highnesses and Excellencies, the Ministers of interior in the Gulf Cooperative Council Countries, in their meeting which was held in Muscat on 29–30 Jumada Akhera 1417 Hijri, i.e. 10–11 November 1996 to the Technical Committee of the Secretariat of the Council countries for laying down safety and preventive supervision requirements for the buildings, the Secretariat General of the Cooperative Council of the Arabian Gulf countries is pleased to present this “Buildings fire Prevention and Protection Requirements document endorsed by the Decision of the Inspector General of Police and Customs No. 77/2002 as Omani Requirements and Published in the Official Gazette: Issue No. 727 as part of the set of fire prevention systems which aim to protect the lives of the users of such buildings in the Council Countries.

The Secretariat General of the Cooperative Council of Arabian Gulf countries would like to express its thanks to everyone who contributed to the finalization of this project while appreciating all endeavours exerted for the application of these requirements and conditions which target the protection of life and properties, the application of which will be real translation to the most prominent signs and indicatives of cooperation and goals of the leaders of the Gulf Co operative Council of Arabian Gulf Countries which aim to protect the national and native wealth from the risks which may be confronted in the course of the contemporary life.

May God guide us to the righteous path

Secretary General

FIRE PREVENTION AND PROTECTION REQUIREMENTS FOR BUILDINGS –

PART ONE.

1. Title:

1.1 These regulations should be known as regulations of buildings fire prevention and protection requirements and referred to in this document as the regulations or these regulations.

2. Purpose:

2.1 The purpose of these regulations is to determine the minimum level of prevention requirements necessary for the protection from fire in order to protect the life of the users of the buildings without hindering their daily use of these buildings.

3. Field:

3.1 These regulations concerned with the life protection requirements from fire and its alike arising from emergency cases

3.2 These regulations take into consideration the panic status resulting from the buildings fire through requirements designated for eliminating the causes of such panic during emergency times.

3.3 Several aspects were taken into consideration during the preparation of these regulations the most important of which are the following:

3.3.1 Structural fire resistance.

3.3.2 Types and standards of fire protection.

3.3.3 Types of users of the building and their number

3.3.4 Types of activities practiced in the building.

3.4 The minimum level of requirements for designing escape means (exits) for the users of the building to other safe locations whether inside or outside the building.

- 3.5 It was observed that escape means are not the solely factor in life protection which the regulations handle. These regulations do not tackle all the factors such as awareness of the public which is considered as one of life protection factors.
- 3.6 The regulations do not take into consideration the prevention of normal personal incidents (such as falling on the ground) which are caused by lack of the building with regard to the safety means. The regulations concentrated on the protection of lives from fire as a basic requirement rather than protection of property.
- 3.7 These regulations are not building requirements regulations but can be used with building requirements regulations.
- 3.8 These regulations are not laid down to safeguard the life of those who by accident or intention set fire or become close to burning point.

4. Application Procedures

- 4.1 These regulations should apply to all buildings for which construction permits are issued after these regulations become valid.
- 4.2 It is not practical to apply these regulations on the existing buildings. In such case the civil defense may request additional equipment or as a substitute for some precautionary prevention measures required according to these regulations.
- 4.3 The civil defense on issuing the construction or operation permit may request additional equipment or as a substitute to some precautionary preventive measures required according to these regulations.
- 4.4 Any additions to the existing building should be according to the requirements and conditions of these regulations.

- 4.5 If the building contains two or more activities or uses which are different in the degree of hazard and cannot be separated the requirements which are more concerned with the life protection shall be applied on the various activities and uses.
- 4.6 No requirement prescribed in these regulations prevents the designing or installation or use of better types of equipment for prevention and protection from fire or more number of emergency exits or any equipment which have positive impact on the protection of the life of the users of the building or the equipment which serve the same purpose prescribed in these regulations or superior equipment provided that the supporting documents and papers which prove the efficiency of the substitute shall be submitted to the civil defense for approval.
- 4.7 The systems, equipment and tools of prevention from fire of life from fire in the building should receive the required maintenance to ensure their permanent operation with high efficiency.

5. Operation and Use of the Building:

The building construction permits of which are issued after the validity of these regulations shall not be operated or used in whole or partial if not in compliance with these regulations.

The used buildings before the validity of these regulations may be used or operated provided that they meet two basic requirements as follows:

1. There is no real noticeable hazard which may affect the lives of the users of the building.
2. The classification of the building and the related activity remain without change. Any change in the building requires the application of the conditions and requirements of these regulations. As long as the escape means (emergency exits) are available and the protection systems from fire are operating normally the building may be used during the maintenance or amended by addition or deletion.

6. Designing Basics

6.1 The purpose of these regulations as mentioned earlier is centered around the protection of the users of the building without hindering their daily use of it. This goal is achieved through ensuring the application of the minimum level of requirements which can be summarized in the following considerations:

6.1.1 It should be taken into consideration that the Construction frame and the building shall be properly designed, well ordered ,operated and maintained to avoid any hazard to the lives of the building users from fire, smoke, vaporization and panic in the event of emergencies, shall permit the evacuation of the users of the building during emergencies.

6.1.2 Ensuring that the building construction frame endures the fire impact during the building evacuation course in the event of emergencies.

6.1.3 Ensuring during the designing of the building and before the construction phase that the appropriate escape means (emergency exits) are available for each building or establishment in terms of number, capacity, location, height of the building and the type of materials used in the construction and it should be also taken into consideration the type of the building, its uses, its users and the type of fire prevention means which shall be made available.

6.1.4 Ensuring the availability of escape means (emergency exits) without relying on Firefighting means.

6.1.5 It is not always necessary to evacuate the building as a whole for rescue from fire. The building may include a horizontal evacuation area protected from the smoke or gas leak from other floors or parts of the building. These protected areas allow relative safety until the emergency case is ended.

- 6.1.6 Ensuring during the designing phase that the escape means are free from anything that may hinder their use. The doors opening direction in the designing and implementation are in compliance with the escape path.
- 6.1.7 Ensuring the placement of the guiding signs on the escape mean so that no confusion shall occur during the evacuation.
- 6.1.8 Ensuring the availability of satisfactory lightening and the suitable warning devices in the building and the vertical openings shall be isolated from other parts of the building.
- 6.1.9 Ensuring the availability of the minimum level of prevention requirements for protection from fire as indicated in these regulations.
- 6.1.10 Allowing the opportunity in the designing phase to provide more protective requirements conducive for continuation of the use of the building.

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Chapter One (contd..)

General Preventive requirements for protection from fire in Establishments

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Chapter One

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Definitions:

Square:	Large area of land without separating roads between its parts.
Fire spread preventive units:	A section or sections of the building separated and surrounded with Construction barriers which prevent for specific period the movement of fire within the fire spread preventive unit and other parts of the building or the neighboring buildings
Fire spread preventive barriers:	Construction elements separating between fire spread preventive units
Basement (basements):	Part of the building located under the ground or protected vault from bombs

Light hole (holes):	A gap through which the light or air falls directly from the highest part until the ground floor of the building and accordingly enlightens the place and allows the air inside the building
Mezzanine:	Part of the floor on top the ground floor and mostly face up to it or a floor between two main floors
Final exit:	Any corridor, path or exit mean from the building or ground floor or basement to the road or open field (open area) such as courtyard.
External wall:	The wall facing internal open area in the building or facing up to the road.
Internal wall:	The wall which divides the building internally into parts whether the wall is fixed or mobile.
Roofs:	Part of the building Construction frame which separates two units horizontally. i.e. a cover of a unit and forms a roof to it.
Staircase:	Vertical movement mean between the floors of the building.
Non combustible materials:	Material which cannot be burnt and do not release susceptible gases or vapors to burning.
Fire preventive wall:	A fire resistant barrier for specific period for limiting fire or vapors spread.
Corridor :	Joint path extending from the rooms or sections to a hall or staircase or exit.
Closed finish:	The corridor or point from which the escape could take one direction only.
Emergency lightening:	Lighting from independent electrical source from the main electrical current supply source. This lightening continue to lighten when the current is disconnected from the main supply source.
Evacuation period:	Allowed time for the occupants of the building (available at the fire site) to reach to a safe location from fire hazard

External fire spread:	Fire spread on the external façade of the building through the extension of flames from the windows and other openings or through the extended heat from the fire site to the neighboring buildings.
Fire proof door:	A door the frame of which and its all parts designed to present the passage of smoke or hot gases or flares when it is closed.
Coverage:	Open surfaces materials of the rooms walls, roofs and also includes partitions which can be folded or removed and glass fittings.
Movement distance:	The distance from the further point in the room or section to the exit or protected staircase from fire.
Automatic ventilation:	Disposal system of the smoke which depend on the use of suck up fans for driving away the smoke or any other gases from the hazard area.
Ramps:	Any beveled corridor or path connecting two different heights levels and forms one of the escapes means (emergency exits).
Wastes accumulator:	Vertical corridor with the building length for disposing the wastes provided with appropriate openings in each floor.
Chimney:	Vertical design constructed of materials which endure high temperature degrees for the disposal of the smoke and gases arising from fuel burning devices
Dry Firefighting water network:	Vertical pipes network installed in the building for firefighting purposes provided with fire men capable of driving the water and connected with fire hoses at certain points in the building and end ending with air release valve.
Moisture Firefighting water network:	Vertical pipes network installed in the building for firefighting purposes connected with compressed permanent water source provided with water hoses for firefighting at certain points in the building.
External fire extinguishing water hoses:	Fire extinguishing water supply system provided to enable fire men to control the fire. It is assumed that the external fire extinguishing water supply network hoses shall be independent from the building and neighboring other buildings water supply network.

Fire warning systems:

A group of devices which release audible or visible signals which attract the attention and operate automatically or manually when exposed to smoke or certain level of heat

Critical minimum heat exposure level:

A feature through which the resistance of the finishing surfaces of the floors to the flames spread is classified. It is carried out through standard test technically based on the assumption that flames spread on the floors surfaces during actual fires depend on the level of heat exposure. Therefore the greater the heat exposure level at which the standard test criteria are achieved, the greater the tested material ability to resist the flames spread.

2 Buildings and Establishments classification:

2.1 Classification of buildings by two methods: in terms of the nature of use and in terms of the hazard of their contents.

2.1.1 Classification of the establishments in terms of the nature of use to the following groups:

2.1.1.1 Assemblies buildings

2.1.1.2 Educational buildings

2.1.1.3 Health and social care buildings

2.1.1.4 Residential buildings

2.1.1.5 Commercial buildings and public markets

2.1.1.6 Industrial establishments and industrial professions buildings

2.1.1.7 Warehouse and car parking buildings

2.1.1.8 Special nature buildings

2.1.2 Each one of these groups contain several types of buildings activities or assemblies closely related such as the following:

2.1.2.1 Assembly buildings: Allocated buildings for accommodating (50) persons or more for recreation, cultural, sports or presentation purposes such as:

- Worship premises
- Courts
- Lectures rooms
- Meeting halls
- Presentation halls
- Bank venues
- Museums and theaters
- Major libraries

Sports club and covered play grounds.

2.1.2.2 Education buildings:

The buildings or their parts which are allocated for education purposes and they accommodate (6) regular students with attendance not less than (12) hours per week such as kindergartens and preparatory, elementary, secondary schools, professional, applied institutions, colleges, universities and their alike.

2.1.2.3 Health and social care buildings:

Buildings or their parts which are allocated for health, social care purposes and the occupant of which are unable to move or they are under deprivation of liberty with limited movement including hospitals, elderly caring premises, mental health facilities and prisons of all category types.

2.1.2.4 Residential buildings:

Buildings or their parts allocated for residences or stay overnight.

The residential buildings are divided into several categories according to the type of use as follows:

2.1.2.4.1 Buildings composed of permanent residential units for one family (flats) such as investment residential buildings.

- Buildings composed of rooms or barrack rooms permanent individual or group residence such as residences of the students, employees, workers and barrack rooms of the soldiers and their alike.
- Buildings composed of rooms for temporary stay overnight with or without pay such as hotels, motels, guest houses, furnished flats and their alike.
- Residential buildings such as small villas or private palaces.

2.1.2.5 **Commercial buildings and public markets:**

Buildings or their parts which are allocated for serving the public “commercial shops” or the users of which are not exceeding (50) persons at one time and those allocated for office uses “offices” such as:

- Whole and retail sale shops
- Light professions services
- Commercial centers
- Tailoring and barber’s shops
- Business administration offices
- Small banks services
- Institution offices
- Consultancy or engineering officer
- Company offices
- Real estate offices and their alike

2.1.2.6 **Industrial establishments, buildings and industrial professions which include improvement operations such as:**

- Dairy plants
- Furniture factories
- Various industrial shops
- Printing Presses
- Hazardous chemical materials laboratories
- Central laundries
- Industrial Handcrafts buildings
- Various industrial shops

2.1.2.7 Ware houses and car parking buildings:

Buildings or their parts which are allocated for raw materials, processed and half processed products storage purposes such as:

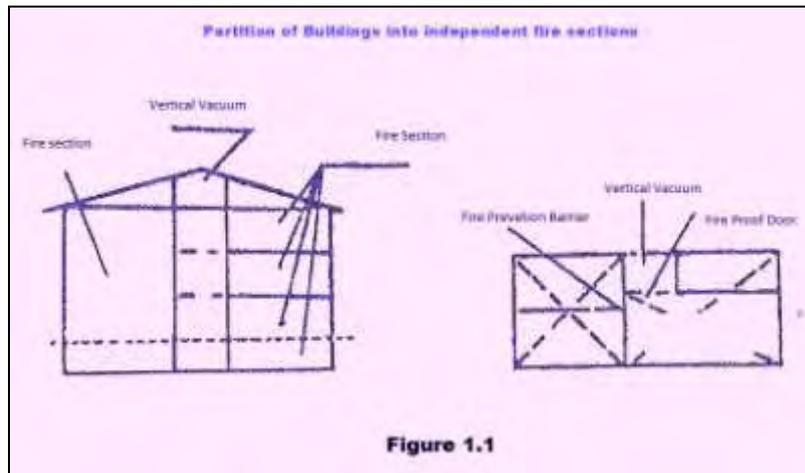
- Car parkings
- Horse stables
- Feed stores
- Food materials stores (refrigerators)

2.1.2.8 Special nature buildings:

Buildings composed of several and various types of the previously mentioned buildings such as towers and high buildings and basements (buildings underground surface).

2.1.3 Classification of the establishments in terms of the hazard of their contents into the following categories:

Hazard Level	Description
Light hazard	Buildings the contents of which are of weak burning nature to the extent that it is not possible for them to be of self ignition and therefore the potential hazard is represented in the panic status and over crowd in the exits during exposure to fire and smoke from external sources
Medium hazard	Buildings the contents of which can burn at medium speed or can release noticeable quantity of smoke but do not produce toxic vapors and do not result in explosions during burning
High hazard	Buildings the contents of which burn at high speed or produce toxic vapors or explosions.



3 Documentary courses for construction and use permits:

- 3.1 The document courses for permits related to the establishments subject to the requirements of protection from fire in the buildings should be left to the organizing laws and regulations in each country of the council countries.

4 Designing, supervision and implementation

- 4.1 The organization of the designing, supervision and implementation process should be left to the prevailing laws and regulations in each one of the council countries.

5 Sites organization requirements for protection from fire

- 5.1 On submission of site plans with other plans for obtaining approval the construction requirements should be observed in addition to clarification of the project site and the important sites and neighboring buildings and the areas of their use and the names of the surrounding roads of the site mentioned.
- 5.2 The building concentration and its distance from the neighboring buildings should be determined by the approval of the civil defense.

In accordance with the nature of the use

- 5.3 The easy passage of civil defense vehicles and equipment to the nearest point of the building shall be taken into consideration.

When the buildings are numerous such as complexes the following should be taken into consideration:

- 5.3.1 Availability of satisfactory internal roads

- 5.3.2 Easy passage of civil defense vehicles and equipment to the buildings
 - 5.3.3 Availability of satisfactory inlets and outlets for the vehicles
 - 5.3.4 Distribution of ground fire water mains hoses around the buildings
 - 5.3.5 About 20% of the area of industrial zones should be left for utilization in firefighting operations and it shall be determined by the civil defense through the establishment of natural partitions between the buildings of the square or between the buildings of the square and the neighboring buildings.
- 5.4 Arrival of civil defense vehicles and equipment:
- 5.4.1 Satisfactory roads paths should be made available for the arrival of civil defense vehicles and the supporting equipment to the required distance from the building.
 - 5.4.2 The suitable road or path for the passage of civil defense vehicles should meet the following requirements.
 - 5.2.3.1 The road surface and covers of septic tanks should be durable to the passage of various types of civil defense vehicles.
 - 5.4.3 The required distance between the building boundaries and the nearest point which shall be reached by the civil defense vehicles should be calculated according to the type and size of the building as follows:
 - 5.4.3.1 The distance in the buildings the height of which is not more than two floors and do not constitute any hazard should be more than 46m from any point in the ground floor of the building.
 - 5.4.3.2 The distance in normal buildings composed of 3 – 4 floors the area of which is more than 139 square meters should not be more than 28m from any point in the ground floor of the building.
 - 5.4.3.3 In the buildings which are provided with fire extinguishing water hoses network the distance from the staircase which contains Firefighting water hoses should not be more than 17m.

5.4.3.4 If the height of the building is more than four floors and the area of which is not more than 139 square meters or if the buildings are of industrial use the civil defense vehicles should reach to a distance of 5 – 6 m along one façade of the building. If the height of the building is more than the noted height the civil defense vehicles should reach to a distance of 5 – 6 m along two facades or more of the building according to the type and hazard of the fire and assessment of the civil defense.

5.5 Arrival of civil defense men:

5.5.1 One of the building designing requirement is to be provided with the means and facilities which enable the civil defense men to enter the building quite easily to perform the fighting and rescue works.

5.5.2 The barriers and hindrances should not be fitted on the windows of the external facades above the ground floor of the unless they can be easily opened and after obtaining special approval from the civil defense.

5.5.3 On the placement of firefighting equipment designated for assisting civil defense men such as Firefighting hoses and driving points in the ground floor the following should be observed.

5.5.3.1 The fire equipment designated for assisting civil defense men should be away from the fire hazard and the glasses and other scattered materials in the building as well as other hazards.

5.5.3.2 The designated firefighting equipment for assisting civil defense men should be distinguished with a clear and noticeable signal (red color).

5.5.3.3 It should be complied with the application requirements and the special specifications so that they reflect consistency with the various firefighting equipment.

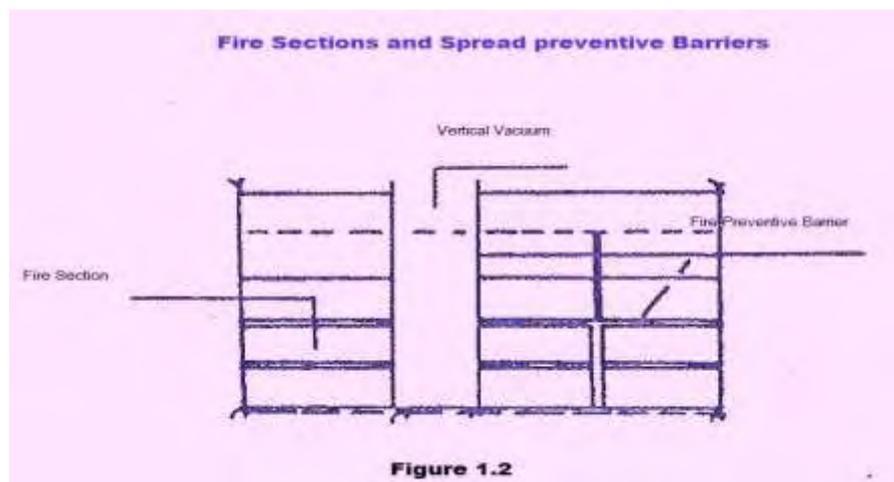
5.5.4 If there is a requirement for a basement in the building (under ground level floor) there should be emergency openings (inlets and exits) in order to drive away the smoke or for fighting to assist the civil defense men and the following shall be taken into consideration:

5.5.4.1 They should be in a clear location and easy to reach by the civil defense men.

- 5.5.4.2 Should be distinguished by the required guiding boards and the purpose for their existence should be mentioned.
- 5.5.4.3 Should be covered with materials which can be easily opened or broken by the civil defense men when necessary
- 5.5.5 If the area of the site is more than 500 square meters another emergency entrance should be made available on the external fence to facilitate the arrival of the civil defense men.
- 5.5.6 A guiding plan within a frame should be placed at the main entrance of the building which indicates all details related to Firefighting requirements for assisting the civil defense men.
- 5.5.7 Suitable traffic guidance signals should be placed to prevent parking in the allocated parking and roads for the parking of civil defense vehicles and machinery.

6 Construction requirements and building materials

- 6.1 **Goal:** The prevention requirements in Construction areas aim to provide safety of the Construction frame from the hazards so that it will lead to :
 - 6.1.1 Resisting building collapse because of the fire
 - 6.1.2 Fire control inside the building within minimum possible area and prevention of its movement from and to neighboring buildings
- 6.2 Construction classification of the building: The buildings are classified in terms of its Construction frame resistance to fire according to fire according to table no: 1.2



6.3 Building materials specifications:

- 7.3.1 The properties and composition of building materials used as construction elements in the building are determined according to the impact of fire on them.

Classification of buildings as per their fire resistance ability

Building material	Type	Building fire resistance	Construction description.	Examples
	First	3-4 hours	Construction from materials which are not susceptible to burning or of the required fire resistance degree.	Buildings constructed totally from concrete and cement bricks and may include iron elements in their frames offering the same required resistance degree
Non susceptible to burning.	Second	1-2 hours	Most of it is constructed of susceptible materials to burning and non resistant originally to burning but treated to provide the required degree of fire resistance.	Building constructed from iron frame and treated to provide certain degree of resistance such as hangers in industrial zones and storage areas and readymade buildings from materials with limited resistance to fire
	Third	Non resistant	Like the second type but the iron frame is not treated and therefore the building is non resistant	Such as hangers in industrial and storage areas where they are dominant.
Susceptible to burning.	Fourth	1-2 hours	Construction of non susceptible materials to burning and resistant to fire originally and their frames contain susceptible materials to burning with limited resistant to fire.	Such as buildings constructed of a frame of concrete, cement bricks and some elements of wood (like frame roof) which are treated to provide limited resistance degree like sports and games halls building
	Fifth	Non resistant.	Construction of susceptible materials to burning and resistant to fire or unknown materials.	Buildings not belonging to (1-4) types and the buildings which do not have a criterion for fire resistance.

Table no: 1-2.

7 Fire spread control

7.1 In order to control the fire size and confining it to a most limited area and preventing its spread inside the building or its movement to the neighboring buildings the preventive requirements should be made available to contain the fire spread.

7.1.1 The building or floor should be partitioned into separate sections called (preventive sections to fire spread).

7.2.1 The area or size should not exceed the permitted level in the table of partition of the buildings into preventive sections to fire spread. The design of the preventive sections to fire spread should be according to the table of the partition of buildings into preventive sections to fire spread.

Partition of buildings into preventive sections to fire spread

No.	Use	Maximum		Remarks
		m ²	m ³	
1	Assemblies buildings	-	7000	
2	Educational buildings	2000	-	Each class is considered independent secondary fire section
3	Caretaking buildings	2000	-	Wings and clinics are considered independent secondary fire sections
4	Residential buildings.	3000	-	Each independent residential unit is considered independent secondary fire section
5	Commercial shops.	2000	-	Each rented unit is considered independent secondary fire section
6	Offices	3000	-	Each rented unit is considered independent secondary fire section

No.	Use	Maximum Limit		Remarks
		Per area	Per area	
		m ²	m ²	
		For ground floor	For basement or higher floors.	
7	Industrial Establishments – high hazard.	1000	500	Plants which process or collect or produce materials susceptible to burning – explosions – or produce toxic gases
8	Professions shops medium hazard	5000	1500	Plants which process, collect or produce non susceptible materials to burning or repairs workshops
9	Storage (a) light hazard	5000	1500	Stores of non susceptible materials to burning
10	Storage (b) high hazard	1000	500	Stores which keep general hazard materials
11	Storage (c) high hazard	1000	500	Stores which keep general hazard materials
12	Car parking	5000	-	

Table No. 1.3

7.3.1 Regardless of the indicated areas in the previous table 1.3, partition of the buildings into fire spread preventive units, each one of the following units should be considered independent fire section:

7.3.1.1 The floor in multi floors buildings.

7.3.1.2 Area unit of different use as compared with the nature of the building use.

7.3.1.3 Vertical vacuum in the buildings such as staircase – ladder well and light holes.

7.3.1.4 Endorsed emergency exits in the building such as protected staircase hall and corridor.

7.3.1.5 Hazard areas such as places used for storing easily inflammable liquids and materials.

7.3.1.6 The bordering building to the neighbor boundaries should be considered as preventive unit to fire.

7.3.1.7 If the building is used for more than one purpose the allocated section for each purpose should be considered as fire preventive unit regardless of its area.

7.2 Fire spread preventive barriers:

2.1.1 The fire spread preventive units should be separated from each other by construction elements called (fire spread preventive barriers) constructed of non susceptible material to burning and contain the specified fire resistance degree in the table of minimum level of resistance degree in the frame elements of the building.

Minimum level of resistance degree in the frame elements of the building

Construction elements			Construction Classification				
			First	Second	Third	Fourth	Fifth
			Resistance degree by hours				
	Separating distance from neighboring building	Bearing	4	2	-	1	-
External walls.	More than 15 M	Non bearing	-	-	-	-	-
	Separating distance from neighboring building	Bearing	4	2	-	2	-
	from 5-15 m	Non bearing	1	-	-	1	-
	Separating distance from neighboring building	Bearing	4	2	1	2	1
	Less than 5 m	Non bearing	2	2	1	2	1
	Carrier construction frame		4	2	-	2	1
	Carrier internal walls		3	2	-	2	1
	Fixed internal sections		1	1	-	1	-
	Encompassed vertical vacuum		2	2	1	2	-
	Roof and floor tiles		2	2	1	2	-
	Surface frame		2	1	-	1	-
	Fire preventive barriers		According to table No. 1.5 and Chapter One requirements				

Table No. 1.4

7.5.2.2 When fire spread preventive units are fire barrier only the resistance should be according to the type of hazard in the sections which separate them in compliance with the table of the resistance degree of fire spread preventive barriers.

Resistance degree of fire spread preventive barriers according to the hazard degree in the separating sections.

The figures indicate the resistance degree by hours	Hazard type in fire section (c)		
	Light	Medium	High
Hazard light	1	2	4
Type in fire medium	2	2	4
Section (a) high	4	4	4

Table 1.5

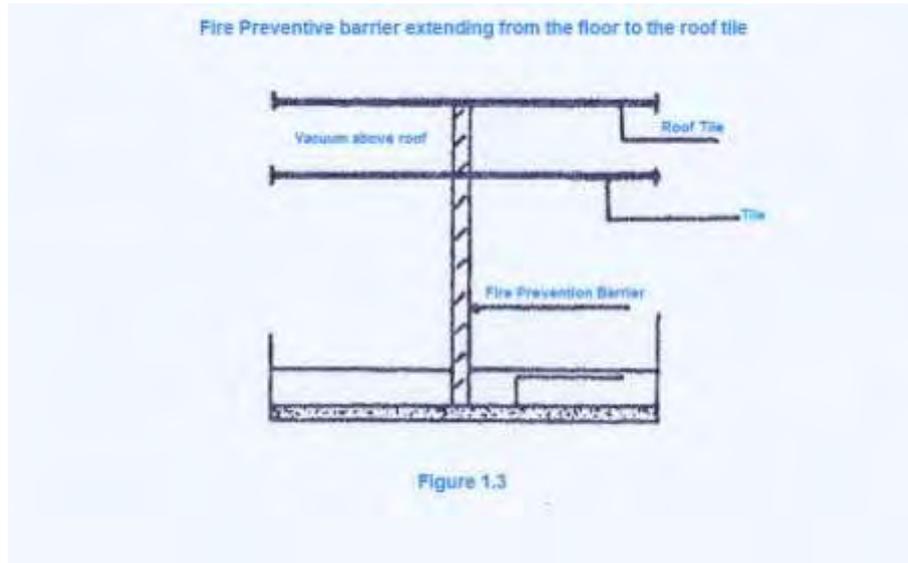
7.3.2 The fire barriers should form actual integrated barrier which prevents the penetration of fire and smoke and continue to cover the whole section from wall to wall passing any vacuum behind or hollow within and from the floor to the roof according to the hidden vacuum requirement.

7.4.2.1 It is permitted to allow openings in fire preventive barriers according to these requirements:

7.4.2.2 If the openings are covered with doors or windows which are preventive to fire spread by the required degree.

7.4.2.3 The designated openings for passing the pipes should be confined to meet that purpose only and vacuum or gap around the pipes should be covered with fire preventive materials.

7.4.2.4 The existing openings in the barriers which have 4 hours resistance degree should not have an area exceeding 12 square meters each and a total width not exceeding 25% of the total length of the barrier. These measures will be doubled when the place is protected by automatic water sprayers' network in accordance with the approval of the civil defense.



7.3 **Hidden vacuum:**

For completing the partition process of the building into fire sections for preventing fire movement, the following should be observed:

- 7.3.1 The partition should include all hidden vacuum behind or above or between or within the construction elements and the gaps should be covered.
- 7.3.2 The gap or hollow within the construction elements such as walls, roofs or floors at the ends and around the openings and at joining with the other construction elements should be covered with fire preventive materials with the exception of the gap within the walls constructed with insulated non susceptible materials to burning.
- 7.3.3 The confined gap behind the construction elements, i.e. the formed gap above suspended roof or below the last surface of the building, below the floor or behind the walls and alike should be partitioned by fire spread preventive barriers.
- 7.3.4 These gaps should be partitioned by fire preventive barriers as follows:
 - 7.3.4.1 Should be divided into areas each one not exceeding zoom between barriers or areas not exceeding (150) square meters each between the suspended roof and the floor of the above floor and (300) square meters between the suspended roof and the last surface.

- 7.3.4.2 The following cases should be exempted from the previous requirements:
 - 7.3.4.2.1 The gap above the suspended roof if it is not exceeding (1) m in height and is not permissible for the entry of people.
 - 7.3.4.2.2 The gap above the suspended roof is fire preventive element and not susceptible to dismantlement and installation and does not contain open materials the flame spread degree on their surface less than (10).
 - 7.3.4.2.3 Protected gap with automatic water sprayer's network.
- 7.3.5 The arising gaps and hollows from the installations process of the building elements or their interference should be covered with filling materials preventive to fire in the form of paste in the following cases:
 - 7.3.5.1 The gap which occur around the passage openings of the pipes, cables and their alike. The gap which occurs at the joining points of the construction elements such as the joining point of a wall and wall or the roof and surface.....etc.
- 7.3.6 The hidden vacuum should be closed and divided by fire and smoke spread preventive barriers as follows:
 - 7.3.6.1 In the gap the height of which is more than (1)m the barriers should have a fire resistance degree should have a fire resistance degree not less than half an hour at least.
 - 7.3.6.3 Other than that the barriers could be of gypsum slabs and reinforced glass fixed in the form of metal frame and the likes.
 - 7.3.6.4 The gypsum slabs or reinforced glass should be fixed in a durable manner which will not be effected or dismantled in the event of fire and also flexible so that their efficiency will not be affected by the expansion and shrinkage movement of the building.

Filling the gaps and hollows within construction elements

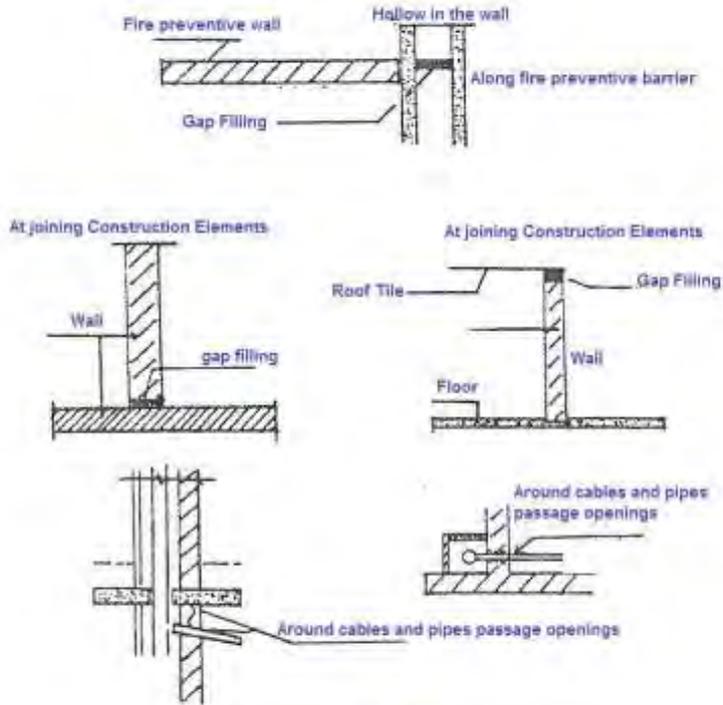


Figure 1.4

Partition of hidden hollows behind construction elements

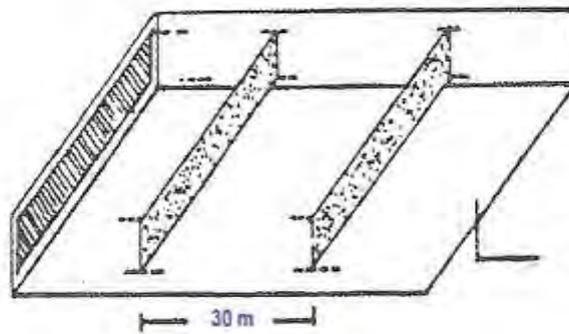


Figure 1.5

7.4 External spread between fire sections:

For completing the control process of fire spread inside the building the requirements for preventing the spread between fire sections should be made available through the openings which face the external facades or the surface or light holes as follows:

7.4.1 As for the windows on external facades, the distance between two adjacent windows of two different fire sections at the same level should not be less than the following levels.

7.4.1.1 Half meter if they are on straight facade.

7.4.1.2 1.20m if they are on two facades in the form of angle.

7.4.1.3 3 meters in case of staircase window adjacent to a window of another fire section.

Fire movement prevention through two adjacent windows in the form of straight line

External spread between fire sections

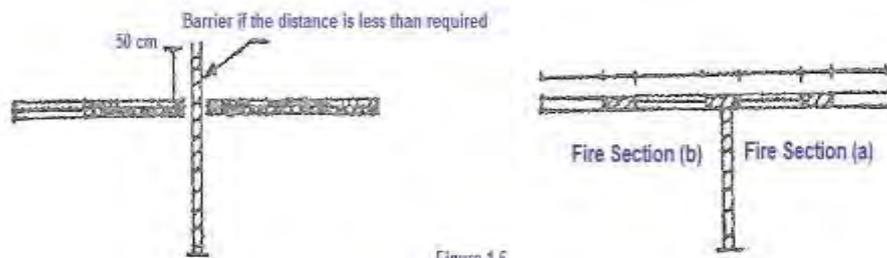


Figure 1.5

Fire Movement Prevention through two adjacent windows in the form of angle

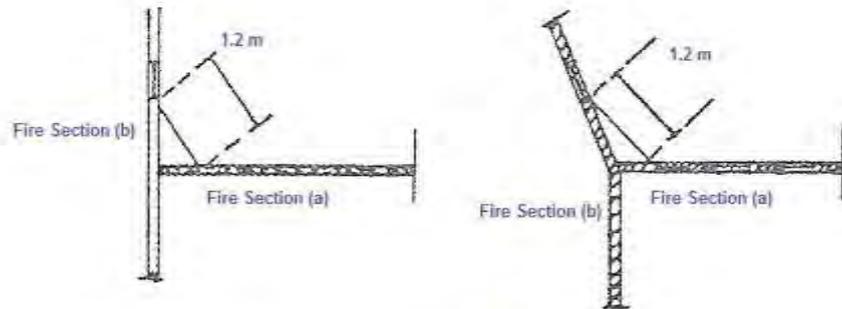


Figure 1.7

Vertical fire movement prevention through facade

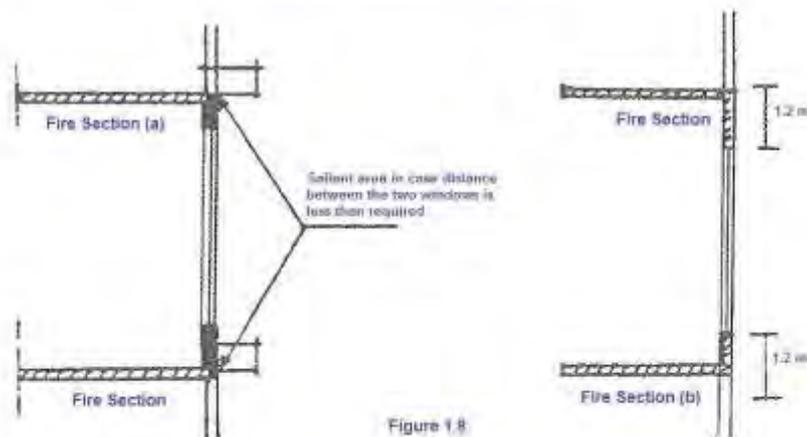


Figure 1.8

7.4.2 The vertical distance between the windows on the external façade should not be less than the following limits:

7.4.2.1 1.20m if they are on top each other

7.4.2.2 The distance may be less than 1,2m if they are separated from each other by a salient concrete shade through a distance of 0.50m from the façade line.

7.5 Spread at surface level between the fire sections:

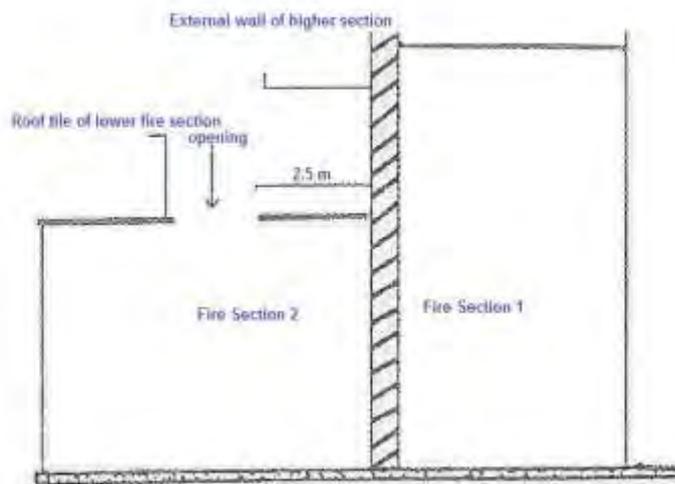
7.5.1 The fire preventive barrier should continue to extend penetrating the last roof vacuum and if the last roof is in the form of gable or truss it should extend to a distance of 0.5m above the joining point with the surface cover slabs level.

7.5.2 In case there are differences in the height of the fire sections of the building the roof of the lower part should be as follows:

7.5.2.1 With fire resistance degree not less than one hour

7.5.2.2 No openings should be permitted in the roof of the lower part within a distance of 2.5m from the external wall of the upper section unless that wall is a noiseless without openings and of fire resistance degree of one hour at least.

Fire movement between two fire sections with two different surface levels



Fire 1.9

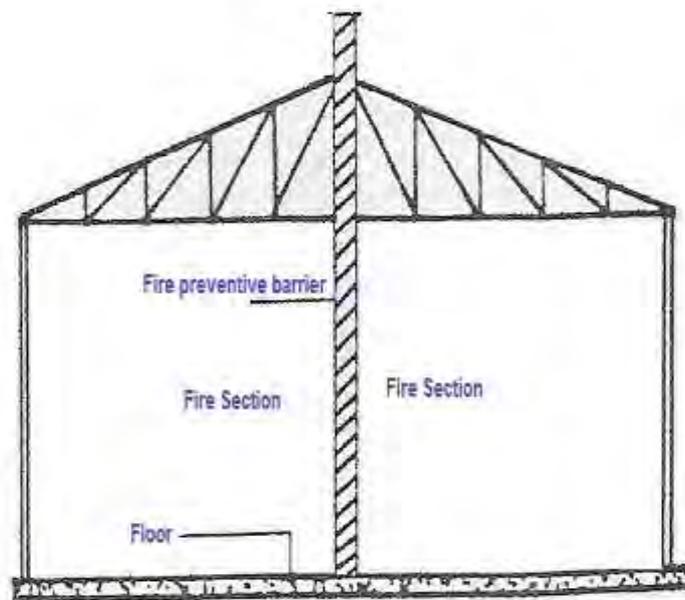
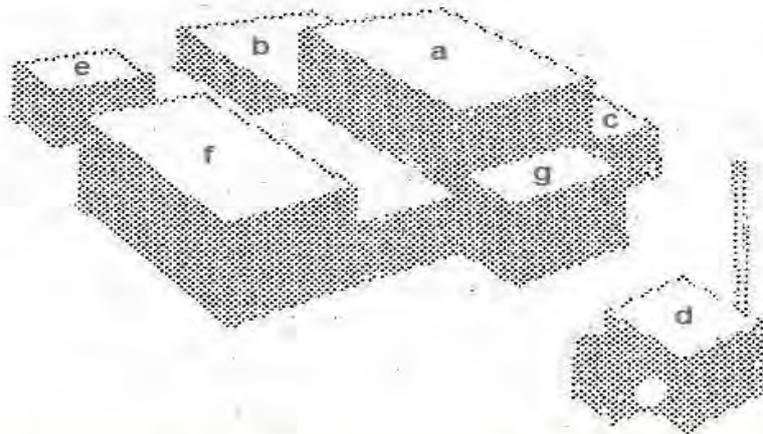


Figure 1.10:

7.6 Fire spread between buildings:

- 7.6.1 For preventing fire spread between the buildings a satisfactory distance should be made available for preventing the fire spread between the buildings according to the external walls requirements with regard to the relationship with the opening area and the type of external casing and also according to table no. 1-6 the required distance between the buildings and the land boundaries (building boundaries). It should be also taken into consideration the details of table no. 1- 4 the minimum level of resistance of frame elements in the buildings and the table no. 1-5 the resistance degree of fire preventive barriers

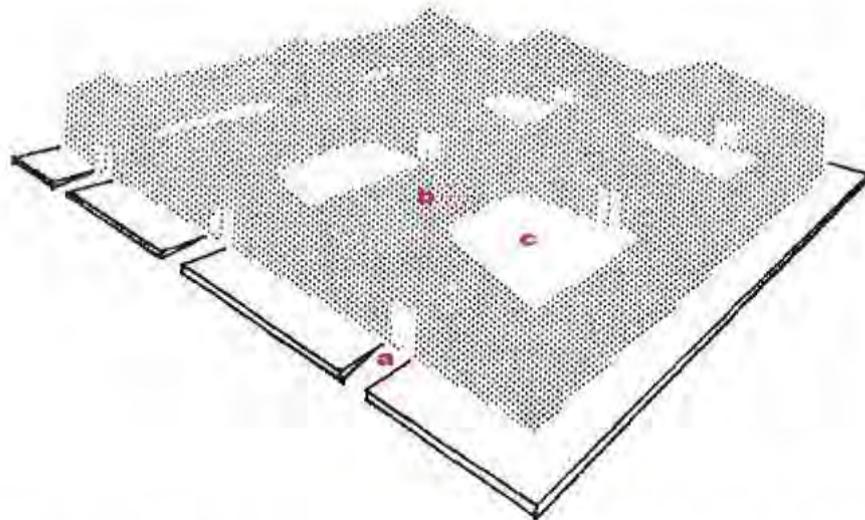
Fire Spread between buildings



(a) Multi use building (b) Quick fire spread areas (potential) (c) Hazardous Operations (d) Boilers or Paints room (e) Warehouses (f) Storage with special hazard (g) Valuable materials and equipment)

Figure 1.11

Internal Sections



(a) Fire Proof Door (b) Fire Resistant Separating Wall (c) Preventive unit to fire movement

Figure 1.12

Required distance between the buildings and the land boundaries (building boundaries) according to the height of the building and the area of the openings on the external facades.

Area of the openings in relation to the area of facade	Building height in meters		
	8	8-24	Above 24
Zero	Distance by meters		
Less than 50%	3	5	10
More than 50%	3	7.5	15
100%	3	7.5	15

Table No. 1.6

8. Construction requirements for building construction elements

The building frame is established by all its elements such as the walls, bridges, columns and floors..... etc which should be of non susceptible material to burning and with suitable fire resistance degree proportionate to the nature of use in accordance with fire resistance degree of building frame indicated in Table No. 1.7

Required fire resistance degree for the building frame

Frame elements	Multi storey residential and commercial buildings	Industrial buildings and ware houses.
Columns – bridges and roof tiles	2 hours	4 hours
External walls separating from neighbors or hazardous sections of the building	4 hours	4 hours
Internal walls or internal sections	2 hours	4 hours
Separating walls of the exit path (including stairway) and lift well and light holes and vertical and horizontal service waterways.....etc	-	-

Note: columns and bridges fire resistance degree could be increased as per civil defense decision in case the building is used for more than one purpose i.e. application of the resistance degree to the use which is more hazardous.

Table No. 1.7

- 8.2 If some frame elements are in iron form they should be wrapped by non susceptible material to burning and of fire impact resistance in consistence with the required degree to the frame itself.
- 8.3 If the roof frame is made of iron gable and based on iron columns and the external walls should be separated from the columns totally and in such case the connecting columns and bridges should be used so that the roof frame shall not be affected by the fire heat.
- 8.4 A wall should be constructed around each square forming fire preventive separating wall as prescribed in fire spread control according to the nature of the building use and the use of neighboring buildings or as per the recommendations of the civil defense.
- 8.5 If the external wall of the building is not the separating wall of the neighboring building and is at a distance not less than 3m it is preferred not to create any openings on it unless it is provided with a fire resistance door with similar resistance degree to the required degree to the wall itself.
- 8.6 The building should be partitioned into fire preventive units separated from each other by fire preventive walls or roofs which meet the specifications of frame elements as prescribed in fire spread control.
- 8.7 If the building is located on the boundaries of the parallel square to the neighboring squares, this building should have an external wall which form separating wall from the buildings in the parallel squares as indicated in fire spread control.
- 8.8 **Classification of internal finishing materials types:**
- 8.8.1 The internal sections whether fixed or mobile type should be established of non susceptible material to burning and with appropriate fire resistance degree to the nature of use which is not less than one hour.
- 8.8.2 The flame spread degree on the material surface should not be less than (zero) in accordance with the recognized international standards.
- 8.8.3 Internal sections may be used (whether fixed or mobile) from susceptible materials to burning in certain cases at the discretion of the civil defense and according to the following requirements:
- 8.8.3.1 It should not be at a location where firing could occur or crowds could exist or may form part of the escape path.
- 8.8.3.2 These materials should be placed in specific and isolated locations.

8.8.3.3 Their use should not contradict with the applicable preventive requirements of the building use.

8.8.3.4 The flame spread resistance degree on the surface should not be less than (20) in accordance with the recognized international standard.

Flame spread degrees for some building materials.

	Material	Flame speed degree
Roof	Noise reducing fiberglass	15 – 30 d.
	Noise reducing metal plates	10 – 25 d.
	Aluminium plates with furnace point on one side	5 – 10d.
Walls	Cement asbestos	Zero d.
	Cement or clay bricks	Zero d.
	Gypsum plates covered by cartons on both sides	10 – 25 d.
	Carpets or rugs	10 – 600 d.
	Concrete bedding, tile or marble	Zero d.
	Linoleum	190 – 300d
	Reinforced floor tiles with silken rocks	5 – 10 d.

Note: A complete list of fire spread degrees in building materials may be obtained by referring to building materials directory published by underwriters, Inc. Pvingsten Road, Northbrook, IL 60062.

Table No. 8

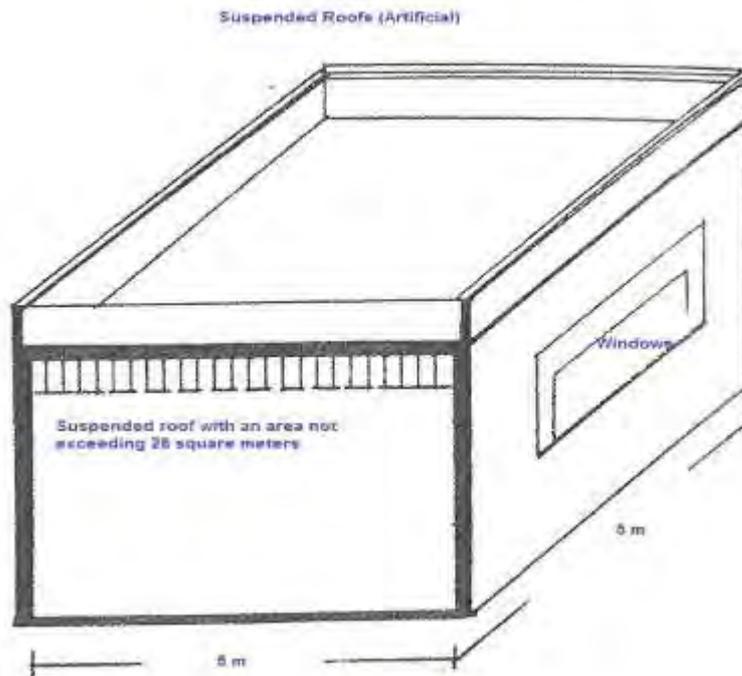


Figure 1.13

8.9 Suspended roofs (Artificial):

8.9.1 The roofs (slabs and frame) should be established of a non susceptible material to burning.

8.9.2 The suspended roofs may be constructed of a susceptible material to burning in certain cases according to the discretion of the civil defense and as per the following requirements:

8.9.2.1 Should not be at a location where fire could occur or crowds could exist or form a part of the escape path.

8.9.2.2 The total area should not exceed 28 square meters.

8.9.2.3 The roof should be separated from the neighboring roofs by raising the surrounding walls to the original roof

8.9.2.4 The construction method should not contradict with the applicable preventive requirements of the building use.

8.10 Wrapping pertaining to thermal or audio insulation or decorative wrapping:

8.10.1 The materials used for decoration and beautification or thermal or audio insulation should be fire resistant and of flame spread degree not less than zero.

- 8.10.2 In case the used materials are susceptible to burning it should be observed to treat such materials chemically or wrap them with delay paint to the burning so that they become flame spread resistant surface for a period not less than one hour.
- 8.10.3 Wood may be used for tiling the floor in certain cases which are left for the discretion of the civil defense in accordance with the following requirements.
 - 8.10.3.1 The wood should be of hard wood type.
 - 8.10.3.2 Should be used at locations where there is no hazard of fire occurrence and no crowds exist and approved by the civil defense.
- 8.10.4 Susceptible materials to burning may be used for wrapping the walls in certain cases to be determined by the direction of the civil defense and in accordance with the following requirements:
 - 8.10.4.1 They should not be at locations where fire could occur or crowds could be existing or form part of the escape mean.
 - 8.10.4.2 The materials used should be fire resistant and of flame spread degree not less than zero and in case the materials used are susceptible to burning they should be chemically treated or wrapped with burning delay paint so that they become flame spread resistant surface for a period not less than one hour provided that they should be above the floor level by 76 cm. and fixed directly on the walls surface without vacuum behind.

8.11 **Fire resistant doors**

All existing openings on fire resistant separating walls should be provided with a fire resistant closing mean such as doors and windows etc. and with fire resistant degree equivalent to the required degree to the wall itself.

- 8.11.2 The door frame resistance should be of the same resistance degree required for the door itself.
- 8.11.3 The frame should be manufactured from a material which is non susceptible to burning if the required resistance degree for the door is 4 hours or more or its use purpose is to separate sections connected with classified sections as fire hazardous.

- 8.11.4 If the required resistance degree is one hour and the use purpose is at a normal location where there is no fire hazard the frame may be manufactured of susceptible material to burning (such as wood) provided that it is treated by one of the following methods:
 - 8.11.4.1 It should be wrapped or lined with a material which is non susceptible to burning or painted with fire delay material.
 - 8.11.4.2 It should be made of hardwood without any vacuum or holes and should be of the required resistance degree.
- 8.11.5 Glass plates fixed on the windows and doors should be of the required fire resistance degree equivalent to the door itself.
- 8.11.6 The fire resistant door should be provided with automatic closure mean and if it is necessary to keep the door open it should be provided with a closing mean which closes it automatically when fire occurs through thermal separation or through warning system.
- 8.11.7 A simple manual closing mean should be made available in addition to the automatic closure mean.
- 8.11.8 The international specifications should apply in case local specifications are not available for the assessment of the degree of doors fire resistance.
- 8.11.9 The fire delay materials should be approved by the civil defense.
- 8.11.10 When the requirements permit that the used materials in the wrapping could be less than (10) the following specifications should be observed:
 - 8.11.10.1 Selection of burning intensity: 1:20
 - 8.11.10.2 Selection of burning easiness: non easy burning materials.
 - 8.11.10.3 Selection of smoke density: not more than (450) and do not produce toxic gases.
- 8.11.11 If the used material in wrapping is of wood type or of materials the degree of which is less than zero, they should be fixed directly on the wall or on directly fixed beams on the wall with a thickness not less than 2cm and width of 5cm provided that the gaps between the beams should be filled with materials not susceptible to burning.

8.11.12 In case that the wrapping materials are fitted on a frame which is far from the wall or roof as in suspended roofs the surface of the fitted plates from both sides should be of the required degree and fixed on a frame of non susceptible materials to burning. The back vacuum should be divided as indicated in Para 7.3.3 all confined vacuum behind construction elements should be divided by fire spread preventive barriers.

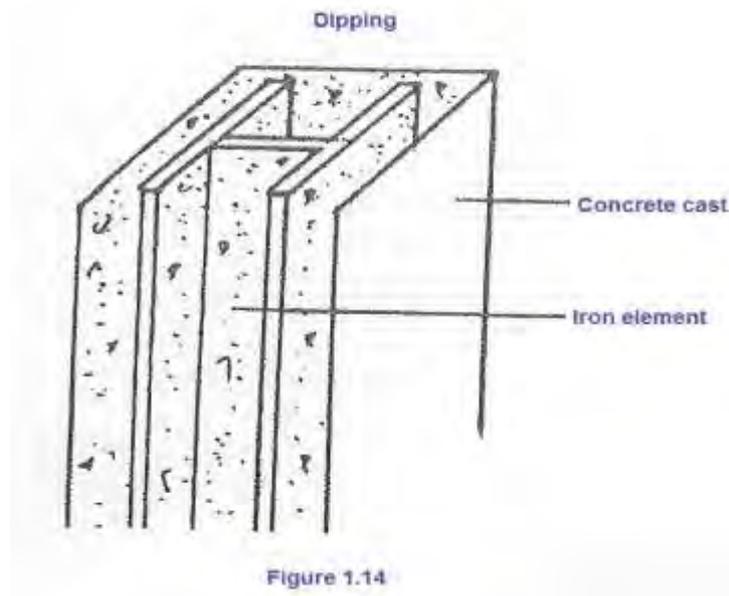
8.12 Iron construction frame

8.12.1 If the construction elements in the building are of iron type they should be treated to provide the required resistance degree to protect it from collapse because of the fire heat.

8.12.2 The protection process of iron construction elements is divided into the following methods:

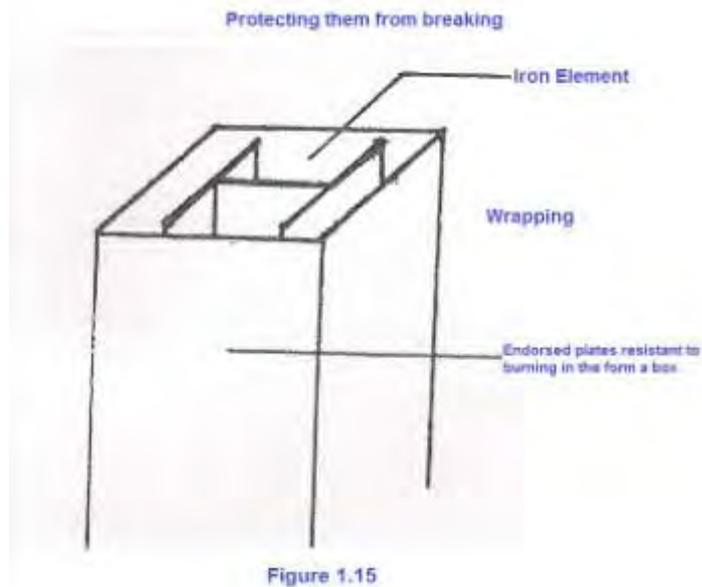
Dipping the iron element within concrete cast, cement or clay bricks building and such protection by dipping should be according to the following requirements:

8.12.2.1 Dipping: dipping the columns by wrapping them by reinforced concrete cast, cement or clay bricks building or layer of cement content on a base of mesh reinforcement. The details of the thickness of wrapping should be approved by the civil defense after considering the required resistance degree.

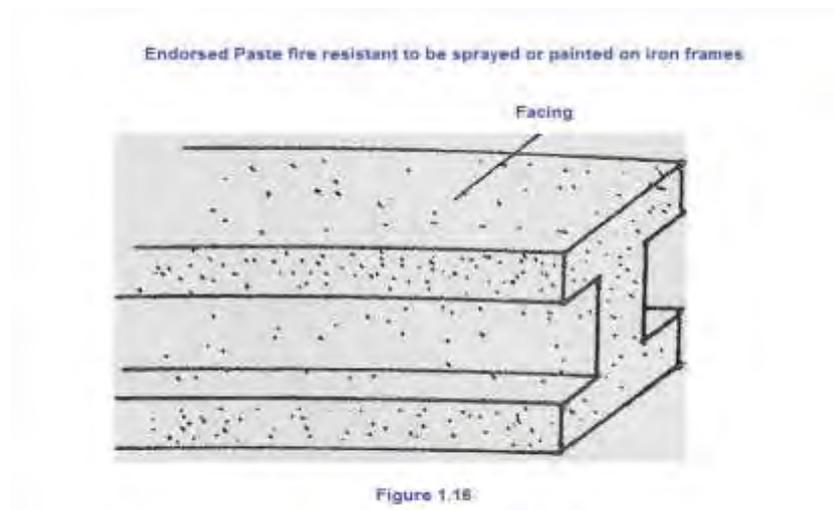


8.12.2.2 **Wrapping:** The iron element should be wrapped with endorsed plates resistant to burning in the form of a box. The protection through dipping process should be according to the following requirements:

No services should be allowed to pass through the vacuum behind iron elements protection plates. When the width of the protection plates exceed (60) cm the installation should be on rigid base for



8.12.2.3 **Facing:** Facing the iron element with a layer of endorsed material fire resistant in the form of a paste which should be applied through spray method or facing. The protection process through facing should be according to the following requirements:



- 8.12.2.3.1 The protection process through facing method should be according to the manufacturer requirements and approved by the civil defense and it should be taken into consideration the calculation of thickness, the application method, conditions, the mixing ratio, the climatic conditions, and their relation to the application, storage and the validity of the material.
- 8.12.2.3.2 Preparation of the iron element i.e. cleaning, painting...etc.
- 8.12.2.3.4 The iron construction elements protection process should be as per the three mentioned methods in accordance with the recognized engineering principles and the specifications of the specialized institutions endorsed by the civil defense.

8.13 **Plastic building materials:**

- 8.13.1 For controlling the fire hazard arising from the use of plastic materials which have been increasingly in use in construction or finishing of the buildings, such materials should be subject to the control measures which reduce their hazard according to the following requirements .the plastic materials are divided into the following types:
 - 8.13.1.1 **First type:** Porosity plastic materials which are divided into two types:
 - 8.13.1.1.1 **Solid plates:** such as polystyrene and polyurethane which are used in the insulation, sections forming and surface cover....etc.
 - 8.13.1.1.2 **Flexible plates:** Sponge type such as polythene which is used in decoration works
 - 8.13.1.2 Fire delay paint should be added to the porosity plastic materials manufacturing mixture to be used in the buildings so that the plastic materials foam characteristics should be as follows:

- 8.13.1.2.1 Not easy to burn.
- 8.13.1.2.2 Flame spread degree exceeding (450).
- 8.13.1.2.3 Smoke toxin is not exceeding the one in the normal wood.
- 8.13.1.3 **Second type:** solid plastic materials: used in the form of coloured or transparent plates, used for covering light holes, basements and shades roofs.
- 8.13.2 Plastic materials as thermal insulation in the buildings:
 - 8.13.2.1 The plastic materials are permitted to be used according to the following conditions:
 - 8.13.2.1.1 Filler with thickness not exceeding (10) cm between two layers of bricks the thickness of each not exceeding (5) cm provided that the gap is filled.
 - 8.13.2.1.2 It should be dipped within concrete cast the thickness of its cover should not be less than (5) cm in case being used as part of construction elements components such as internal sections or surface cover.
 - 8.13.2.1.3 It is permitted to use filler in non fire preventive doors provided that its thickness should not be more than (5) cm and flame spread degree is not exceeding (10).
 - 8.13.2.2 They are permitted to be used inside the buildings whether for thermal insulation or as filler in the internal sections according to the following requirements:
 - 8.13.2.2.1 The storey area should not exceed 200 square meters or the area of the sections not more than 100 square meters. The storey should be divided into five sections with a section area not exceeding 200 square meters if the storey area is more than that.
 - 8.13.2.2.2 The thickness should not exceed 5cm.

9. General requirements of various building sections (basement, mezzanine, light holes ...etc)

- 9.1 **Basements:** With regard to the basements it should be observed to provide fire prevention requirements and safety of the individuals in accordance with the nature of the use while taking into consideration the following requirements.
- 9.1.1 It should be observed to provide satisfactory ventilation and natural or artificial lighting in the basements.
- 9.1.2 All necessary precautions should be made to prevent the water leak to the basement and the basements floors should be provided with the required means for water disposal in case the level with the neighboring water resources.
- 9.1.3 The staircase requirements and basements exits should be applied according to the prescribed items in the escape means and emergency exits chapter. The number of exits for each basement should not be less than two exits if its area is more than 150 square meters. The further point in the basement should not be away from the exit by more than 15m provided that one exit leads directly to outside.
- 9.1.4 If the exit of any basement leads to the entry of main stairs of the building all necessary precaution measures should be taken in the ground floor so that the basement stairs lead directly to outside without continuation to reach the higher stories.
- 9.1.5 Satisfactory natural ventilation should be made available to the basement in accordance with the nature of the use through using windows on the external wall of the building and they should be covered with thick mesh barrier if it can be opened or with reinforced glass if it is closed.
- 9.1.6 If satisfactory natural ventilation is not available other natural means should be provided for the disposal of smoke and other gases if fire occurs according to the following:
- 9.1.6.1 Creation of openings on top the external wall of the basement (or on its roof) facing the pavement or open areas of the ground floor such as the corridors and others measuring (90x90cm) to be covered with glazed bricks break easily when necessary during emergency cases or any other materials which the civil defense men can open or break easily when necessary during emergency cases.

- 9.1.6.2 Development of a similar system such as chimney drain pattern for the disposal of smoke and suctioning it from the basement if fire occurs. This should be done through providing fresh air inlets near the basement floor and suction pipe on the roof to be connected with openings in the upper storey and covered as mentioned in previous Para.
- 9.1.6.3 The civil defense may accept and approve any other appropriate means for smoke suction proposed by the designing engineer provided that it meets the requirements.
- 9.1.7 The following requirements should be made available in the ventilation openings pertaining to basements:
 - 9.1.7.1 Should be in a clear position which can be easily reached by the civil defense men
 - 9.1.7.2 Should be distinguished with the necessary sign boards indicating the purpose of their existence
 - 9.1.7.3 Should be covered with the materials which the civil defense men can easily open or break when necessary
- 9.2 **Light Holes:** With regards to light holes it should be observed to provide fire prevention requirements and individuals safety in accordance with the nature of use while taking into consideration the following requirements.
 - 9.2.1 The facing windows to the light hole should be of fire resistant type specially if they are at a location where fire hazard exits such as kitchens and toilets and others or the prescribed requirements in the control of fire spread should be applied.
 - 9.2.2 If the light hole is used as an outlet for the chimneys all facing openings should covered with fire resistant doors which are automatically closed. This should be done by approval from the civil defense in advance.
 - 9.2.3 The upper opening of the light hole should be open with its edge surrounded by a wall the height of which should not be less than 1,5m at least from the surface level to form preventive barrier from falling down.
 - 9.2.4 The light hole should not be used for exit during emergencies without the approval of the civil defense.
 - 9.2.5 The light hole should not be used for wastes collection purposes or used as a room or store for the first floor or for any other purpose not designated for it.

9.3 **Mezzanine:** It should be observed with regard to the mezzanine to provide fire prevention and individual safety requirements in accordance with the nature of the use while taking into consideration the following requirements:

9.3.1 It should have an open facade from the road side.

9.3.2 It should have satisfactory exits provided that one exit leads to the outside.

9.3.3 It should not form a hazard to the individual's safety

The mezzanine which is not connected with the ground floor (commercial shop) should be considered as normal floor and separate in multi storey buildings.

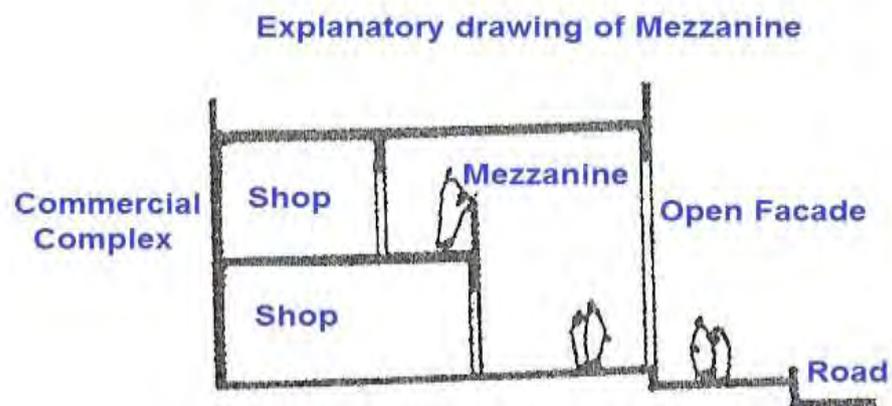


Figure 1.17

Chapter two

General requirements of Firefighting and warning systems

	Code	General requirements of Firefighting and warning systems.
1	Goal	
2	Application areas	
3	Designing requirements	
4	Permit requirements	
5	Maintenance requirements	
6	Training requirements	
7	Classification of Firefighting systems and equipment	
	7.1	Manual firefighting equipment
	7.1.1	Manual fire extinguishers
	7.2	Types of extinguishers
	7.2.1	Water extinguishers
	7.2.2	Foam extinguishers
	7.2.3	Carbon dioxide extinguishers
	7.2.4	Dry powder extinguishers
	7.2.5	Evaporating liquids extinguishers
	7.3	How to select the suitable extinguisher
	7.4	Types of fire
	7.4.1	Fire type (a)
	7.4.2	Fire type (b)
	7.4.3	Fire type (c)
	7.4.4	Fire type (d)
	7.5	General aspects in the distribution of manual fire extinguishers
	7.6	Distribution of manual Firefighting extinguishers

Chapter two (Contd.)

General requirements of Firefighting and warning systems

Code	General requirements of Firefighting and warning systems.
7.7	Fixed firefighting equipment
7.7.1	Pulley block rubber hoses
7.7.2	Vertical dry pipes
7.7.3	Moisture vertical pipes
7.7.4	Foam driving network
7.7.5	External Firefighting mains
7.8	Automatic fixed firefighting equipment and systems
7.8.1	Automatic Firefighting water sprayers systems
7.8.2	Types of automatic Firefighting water sprayers systems
7.8.3	Halon system
7.8.4	Carbon dioxide system
7.8.5	Dry chemical powder system
7.8.6	Foam and water system
7.8.7	Fixed automatic unit (Modeler Extinguisher)
7.9	Fire warning systems
7.9.1	Manual warning system
7.9.2	Automatic warning system
Table number	Table title.
2.1	Selection and distribution method of fire extinguishers type (a)
2.2	Selection and distribution method of fire extinguishers type (b)
2.3	Selection and distribution method of fire extinguishers type (c)

General requirements of Firefighting and warning systems

1. **Goal** - Providing the buildings and establishments with Firefighting, warning and prevention systems in order to protect the buildings and their occupants from fire hazard by providing warning in advance so that the building could be evacuated and Firefighting is carried out in preliminary form by trained individuals or by automatic equipment to be followed by calling the civil defense teams for actual fighting and rescue if necessary.
2. **Application areas:** All buildings, establishments and shops are subject to the civil defense permit. Should be provided with Firefighting and warning equipment and suitable prevention methods according to these requirements.
3. **Designing requirements:** Firefighting and warning and prevention systems should be designed and implemented according to the requirements of part two (engineering specifications of warning and Firefighting systems).
4. **Permit requirements:** Application of civil defense requirements in each country.
5. **Maintenance requirements:** The Firefighting and warning equipment and systems should receive regular periodical maintenance from specialized authority or recognized contractor in accordance with part two requirements.
6. **Training requirements:** The occupants of the building should be trained in the field for Firefighting and warning systems operation, use and inspection.
7. **Firefighting systems and equipment classification:** The Firefighting and warning systems and equipment are divided to the following main types:
 - (a) Manual, fixed and automatic Firefighting systems and equipment
 - (b) Manual and automatic fire warning systems

7.1 Manual firefighting equipment: They are mobile manual equipment (preliminary fighting) which are used for firefighting at its initial stages by normal people available in the building including:

 - (a) Various manual fire extinguishing equipment
 - (b) Manual water pumps.
 - (c) Sand and water containers.
 - (d) Special fire resistant blankets.

7.1.1 **Manual Fire Extinguishers:** Manual extinguishers are light annual means for extinguishing the fire at its initial stages and considered as preliminary firefighting equipment.

- 7.1.2 **Manual Fire Extinguishers:** Manual extinguishers are required in any building subject to the permit of the civil defense in accordance with prevention requirements in the buildings or any location where they performed activities require the approval of the civil defense.
- 7.1.3 The manual extinguishers should be of a recognized type by official permit from the civil defense.
- 7.1.4 The owner of the building or the site should keep the manual extinguishers in a proper condition to remain suitable for use when necessary through taking the required measures for the periodical inspection and maintenance by the recognized agent or by any technical authority approved by the civil defense.
- 7.1.5 The periodical inspection and maintenance should be in accordance with the manufacturer and civil defense instructions.

7.2 Types of extinguishers: The manual extinguishers are divided to various types according to the extinguishing material type:

- 7.2.1 **Water extinguishers:** The extinguishers which contain water as Firefighting material and are divided into **two types:**
 - 7.2.1.1 **Water extinguishers by gas pressure:** It is a filled cylinder with water through normal pressure. It also contains small cylinder pressed by carbon dioxide gas and when operated the pressed gas will drive the water powerfully through the opening.
 - 7.2.1.2 **Water extinguishers operating through pressure:** A cylinder two thirds of which are filled with water and the rest with normal air or pressurized nitrogen gas and when operated the water is driven out powerfully by the preserved pressure.
- 7.2.2 **Foam extinguishers:** The extinguishers which provide liquid foam as fire extinguishing material and it is of two types:
 - 7.2.2.1 **Chemical Foam Extinguishers:** The type which produces the foam by which produces the foam by chemical interaction and drives it out through the resulting pressure from the interaction.
 - 7.2.2.2 **Mechanical Foam Extinguishers:** The type which produce the foam mechanically through mixing the foam materials liquid with water, air and drives them out through the pressurized carbon dioxide gas in small cylinder

7.2.3 **Carbon Dioxide Gas Extinguishers:** The extinguishers which contain carbon dioxide gas as extinguishing material. They are originally one type with different sizes only. The gas is kept in liquid condition by pressure and when operated the gas is driven out through the control valve on the upper part of the cylinder.

7.2.4 **Dry Powder Extinguishers:** The extinguishers which provide dry chemical powder as extinguishing material and they are of two types with regard to the operation method:

7.2.4.1 **Extinguishers Operating through Gas Pressure:** A type which drives the powder through carbon dioxide gas pressure kept in a small cylinder under pressure.

7.2.4.2 **Extinguishers operating through preserved pressure** a type which drive the powder through nitrogen gas pressure in the cylinder with the powder. The powder from chemical composition point of view includes several types the most important of which are the following:

(a) The powder the composition of which is dominated by sodium bicarbonate.

(b) The powder the composition of which is dominated by potassium bicarbonate.

(c) Multipurpose powder

(d) There are some types of powder allocated for certain types of metal fire and are used only for special cases.

7.2.5 Evaporated liquids extinguishers (B.C.F.S) the extinguishers which provide different types of chemical liquids as fire extinguishing material. These liquids on colliding with the fire heat turn to dense heavy vapors which stop fire chemical interaction chain. This type of extinguishers will be prohibited internationally soon due to its impact on the environment.

7.3 How to select the suitable extinguishers: The fire is divided into (4) types as mentioned in the next Para 7.4.4 with the suitable manual extinguishers for them. Please review the tables from 2.1.2.3.

- 7.1 Types of fire and the suitable extinguishes for fighting them:
- 7.4.1 Fire type (a) includes normal solid materials of carbon origin such as papers, wood and clothes ...etc. The suitable extinguishers for this type are water extinguishers because of availability of cooling property in water and the easiness of water leak into the pores of the materials.
 - 7.4.2 Fire type (b) which includes susceptible materials to burning, petroleum and chemical materials
 - 7.4.2.1 **Foam extinguishers:** The foam liquid overflows the surface of the burning liquid and form a cover which block off the surface of the burning liquid from air oxygen and the foam is distinguished by remaining for a long time on the liquid surface which helps in preventing the return of burning. It should be noted that the foam is good electricity conductor.
 - 7.4.2.3 **Carbon dioxide gas extinguishers:** Like chemical powder extinguishers with the difference that carbon dioxide gas has no harmful impact on the assets such as other types of extinguishers like foam and powder extinguishers and it is also not electrical current conductor material.
 - 7.4.2.4 **Liquid evaporates extinguishers:** As their packages are small they are used in small fire or in the motors which operate by liquid fuel and they are not electricity conductor's materials.
 - 7.4.3 **Fire type (c)** - they are the fires which occur in electrical fittings and are fire which occur in electrical fittings and are fixed by the use of carbon dioxide and dry powder or evaporated liquid extinguishers. It is prohibited to use water or foam as they are electrical current conductors.
 - 7.4.4 **Fire type (d)** - is the type of fire that occurs in the metals such as magnesium, titanium, sodium, potassium etc. for which special dry powder is used. There are some metals which require special powder. Director General of Civil Defense should be consulted in this regard and the prescribed instructions fixed on the extinguishers by the manufacturer should be followed. A type of dry powder has been developed to be used for fighting metals fire in the form of paste on contacting with the burning surface with a commercial name (Purplek)

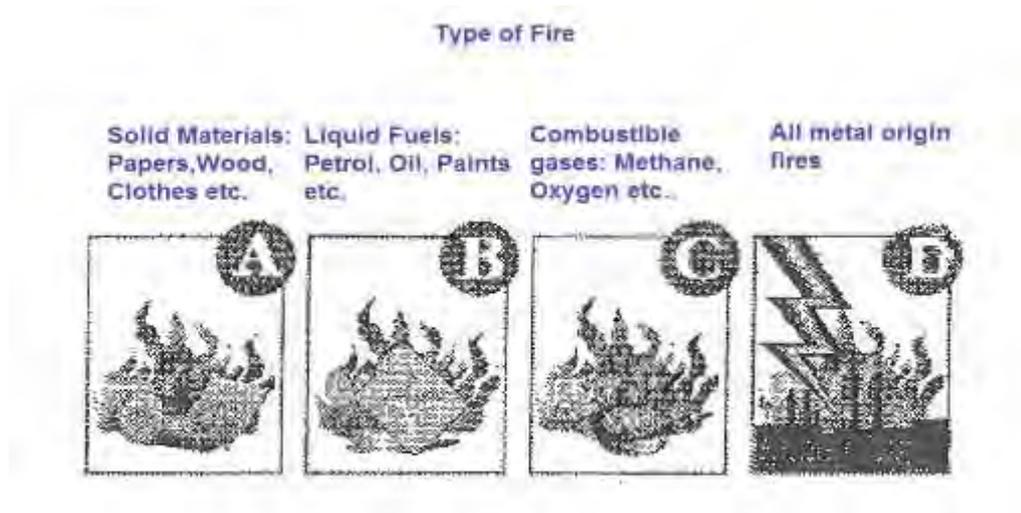


Figure 2.1

7.5 General aspects of the distribution of manual fire extinguishers:

In addition to what has been mentioned in the previous items and the attached table on selecting the suitable type of manual extinguishers the following should be taken into consideration.

- 7.5.1 The extinguishers at site should be operated by one method so that no confusion or hesitation could occur when these extinguishers are used in the event of fire.
- 7.5.2 At the sites where there is upper location or the ones which require control of the discharge (hurl) angle the extinguishers with hoses should be used.
- 7.5.3 A suitable type should be selected for the site in terms of hurl distance, type of hurl or discharge (current or drizzle)
- 7.5.4 Selection of the type which shall be of a light reasonable weight and suitable for those who use it
- 7.5.5 It is always preferable to select the types which are easy to use and maintain and not complicated.

7.6 Distribution of manual Firefighting extinguishers:

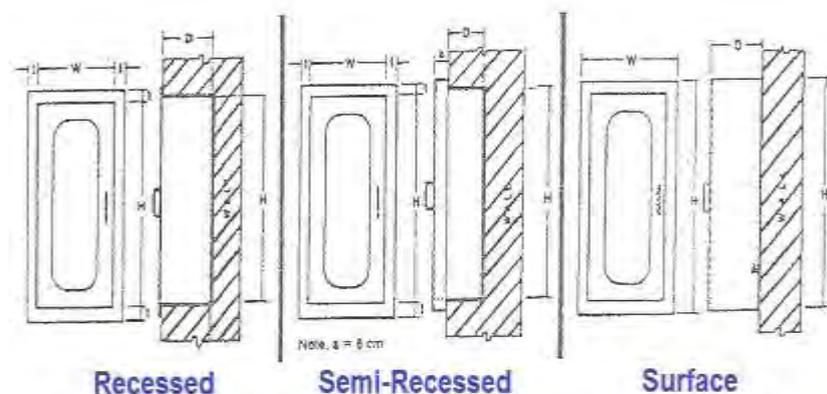
7.6.1 Generally unless it is otherwise prescribed the extinguishers should be distributed in suitable locations not further from each other by more than (20) m and the number of extinguisher for each 200 square meters or two extinguishers for each floor with regard to water extinguishers. As for the combustible liquids extinguishers they should be determined in accordance with the area of the combustible liquids surface as indicated in the attached table. Other than that the extinguishers should be distributed in the suitable locations as recommended by the civil defense and the following should be observed in general:

- ▶ The extinguishers should be kept in a store or cavity in the wall with a door to protect it from climatic conditions and manipulation.
- ▶ They may also be hanged openly on the wall in some cases which are approved by the civil defense where they are safe.

7.6.2 Openly hanged extinguishers on the wall should be fixed on a hook with a height of (1) m from the ground surface.

The required sign boards should be installed to indicate the location of the extinguishers along with the necessary instructions of use and warning.

Figure 2.2



7.6.3 The selection of the extinguishers location should be in a suitable place with easy access means.

7.6.3.1 They should be nearer to the exits or the staircase.

7.6.3.2 They should not be further than each other by more than 20m.

7.6.3.3 They should be of (1) m height from the ground level.

Installation of Extinguisher in Cavity on the wall at (1) m height

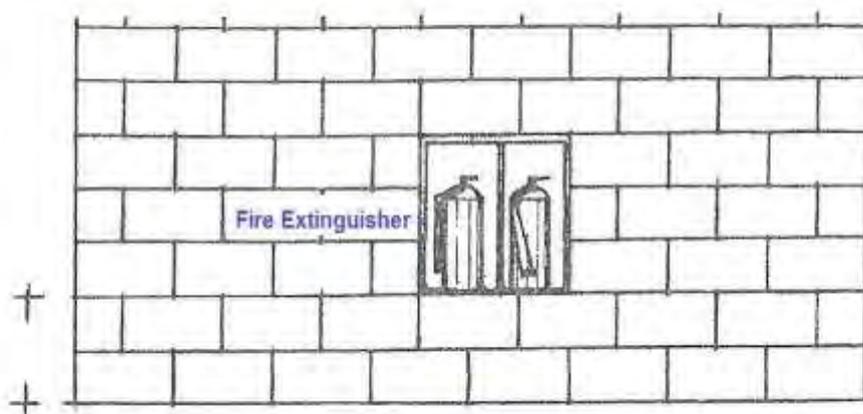


Figure 2.3

7.6.4 It should be observed to take into consideration the climate conditions of the location in terms of heat, moisture, cooling, corrosion and their impact on the extinguishers and their contents.

7.6.5 The number of required extinguishers are determined as water extinguisher two gallons capacity or their equivalent for each 2000 square meters provided that the number should not be less than one extinguisher for each floor with regard to normal fire type (a) as per Table No. 1.1

7.6.6 The number of extinguishers required for fire type (b), the combustible liquids, chemical, and petroleum materials in accordance with Table No. 2.2

**Selection and Distribution Method
Table of Extinguishers of fire type (a)**

Fire type 1	Suitable Extinguishers 2	Remarks 3	Type of Extinguishers 4	Capacity of Extinguisher 5	Extinguisher hurl distance 6	Approximate total weight 7	Number of required extinguishers for each	
							100 m	floor
Fire type (a) Normal Solid Materials like papers, wood, clothes etc.	Water: The impact of the extinguishing material on such solid materials depends on the cooling property. Water is distinguished with better cooling property as compared with other extinguishers. Therefore it is preferred to be used for fighting this type of fire. If these materials are not cooled satisfactorily they will burn again. In addition to that the water penetrates the fire quickly	Water is good electricity conductor and therefore should not be used for fighting electrical fires	Pressurized water and gas	9 liters 2 gallons	10 m 30 ft.	10-18 kg. 33-40 pound	1	2
			Preserved water by pressure				1	2

Table No. 2.1

**Selection and Distribution Method
Table of Extinguishers of fire type (b)**

Fire type 1	Suitable Extinguishers 2	Remarks 3	Type of Extinguishers 4	Capacity of Extinguisher 5	Extinguisher hurl distance 6	Approximate total weight 7	Coverage area per Extinguisher 8	
							1	2
Fire type (b) Combustible liquids and petroleum and chemical materials	(1) Form: Fires are damped by the foam which forms a cover over the burning liquid. Such cover remains after formation for some time enough to cool the liquid and stop reburning. Therefore, foam extinguisher is specially suitable for fighting liquid fires such as fuel tanks, oil heaters, linen seeds heaters and varnish boilers	It is difficult to form a cover of foam on hot liquid and it becomes impossible if the liquid is running on vertical surface. The liquids which flow on tiles or horizontal surface may extend to greater area than the capacity of the extinguisher and there are some liquids like alcohol has the power to destroy the cover formed by the extinguisher and make it ineffective. The foam is a good electricity conductor and should not be used in electrical fires	Automatic foam – Mechanical Foam	9 liters 2 gallons	8 m ² 23 ft.	15-18 kg. 33-40 pound	15 m ²	5 ft
			Mechanical foam Chemical foam				1	2

Table No. 2.2

Table 2.2 (Contd.)

Fire type 1	Suitable Extinguishers 2	Remarks 3	Type of Extinguishers 4	Capacity of Extinguisher 5	Extinguisher hurl distance 6	Approximate total weight 7	Coverage area per Extinguisher 8
<p>Fire type (b) Combustible liquids Such as petroleum and chemical liquids</p>	<p>(2) Dry Powder The powder is the best extinguishers used for fighting combustible liquids fires. The powder dampen the spread of flames on the liquid surface quickly and preferred to be used instead of foam specially in the cases where the fire could extend to the neighboring materials before the foam can be formed on them. The dry powder is not a good electricity conductor and can be used with confidence.</p>	<p>The properties of the dry powder are limited and cannot prevent reburning after stopping the driving of foam. Its effect also is weaker than the foam effect in case of liquid fires inside the tanks as the liquids are heated considerably due to the burning for some time or because of operations process</p>	<p>Dry powder extinguisher of various types</p>	<p>2 kg. 4.5 pounds 3 kg. 7 pounds 9 kg 20 pounds</p>	<p>3 m 10 ft. 5 m 15 ft. 7 m 20 ft.</p>	<p>4 kg 10 ponds 9 kg. 18 pounds 20 pounds</p>	<p>1 m² 10 sq. ft. 11.5 m² 15 ft. 4 m² 40 sq. ft.</p>

Table No. 2.2

Table 2.2 (Contd.)

Fire type 1	Suitable Extinguishers 2	Remarks 3	Type of Extinguishers 4	Capacity of Extinguisher 5	Extinguisher hurl distance 6	Approximate total weight 7	Coverage area per Extinguisher 8
<p>Fire type (b)</p> <p>Combustible liquids and petroleum and chemical materials</p>	<p>(3) Carbon Dioxide</p> <p>Carbon dioxide dampens fire flames on the liquid surface more quicker than the foam speed and it is better in fighting the fires which may spread to the surrounding materials before forming a complete foam cover. The carbon dioxide extinguisher can be used for dampening small fires which include flowing liquids on horizontal surfaces</p> <p>The carbon dioxide can also be used to fight the hazard of paint and burnishing machine and the kitchens and micro-laboratories tools</p>	<p>The carbon dioxide cooling properties are limited and do not prevent reburning after stopping the driving. Its effect is also weaker than the foam effect in also of burning liquids inside the tanks</p>	<p>Carbon Dioxide extinguisher</p>	<p>6 kg. 13 Pounds 16 kg. 23 pounds 19.21 kg 38-42 pounds</p>	<p>1.5 m 4 ft. 3 m 7 ft.</p>	<p>1 kg. 2.5 pounds 3 kg. 7 pounds 4 kg 10 pounds</p>	<p>1 m² 10 sq. ft. 11.5 m² 15 ft. 4 m² 40 sq. ft.</p>

Table No. 2.2

Table 2.2 (Contd.)

Fire type 1	Suitable Extinguishers 2	Remarks 3	Type of Extinguishers 4	Capacity of Extinguisher 5	Extinguisher hurl distance 6	Approximate total weight 7	Coverage area per Extinguisher 8
<p>Fire type (b) Combustible liquids such as chemical and petroleum liquids and materials</p>	<p>(4) Evaporated Liquids: Can dampen fire flames quickly and specially suitable for fighting very small fires as the used extinguishers are of small in size relative and they are used mainly for fighting fires of the motors operated by petrol and oil and they are not good electrical conductor.</p>	<p>They should not be used or kept in closed areas or any places where the inhalation of vapors and gases arising from the burning is possible. It is recommended not to use bromide as it is very toxic.</p>	<p>Evaporated liquids extinguisher (C.B.M.B.C. F)</p>	<p>2 kg. 6 Pounds</p>	<p>7 m 20 ft.</p>	<p>½ Liter 1/8 gallon</p>	<p>1.3 m²</p>

Table No. 2.2

Selection distribution method of fire extinguishers type (c – d) table

Fire type	Suitable extinguishers	Remarks
Fire type (c) electrical or electronic equipment.	<ul style="list-style-type: none"> ▶ Carbon dioxide ▶ Dry powder ▶ Evaporated liquids 	Carbon dioxide, dry powder and evaporated liquids: These materials are considered the best for fighting electrical fires, water, and foam extinguishers should not be used for this purpose to avoid electrical with the exception of cases where it is possible to disconnect the electrical current since water is the best firefighting material. In case of fires which include oils or liquids it is better to use other extinguishing means. Carbon dioxide extinguishers are considered the best extinguishers for electrical fires due to their light weight
Fires type (d) combustible Metals.	<ul style="list-style-type: none"> ▶ Dry chemical powder 	<p>Dry chemical powder:</p> <p>There is no dry powder type which is suitable for all metal fires but there is special powder for each combustible metals. Therefore it is essential to comply with the fixed instructions on the extinguishers by the manufacturers and the civil defense should be consulted on selection of suitable extinguishers for the metal fires.</p> <p>Important note:</p> <p>It should be noted that there is a considerable health hazard if a suitable type of extinguishers is not properly selected for metal fires fighting.</p>

Table no. 2.3

7.1 Fixed Firefighting Equipment

They are fixed network extensions out of which some are used for firefighting by normal occupants of the building and others are used by trained people such as special fighting teams or civil defense men. They are divided to the following in terms of operation.

7.7.1 Fixed Firefighting Equipment

They are simple means for firefighting at initial stages only by the building occupants themselves without previous training requirement. Each hose is a rubber hose of 25mm diameter (one inch) rolled up on fixed pulley on a wall and kept inside metal box connected directly with the water supply network and ready for use immediately after pulling the hose.

7.7.1.1 The pulley rubber hose is formed of the following:

- (1) Network
- (2) Pulley
- (3) Hose and its connections
- (4) Water source
- (5) Dry vertical pipes:

7.7.2 **Dry vertical Pipes**

They are fixed water free network extensions which include driving point for water pumping from outside the building and fire mains openings distributed at the required places in the building and used for assisting civil defense men in water driving and using it for upper floors.

7.7.2.1 The dry vertical pipes network in the buildings is formed of the following:

1. Vertical pipe which supply water to openings
2. Driving point at the lower part of the network for pumping by the civil defense (inlet).
3. Fire water mains in the floors (outlet).

7.7.2.2 Dry vertical pipes are required in the following buildings and cases:

1. Buildings composed of (5) floors and more including ground floor or buildings of (18) m height or more.
2. Buildings composed of two floors if the floor area is more than 1000square meters.
3. Buildings which form hazard to the life or contents as per the discretion of the civil defense.

7.7.3 **Moisture vertical pipes:**

Fixed network extensions with continuous water source which supply water to Firefighting openings (outlet) distributed at the required locations in the building and used by civil defense men or by trained people for Firefighting in the building.

7.7.3.1 The Moisture vertical pipes network are formed of the following:

1. Vertical pipe which supply the openings with water
2. Water resources
3. Pumps
4. Hoses and their connections
5. Driving point or opening

7.7.2.3 The moisture vertical pipes are required in the following buildings and cases:

7.7.3.3 The height of the building which is more than 28 m.

7.7.3.4 The height of the building which is more than 30 m. from the ground floor level to the floor of the last storey.

7.7.4 **Form Driving network:**

It is a fixed pipes network used for driving water mixture and the foam material and enabling it to reach and normally used for storage or use of liquid fuels. The mixture of water and foam material flow in the form of bubbles operating as insulating curtain to the burning surface from outside oxygen whereas the water carries out the cooling process.

7.7.5 **Fire hydrants (water mains):**

They are underground extensions network with continuous water source supplying fire hydrants with water and used for fighting fire from outside by civil defense men.

7.7.5.1 Fire hydrants are required in the following cases:

1. At all public roads in the cities.
2. Outside the buildings provided with moisture vertical pipes network as complementary part.
3. At the roads and courts of main establishments with special hazard such as the air and sea ports and major companies and assembly buildings etc.

7.7.5.2 Fire hydrants are formed of the following:

1. Pipes network which provide water
2. Water sources
3. Water mains

7.7.5.3 Firefighting water mains are divided into two sections:

- ▶ Vertical Firefighting water mains on the ground
- ▶ Underground Firefighting water mains

7.7.5 Vertical firefighting water mains on the ground

1. They are considered as fixed vertical pipe connected at lower part with the supplying network and provided with an opening or more (mains) at the upper part. Each opening (main) is provided with a cover tied to a chain.
2. The vertical pipe diameter depends on the number of openings (mains) and their use and the quantity of driven water from them and it should not be less than 4 inches and each main shall not be less than 25 inches.
3. Beside each main a valve should be placed within inspection hole as per the specifications and requirements determined by civil defense.

7.7.5.3.2 Underground firefighting water mains:

A pipe which includes a valve and ends up with an opening (main) and a cover tied to a chain in accordance with the civil defense specifications. The Firefighting mains should be kept in inspection hole as per the specifications and requirements of civil defense.

7.8 Automatic fixed Firefighting systems and equipment:

They are considered as fixed extensions network with distributed openings at the required locations to be protected and provided with continuous source of suitable extinguishing material. It is operated automatically by heat sensing arising from the fire or the smoke impact or by both means.

7.8.1 **Automatic Firefighting water sprayers system:**

Over head pipes network distributed to the required places to be protected .they are provided with water suitable water source in terms of quantity and pressure so that the water is driven through closed sprayers openings (moisture sprayers). They open automatically through heat impact or the water is driven through openings covering the whole area. They also can be opened automatically through assisting warning mean.

7.8.1.1 The automatic water sprayers network should be designed, implemented and maintained in accordance with the specifications and requirements of (part two) or civil defense directory

7.8.1.2 On designing water sprayers network it should be observed to take into consideration the fire hazard type with regard to the contents whether it is high, medium or light in accordance with the specifications and requirements of part two or the civil defense directory

7.8.2 **Automatic firefighting water sprayers system types:**

1. Moisture network.
2. Dry network.
3. In advance operated moisture network.
4. Full flood network.
5. Fitted network.

7.8.2.1 Moisture network Firefighting water sprayers.

A network pressurized by water so that it can be driven through closed sprayers head openings which are opened by heat impact.

7.8.2.2 Dry network Firefighting water sprayers.

Similar to the moisture network in terms of extensions but pressurized by air and water. Due to the air pressure the valve is opened automatically and the air leaks through the sprayers had openings which open by heat impact and the water is driven out accordingly.

7.8.2.3 In advance operated moisture network:

Similar to the moisture network in terms of extensions with the water stopped by the valve and provided with assisting warning network either aerial or electrical which is operated by heat impact to open the valve the drive the water through the sprayers openings.

7.8.2.4 Full flood network :

Similar network to moisture network in terms of extensions but the sprayers' heads are all opened and cover the whole area with flood on operation of the system.

7.8.2.5 Fitted network:

Joint system combining in advance operated moisture network and dry network.

7.8.3 **Halon system:**

It is pipes network distributed. It is provided with cylinders containing halon gas (as extinguishing material) pressurized by nitrogen which is driven out on operation to protect the required area. The specifications are prescribed in civil defense directory. This system will be prohibited internationally due to its impact on environment.

7.8.4 **Carbon dioxide system:**

It is pipes network distributed to the required areas to be protected and provided with carbon dioxide cylinders (as extinguishing material) which are driven out on operation in the required area to be protected. The specifications are prescribed in civil defense directory

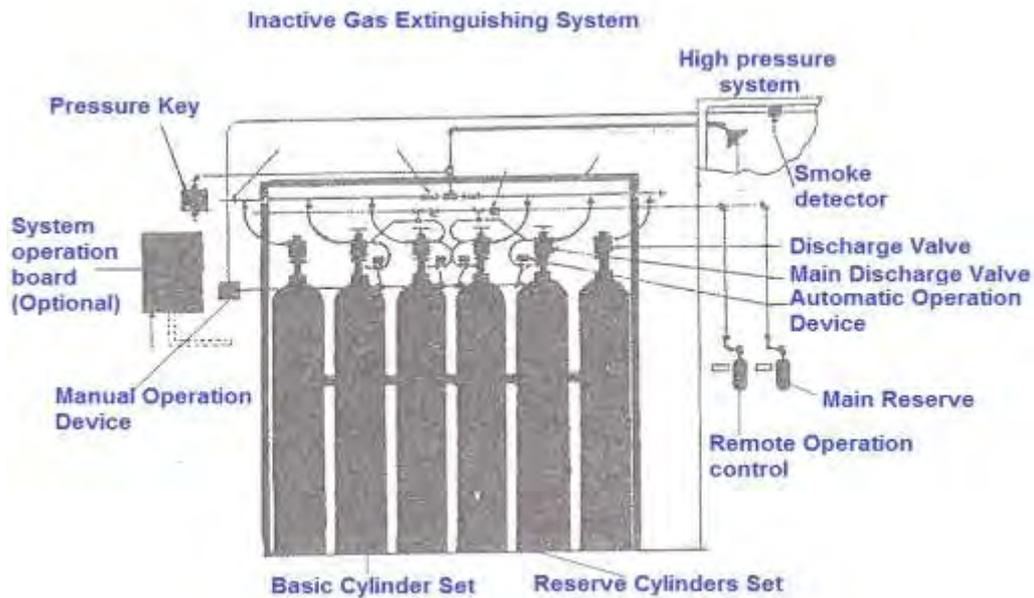


Figure 2.4

7.8.5 Dry chemical powder system:

It is a pipes network distributed to the required areas to be protected containers (as extinguishing material) pressurized by nitrogen gas or carbon dioxide which will be driven out on operation in the required area to be protected. The materials used in the extinguishing material normally include sodium bicarbonate or mono ammonium phosphates.

7.8.5.1 Dry chemical powder systems types:

The dry chemical powder systems are divided to the following types with regard to the coverage method:

1. **Full flood system:** The system which cover the size of the place or the whole room.
2. **Partial flood system:** The system which covers limited part in the building or place.

7.8 The dry chemical powder systems are operated as follows:

1. **Automatic operation:** through fire detective devices which open the valve of the powder containers.
2. **Electrical Manual Operation:** through manual electrical switch performs the role of fire detective devices.

3. **Mechanical manual operation:** Through mechanical manual operation tools

7.8.5.3 **Designing:** The dry chemical powder systems should be designed and implemented and maintained in accordance with the civil defense directory requirements and specifications.

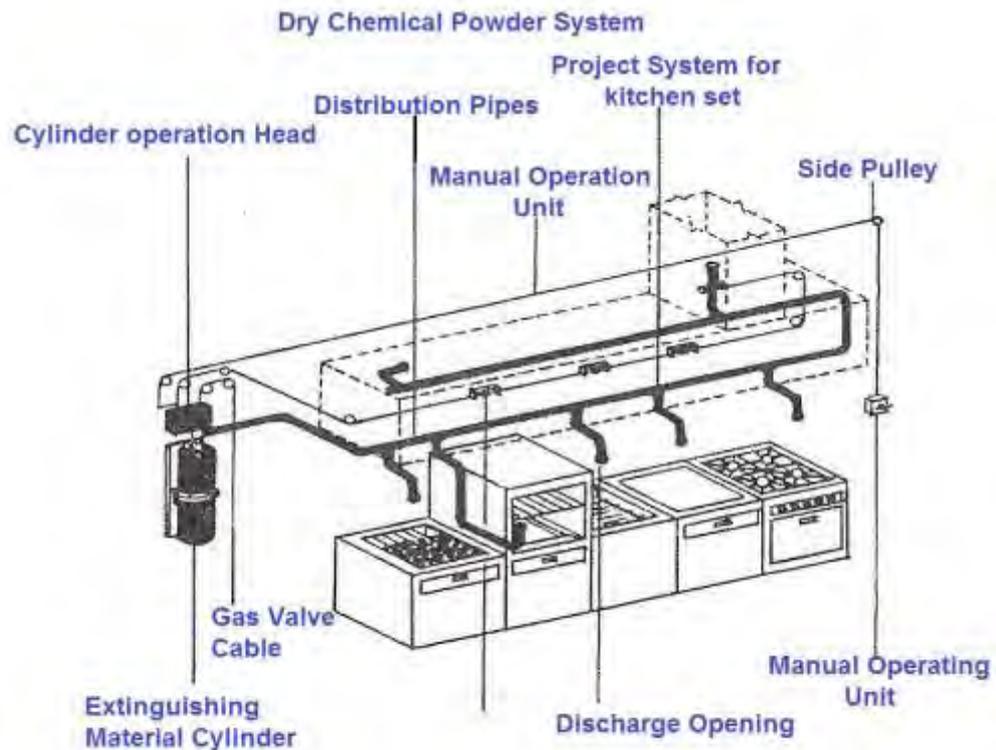


Figure 2.5

7.8.6 **Foam and water system:**

It is a pipe network distributed to the required areas to be protected provided with foam and water either mixed with each other or mixed before flowing on the burning surface

This mixture flows in the form of bubbles which constitute an insulating curtain to the burning surface from the oxygen whereas the water performs the cooling process

7.8.6.1 **Foam types from extension point of view:**

- (1) Low extension
- (2) Medium extension
- (3) High extension

7.8.6.2 **Foam Firefighting systems are divided in terms of performance method to the following types:** (1) Fixed networks system (2) Generation system (concerned with the foam system).

7.8.6.3 **The foam Firefighting systems are operated as follows:**

1. **Automatic operation:** Through fire detective devices or through warning board for operating the pumps or other means for driving the mixture
2. **Mechanical manual operation:** Through the opening of the foam valve or the mixing systems
3. **Electrical manual operation:** Through the operating the pumps or other means such as electrical files for opening the blocking off devices
4. **Remote control system:** Through in advance programming with television camera

7.8.6.4 **Designing:**

The Firefighting systems should be designed and implemented and maintained in accordance with the specifications and requirements of (part two) or civil defense directory

7.8.7 **Automatic fixed units (Modeler Extinguisher):**

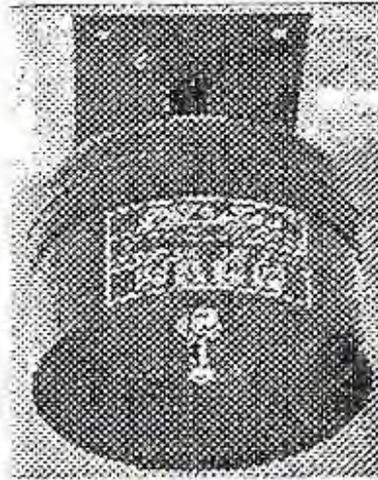
Single extinguishing units fixed at the required locations to be protected. They operate automatically by driving out their contents of extinguishing material when fire occurs.

7.8.7.1 The distribution, size and type should be suitable for protecting the sites according to the civil defense requirements.

7.8.7.2 The units should be in accordance with the international specifications recognized by the civil defense.

7.8.7.3 The units should receive regular periodical maintenance service by maintenance contractor recognized by civil defense.

Automatic
fixed
firefighting
units



Modeler
Extinguisher

Figure 2.6

7.9 **Fire warning systems:** Fire warning systems are divided into two main types:

(1) Manual warning system (2) Automatic warning system

7.9.1 Manual warning system is a device which operates manually through keys (calling points) distributed to certain locations and operates through electrical current. They are of two types:

- 1 Calling points operated manually by breaking the glazed cover.
- 2 Calling points operated manually through turning special key.

10.4.3.1 The manual warning system is composed of:

(1) Pressure button (glazed cover or key) (2) Warning bell (3) Control board

7.9.2 **Automatic warning system:** A device operates through electrical power for sensing fire hazard and providing warning. It is composed of the following:

(1) Fire detectives (smoke, flame, heat etc) (2) Warning bell (3) Control board

7.9.2.2 **The automatic warning system operates through one of the following means:**

- 1 Through connected tools with automatic fire equipment or with central air conditioning system
- 2 Through sensitive tools (detectives) which are affected by heat impact.
- 3 Through sensitive tools (detectives) which are affected by smoke impact.
- 4 Through sensitive tools (detectives) affected by the flames infrared rays
- 5 Mechanical warning device (bell) which operates through pressure arising from the automatic sprayers system
- 6 Fire warning system and its type should be in accordance with the building type and its use purpose and as per the specifications of the civil defense.

Chapter three

General requirements for escape means (emergency exits)

Code	General requirements for escape means.
1	Escape means components
2	Application of escape means requirements
3	Escape means requirements
4	Designing principles of escape means
4.1	Movement distance
4.1.1	Closed ends in escape means paths
4.1.2	Direct distance
4.2	Capacity of escape means
4.3	Height of escape means

Code	General requirements for escape means.
4.4	Wideness of escape means
4.5	Number of escape means
4.6	Distribution of escape means
5	General requirements of escape means
5.1	Building materials
5.2	Protection from fire and smoke hazard
5.3	Protection of existing openings on separating walls
5.4	Internal finishing of escape means
6	Escape means lightening
7	Emergency lightening of escape means
8	Guiding signals of escape means
9	Protection from falling during the use of escape means
10	Escape means doors
10.4	Organization of escape means doors movement
10.5	Opening means of escape means doors
10.6	Automatic and private doors of escape means
10.7	Roller doors
10.8	Limitation of the building occupants and escape means movement
10.9	Visibility capacity through escape means doors
11	Escape means corridors
11.6	Escape means corridors floor

Code	General requirements for escape means.
12	Internal stairs
13	Specifications of escape means stairs
14	Escape means stairs protection
15	Ventilation of escape means stairs
15.1	Natural ventilation means
15.2	Mechanical ventilation means
16	Distribution of escape means stairs
17	Internal stairs
18	Bridges, halls and external corridors
19	Ramps
20	Final exit of escape means
21	Horizontal exit of escape means
22	Private escape means
22.2	Spiral stairway
22.3	Fixed vertical stairs
22.4	Fixed beveled stairs
22.5	Automatic emergency stairs
23	External windows.

General requirements of escape means

Table No.	Table Title
1.3	Movement distance of various locations in the building
3.2	Minimum level of escape means width
3.3	Buildings evacuation time in the event of fire
3.4	Estimation of the building occupant's number
3.5	Required number of exits for limited number of persons

1 Escape means components:

- 1.1 The buildings and establishments and shops should be provided with suitable escape means in order to create an outlet or exit for evacuating the occupants and users of the buildings and moving them away from fire area to protect them from incidents and the life from fire.
- 1.2 The escape means are composed of safe path or more so that the occupants or the people available in the building could escape by moving from any point in the building directly to any safe hall or location from fire and also lead to outside the building where it is safe from fire hazard.
- 1.3 Escape means are composed of (emergency exits) different parts such as corridors, stairs, halls, bridges, ramps, doors and exits etc forming together integrated unit which include (emergency exits) escape means.

2 Application of escape means requirements:

- 2.1 All buildings and establishments and shops which are subject to the civil defense permits should be provided with Firefighting and warning systems and suitable prevention in accordance with these requirements.
- 2.2 It should be prohibited to introduce any change or addition to the building which breaches these requirements and the nature of the building use should not be changed unless the escape means are changed to suit the new use requirements.
- 2.3 The civil defense should preserve the right to add any requirements it may consider appropriate for exceptional cases which are not covered or viewed as of unnatural fire hazard.

3 Escape means requirements:

- 3.1 The escape mean path should not in any case pass through a room or a place which can be closed and it should not pass near any location where fire hazard exists unless it is separated by fire spread preventive barrier.
- 3.2 If escape means path continue to below final exit level (as the continuation of staircase to the basement case) the continuation should be disconnected through fire spread preventive wall so that the escape path will not lead by mistake to the basement or any hazardous location.
- 3.3 Satisfactory signal boards and arrows should be fixed on the exits path which indicates the path direction. If the path is crossed by a door leading to a hazardous location or closed end a clear warning board should be placed on such door.
- 3.4 The escape mean should not be covered with any material combustible to burning or could cause slippery or stumbling.
- 3.5 It should be prohibited to place or install any type of furniture items, barriers, equipment, anything fixed mobile which may reduce the wideness of the escape mean or obstruct its use.
- 3.6 The escape mean should remain always in a suitable condition for use providing the highest capacity for escape and should not be used for any other purposes than the one designated for it.
- 3.7 Preventive barriers should be fixed for protection from falling in escape means paths, such as on the empty parts of the stairs, bridges or higher edges surfaces. And other glass plates and their alike are not considered as preventive barriers.
- 3.8 Satisfactory natural or mechanical ventilation should be provided to the exit path:

Satisfactory natural or artificial lightening should be provided to the exit path in the crowded buildings, high buildings or public buildings such as hotels, cinema premises and factories in addition to reserve source for providing electrical current in case of disconnection and the reserve lightening should include signal boards and indicative arrows to the escape means.
- 3.9 The responsibility of provision and maintenance of Firefighting and warning systems inside the buildings should be assigned to the owner and the tenant should be responsible of removing the obstructions from the escape corridors and keeping the Firefighting and warning systems in the rented part to him.

4 Escape means designing principles:

4.1 Movement distance:

- 4.1.1 The security and exit paths should be coordinated so that the movement distance between any point and the nearest exit in the floor should not exceed the prescribed distance in the following table no: 3 -1 unless it is otherwise prescribed in the buildings preventive requirements in accordance with use purpose.

Movement distance to the various locations in the buildings

Type of location	Direction of movement	
	15 m	40 m
Open location	10 m	30 m
Divided location	10 m	30 m
Divided location through corridor	10 m	30 m
Internal fire sections less than 50 m ² .	unlimited	Unlimited
Internal fire sections more than 150 m ² (less than 50 persons)	Not permitted	30 m
Internal fire sections more than 150 m ² (more than 50 persons)	Not permitted	30 m
Protected corridor	10 m	30 m

Table no: 3.1

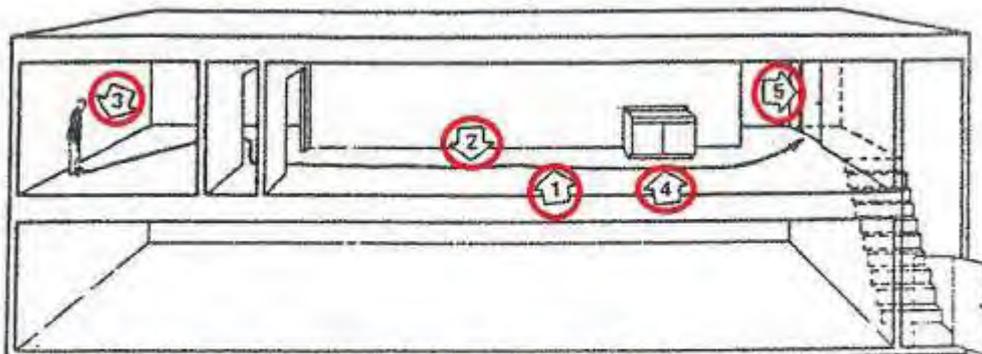
- 4.1.2 The distance should be measured on the pivot line of the actual escape path from distanced point of (30 cm) from the farthest point in the building until the middle of final exist or the safe part of the escape mean which leads to the final exit.
- 4.1.3 In independent rooms or flats the distance should be measured from their entrance provided that their depth is not more than (15 m) and their occupation should not exceed the specified number according to the buildings preventive requirements as per the use of purpose.
- 4.1.4 The maximum level of movement distance in protected corridor for reaching the nearest exit (either other fire section or protected stairs) should not exceed 30 m.
- 4.1.5 The locations where easily burning or combustible materials are manufactured, handled or stored the indicated figures in Table No. 3.1 should be multiplied by 0.5 for obtaining the movement distance.
- 4.1.6 Unfamiliar establishments to individuals or those which they cannot move on them by themselves:

- 1 The movement should not be permitted to be in one direction (closed end).
- 2 The indicated movement distance in Table No. 3.1 should be multiplied by 0.75

4.1.7 The movement distance may be increased by 50% if automatic sprayers and fire detective systems are available and the increase should not exceed 25% as for the open areas.

4.1.8 As for the buildings the height of which is more than five floors (ground + 4) or the buildings of which the floor area is more than 2500 m² should be provided with fire warning systems distinguished with clear operation signs and instructions.

Measurement of Movement Distance



1. In the floor or any surface of the building
2. Along the Central line to cross normal road
3. Beginning from 30.5 cm (1 ft.) from control point
4. Around the angles and obstructions with net 30.5 cm (1 ft.)
5. End where exit begins
6. Crossing distance include crossing over stairs and ramps
- stairs are measured on the surface

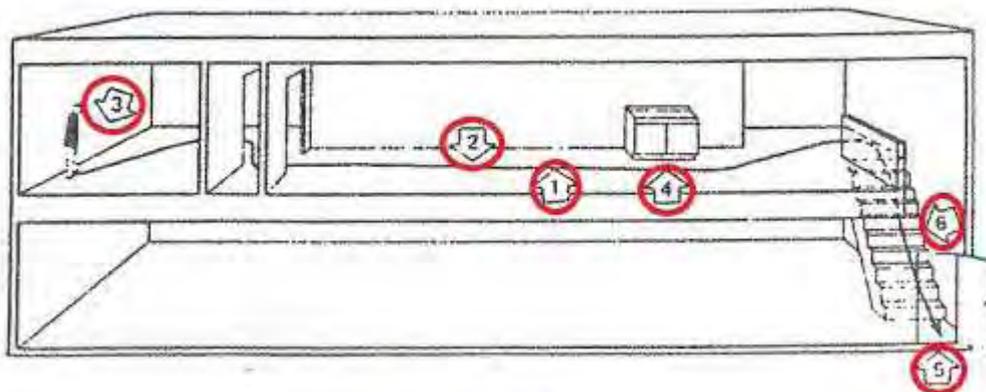


Figure 3.2

4.1.9 **Closed end in escape mean path:**

4.1.9.1 It is measured by the same movement distance method from the farthest point to the middle of the exit or from the farthest point to the starting point to two different escape paths provided that the distance should not be more than 7.5 m.

4.1.10 **Direct distance:** The shortest imaginary line inside the building connecting the farthest point and the exit.

4.1.11 If it is impossible to measure the movement distance on designing due to lack of satisfactory information about nature of use an imaginary line should be assumed to be called direct distance which is the shortest line inside the building connecting the farthest point with the exit regardless of any obstructions and such line is estimated on the bases that the movement distance is 1,5 the direct distance.

4.2 Capacity of escape means:

4.4.1 The capacity is estimated as the maximum number of people who could be available in the building or any part of it at any time provided that the number should not be less than the specified number in Table No. 3.2

Minimum level of the width of the escape means					
Minimum level of net width of escape means (by meters)					
Doors and corridors	Number of Persons				
	100	150	200	250	300
	0.80	0.85	1	1.25	1.5
	0,75	1	1,30	1,65	3

Table no. 3 -2

4.4.2 The escape means width should be calculated as per the previous table on the bases of the number of people who will use it in the emergency event. It is preferred that the width of the exists and escape means should not be less than 100 cm.

4.4.3 The completion method may be used to for calculating the confined figures between 100 – 300 persons from the occupants of the building for reaching the minimum net width of escape means in the floor by meters.

4.4.4 In the event that more than 300 persons of the building occupants are existing the net width should be increased by 0,05m for each additional 10 persons who use the corridors and 8 persons who use the stairs.

4.4.5 In repeated floors the maximum number of persons in one floor only should be taken into consideration. For the assessment of the wideness of the exits which should not be less than the wideness of (emergency exits) the main escape means which lead to the final exits.

4.4.6 If the number exceeds 1000 persons an additional exit should be made available with 152cm width for each additional 500 persons. The width of the stairs and carpets should be equal at all stages until the final exit. As for the cases which are not mentioned in the table the civil defense shall determine the reasonable measures in accordance with each design requirements.

4.3 **The height of (emergency exits) escapes means:**

Escape means should be designed so that net height for each part of them is not less than 2,2m.

4.4 **Wideness of escape means:**

4.4.1 In accordance with table no.3 -2 so that the escape means wideness will be satisfactory for discharging the existing persons in the building. The width is measured by net vacuum at the narrowest point in any part of the escape means components.

4.4.2 When escape means (emergency exits) from upper and lower floors (basement) meet at medium floor the wideness beginning from the joining point until the final exit should not be less than their total wideness.

4.4.3 The wideness of the exits is related to the evacuation time of the building and the number of the occupants. The evacuation time differs from one building to another in accordance with the prevention requirements in the building. The Table No. 3.3 shows the estimates of buildings evacuation times.

Buildings evacuation time during fire:

Type of the building	Proposed evacuation	Time in minutes.
Buildings provided with fire prevention requirements and there is no fire hazard.	3	Three minutes.
Buildings provided with fire prevention requirements but there is fire hazard.	2.5	Two minutes and a half.
Buildings provided with fire prevention requirements and there is fire hazard or buildings provided with fire prevention requirements and there is high fire hazard.	2	Two minutes

Table No. 3.3

Estimates of the number of the building occupants

Number	Description of the building	Area by square meters for each person (m ² /person)	Number of persons per square meter (m ² /person)
1	House of one family	-	-
2	Residential flats building	-	-
3	Hotels buildings	-	-
	Hotel rooms	15,00	0,07
	Restaurants	4,00	0,25
	Meetings rooms	1,00	0,15
4	Commercial shops (marketing centers)	0,75	1,33
	Central markets	2,00	0,05
	Small commercial shops	-	-
5	Schools buildings	3,00	0,30
6	Assemblies building	-	-
	Presentation halls	1,50	0,67
	Conferences halls	1,00	1,00
	Exhibition halls	7,00	0,15
7	Health care buildings	-	-
	Hospital wards	15,00	0,07
	Elderly care buildings	15,00	0,07
8	Car parking buildings	15,00	0,07
9	Industry buildings	10,00	0,10
10	Ware houses buildings	-	-

Important note: The number of the occupants of the building on the bases of their actual number if fixed chairs is available.

Table no: 3.4

4.4.4 **Movement rate in the escape means (emergency exits):** Is the exit of 40 persons per minute from wideness unit.

4.4.5 **Wideness units:** A number of the necessary units for the exit of people in accordance with specified movement rate estimated as (40 persons per minute) in limited period determined in accordance with the type of hazard in the building and the extent of the availability of prevention requirements.

Example: How many wideness units are required for the exit of 480 persons during evacuation time of 3 minutes?

Answer: $480 \div (40 \times 3) = 4$ wideness units.

Mathematical equation for calculating the number of the required wideness units:

$$\frac{\text{Number of wideness units} = \text{Number of people in the building}}{\text{Movement flow rate} \times \text{evacuation time in minutes.}}$$

4.5 Number of escape means (emergency exits) are the minimum number of exit openings required for the exit of persons in accordance with specific movement flow rate estimated as 40 persons per minute in limited period of time.

Example (1): How many escape means exits (emergency exit openings) required for the exit of 480 persons from building within 3 minutes?

Answer: $(\text{Number of wideness units} \div 4) + 1 = (4 \div 4) + 1 = 2.$

Example (2): How many escape means exits (emergency exits openings) required for building which needs exits of (8) wideness units?

Answer: $(\text{Number of wideness units} \div 4 + 1 = (8 \div 4) + 1 = 3.$

Mathematical equation for calculating required number of (emergency exits openings) escape means exit:

Number of (emergency exits openings) escape means exits = Number of wideness units + 1 \div 4

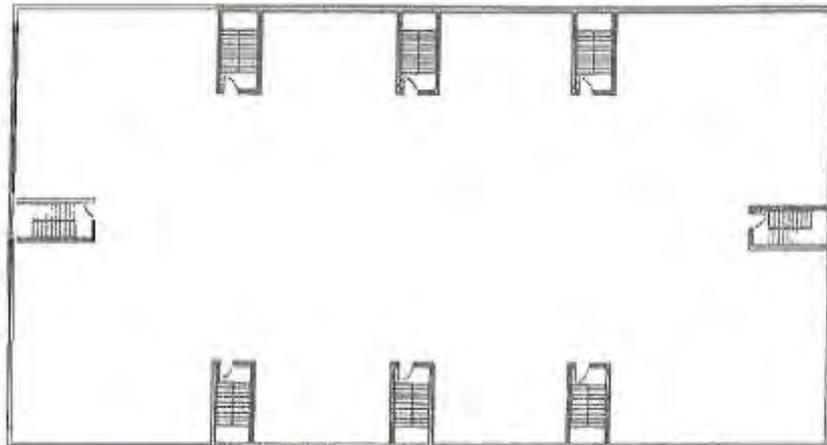
Required exit numbers for limited number of persons

Number of persons	Number of exits	Net minimum width of the exit.
Maximum 200 persons	2	90cm
Maximum 300 persons	2	122cm
Maximum 500 persons	2	152cm
Maximum 750 persons	3	152cm
Maximum 1000 persons	4	152cm

Table no: 3.5

- 4.5.1 The number of exits should in accordance with the preventive requirements of buildings as per the type of use and with the exception of the permitted cases all buildings and establishments should have at least two exits which are independent and distant from each other and both lead directly to the outside area.
 - 4.5.2 On calculating the required number of exists it should be taken into consideration that one of them may be out of because of fire impact and accordingly the remaining exits should be satisfactory to absorb the maximum number of people available in the building at any time. The distribution and area requirements should also be taken into consideration which shall be left to the discretion of the civil defense.
- 4.6 **Distribution of escape means (emergency exits):** The distribution of escape means should be organized to provide the best possible coverage to the whole area.
- 4.6.1 The escape means should be distributed to the utmost parts of the building to avoid the availability of closed ends as much as possible and the distance of the closed ends should not exceed by all means the permitted limit as prescribed in the buildings preventive requirements as per the type of use.
 - 4.6.2 The escape means (emergency exits) should be distributed in a manner that keeps them distant from each other so that they will not all together become out of operation because of the fire impact. The minimum distance limit between two exits at one location is calculated by the following two methods.
 - (a) The joining point angle of the two exits with any point on the location not less than 45 degree.
 - (b) The distance between the two exits not less than half string of the location.
 - 4.6.3 On dividing the floor to more than one tenant or user the escape means should be easily accessible by the existing persons in all sections of that floor at one time.

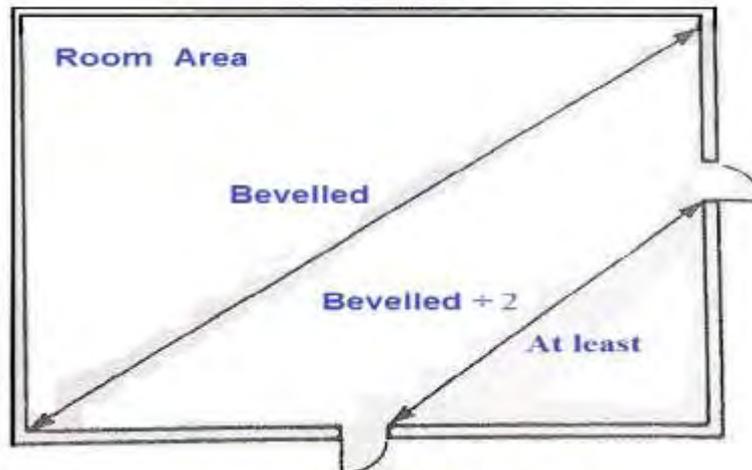
Distribution of Escape Means



Eight Exits - Horizontal exit for VIP persons.
It is required to provide important exit density

Figure No. 3.3

Distribution of Escape Means



Minimum Distance half mile

Figure 3.4

- Joining Point angle of two exits with any point in the location not less than 45 degree
- The distance between the two exits not less than half string of the location

5 General requirements of escape

5.1 **Building materials:** The escape means should be constructed from non combustible materials with suitable fire resistant degree as one of the building frame elements.

5.1.1 The building materials of escape means fire resistant degree should not be less than one hour for the buildings which do not exceed three floors and two hours for the buildings which exceed those floors.

5.2 **Protection from fire and smoke hazard:** The escape means should be separated from other parts of the building for protection of them from fire spread preventive barriers made of non combustible materials with suitable fire resistance degree.

5.3 Protection of the existing openings in the separating walls by fire and smoke spread preventive doors in accordance with these requirements. The number of such openings should be confined to the necessary ones only for entry and exit.

5.4 **Internal finishing of escape means:** The used materials in the internal finishing of the escape means should be non combustible nature as much as possible and of the type which does not increase the burning and fire hazard in any way. They should also be of very low degree of flame spread on their surfaces (zero degree).

6 Escape means lightening: All parts of escape means should be provided with satisfactory natural or artificial lightening.

6.1 In case of artificial lightening with electrical current it should be in accordance with the specifications of the Ministry of Electricity and from a reliable source.

6.2 The lightening should be distributed to all parts of escape means so that if anyone is out of operation it will not lead to the spread of darkness or lack of visibility at any point along the escape mean.

6.3 The lightening should be continuous as long as it is required and in the required lightening degree which is not less than 10 lux units on ground surface.

7 Emergency lightening of escape means: Should be provided to all parts of escape means on the stoppage of the normal lightening in accordance with these conditions and specifications or those recommended by the civil defense.

7.1 The escape means emergency lightening should be provided with emergency electrical current source apart from the main source so that it will be satisfactory to operate for at least two hours or according to the civil defense requirements.

- 7.2 The emergency lighting operates automatically on disconnection of the main source with a time interval not exceeding 10 seconds or it may be operating continuously.
- 7.3 In case of the use of continuous current (batteries) as supply source of emergency light, it should be integrated and recognized in accordance with part two specifications or civil defense specifications.
- 7.4 In the permitted cases as prescribed in the buildings preventive requirements according to the type of use, the emergency lighting may be through independent electrical light, which receives electrical supply from normal source and of automatically charging nature so that it operates immediately on current supply disconnection for two hours at least provide that it is recognized by the civil defense

8 Guiding signals of escape means: The escape means should be provided with the required guiding signals to be placed on the suitable locations in accordance with the buildings preventive requirements as per the type of use in order to acquaint with the escape means and their directions and to advise about any instructions related to the escape in particular and safety in general.

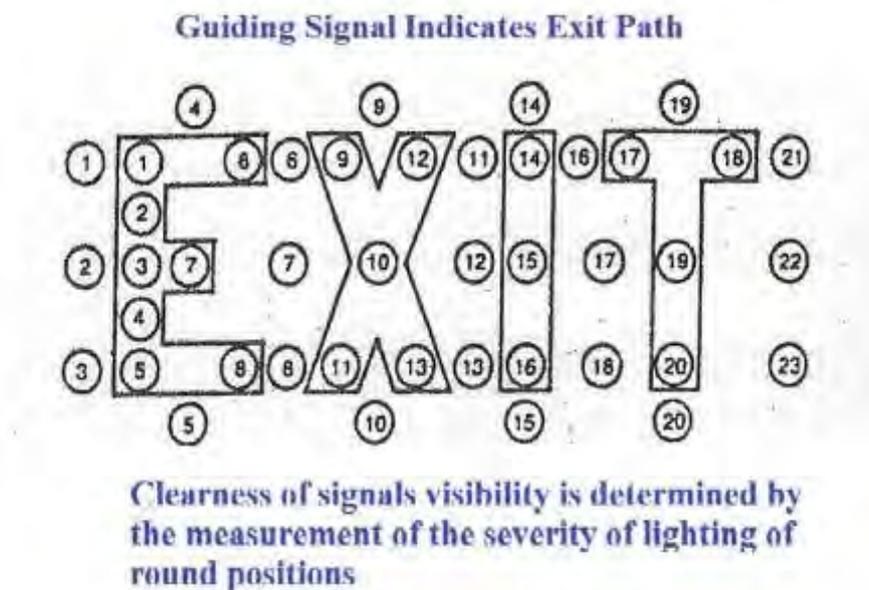


Figure No. 3.5

- 8.1 These signals should have suitable size, explanation, code and color in accordance with civil defense technical specifications in order to appear clearly, distinguished and different from the neighboring signs in terms of lightening, finishing, color or decoration, should not be permitted to place any fittings or lightening which form obstruction to their visibility or attract more attention than them.

- 8.2 Exit sign should be placed on the exit directly and a sign of exit and an arrow to indicate the escape mean path when the exit, path is clear or visible such as the turning points and angels so that there is no point in the path which is distant from the sign by more than 30m.

Some fixing locations of Guiding Signals

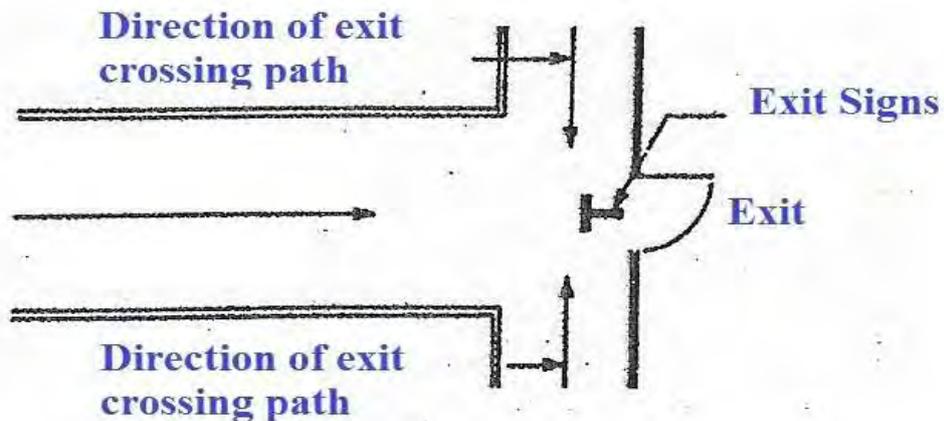


Figure No. 3.6

- 8.3 In accordance with buildings preventive requirements as per the type of use, the guiding signals should be lightened by the same normal lightening source and also the emergency lightening. The lightening degree should not be less than 55 electrical units (watt) on the surface of the signal.
- 8.4 As for each door, corridor or stair which is recognized as part of the escape mean but due to its location may lead to a confusion or escape to unsafe position should receive another signal written on it the actual use purpose (such as to the basement) or storage room).... Etc
- 9 **Protection from falling during the use of escape means:** Barriers should be fitted for protection from falling (such as railing) on all empty utmost parts edges of the escape means components and other part of the building which is accessible by people such as the surface and light hole edge and main vacuums on the surface, halls, corridor edge etc.

Railing for Protection from falling on stairs

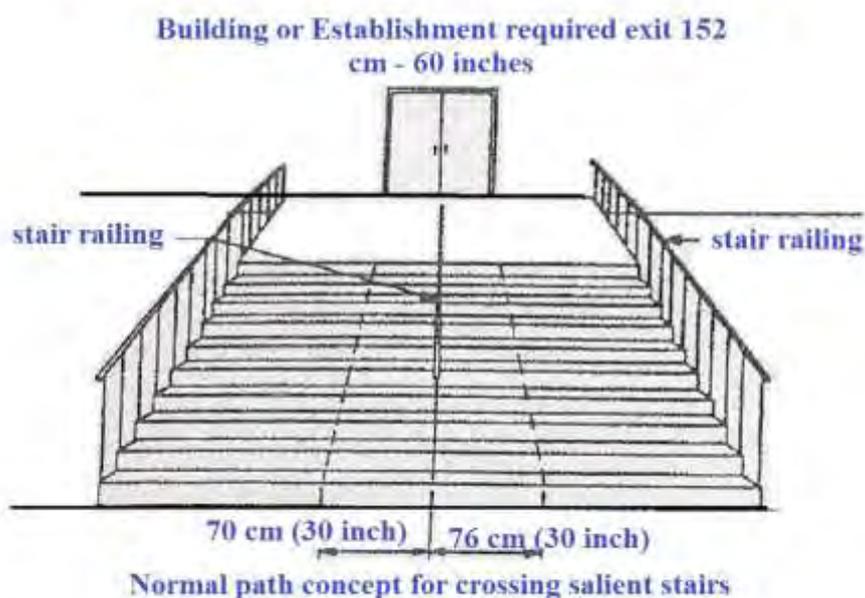
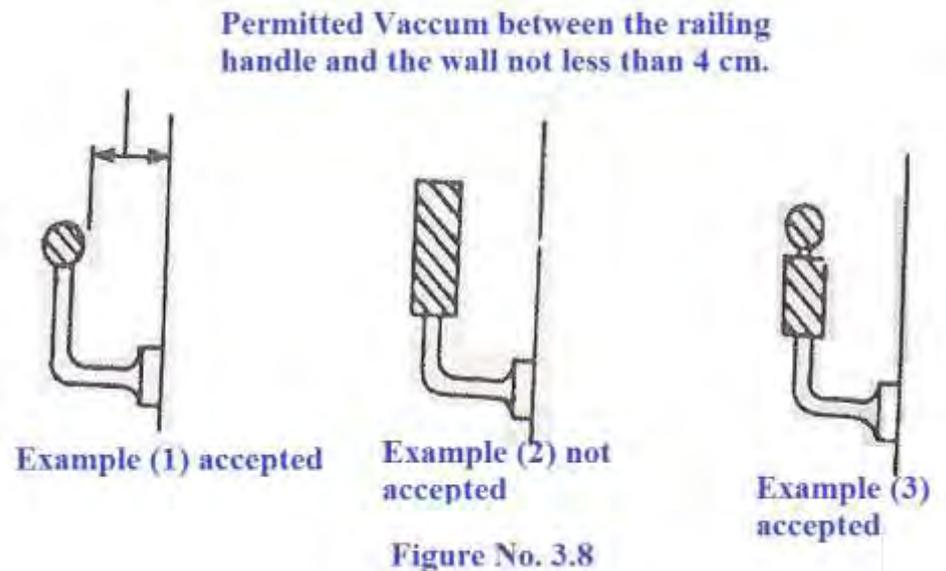


Figure 3.7

- 9.1 Barriers should be installed on one side of the stairs the width of which is less than 120cm and on both sides if the width exceeds that.
- 9.2 If the stairs width is more than 180cm an additional railing should be installed in the middle and in such a case the stairs is considered as divided into two independent sections both of them are subject to the stairs width requirements.
- 9.3 The height of the protective barriers from falling should not be less than 90 cm in the internal parts and 120cm in the internal parts of the building.
- 9.4 The glass should not be considered as protective barrier from falling in any way and wherever glass plates are available on facades or window vacuums additional protection barriers from falling should be installed according to these requirements.
- 9.5 In case there is a difference in the floor level exceeding 18cm or more than one single stair preventive barriers should be installed for protection from falling to be made of non combustible materials.
 - 9.5.1 Preventive barriers for protection from falling should be designed and fixed in firm and solid form which can bear horizontal or vertical pressure and properly implemented so that they will not cause any injury to the body organs or be attached to the clothes part when contacted.
 - 9.5.2 The vacuum in the barriers should not exceed 10cm to avoid any opportunity of stuffing body organs and the bars should be designed in a proper form so that they will not assist the children to climb them

- 9.5.3 On fixing a barrier on stair side from the wall direction a vacuum should be left between the handle and the wall not less than 4cm.



10. Escape means doors: These requirements apply to all doors components including the frames, shutters and tools if they are part of the escape means.

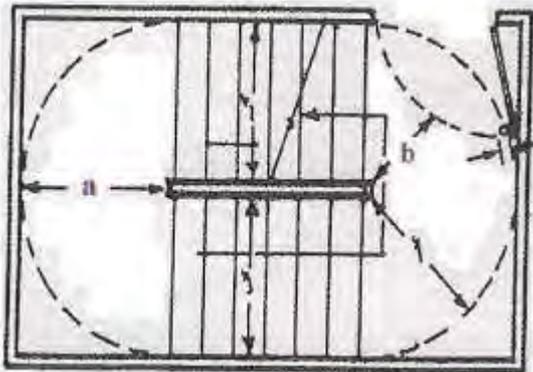
10.1 If the escape doors are fire and smoke preventive at the same time they should be subject to the preventive requirements prescribed in construction preventive precautionary chapter in addition to these requirements.

10.2 Door width is the net width when the door shutter is fully open.

10.3 **Floor level of escape means:** The ground level in escape means on both sides of the door should be equal to a distance not less than the width of the door itself.

Measurement of door net width

Stairs internal draw showing required distance in new buildings



(a) required width (b) At least half width of (a)

Figure No. 3.10

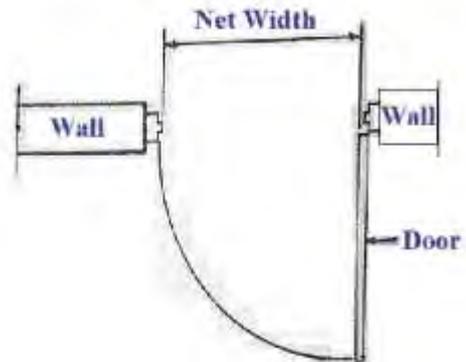


Figure No. 3.9

10.4 Organization of escape means doors movement:

10.4.1 The emergency doors should open in the direction of the escape path.

10.4.2 The required effort for opening the door fully should not exceed (23 kg. on the door handle)

Opening of Emergency Door

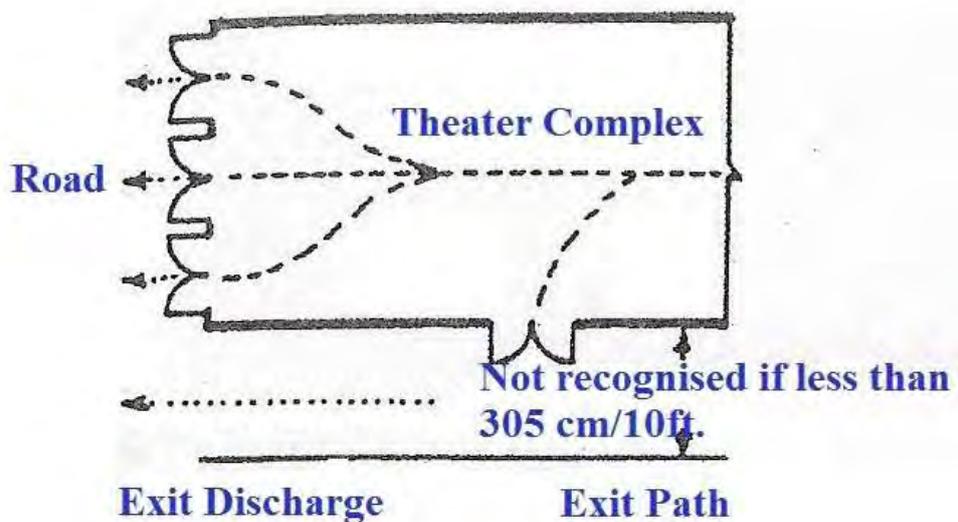


Figure 3.11

- 10.4.3 The door shutter movement should not affect the wideness of the escape means parts or obstruct the use of the escape means in general.
- 10.4.3.1 The door shutter movement should not be less than the stair width or stair or corridor wideness or any part of escape means components by more than half the required width.
- 10.4.3.2 If the door opens in the direction of the corridor it should open by 180 degree angle so that it will not appear by more than 15cm from the wall front.
- 10.4.3.3 In case there are no consecutive doors as in the staircase wideness or insulating wideness the distance between the axils of the two doors should not be less than 1,5m or between the shutters movement than 1m.

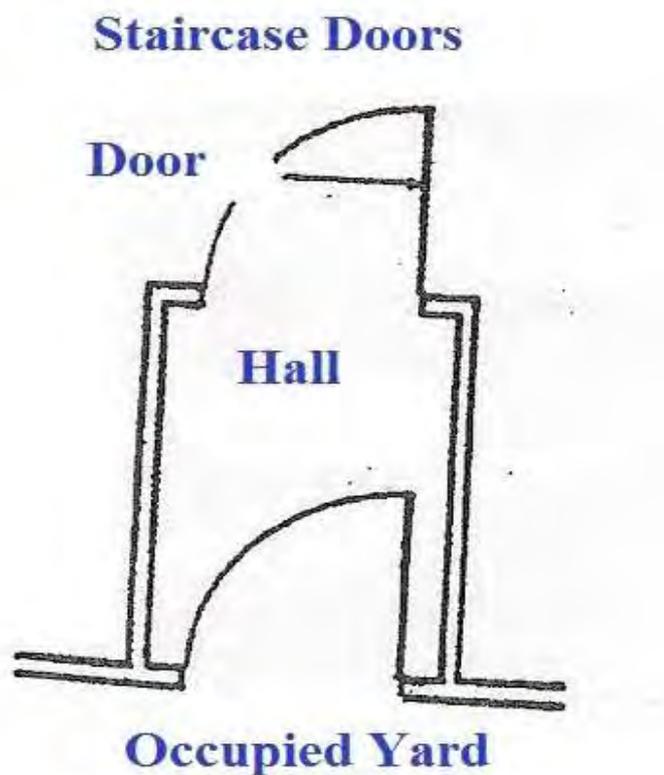
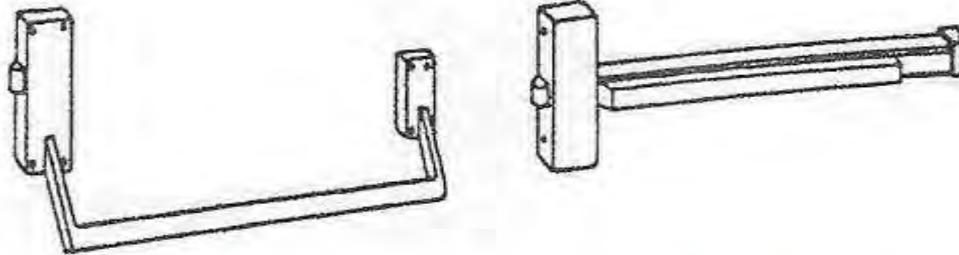


Figure No. 3.12

10.4.3.4 All tools and lockers which form the doors specially bearing joint articulation should be of non combustive materials and with melting degree not less than 800 degree.

10.4.3.5 The lockers and closing tools should be of a type which does not require the use of a key or special knowledge to open them.

Two Types of Emergency Door Opening Bars (Panic Bar)



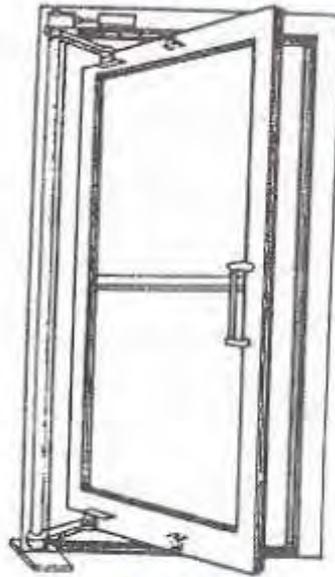
Automatic Closure of Emergency Doors Through Pushing

Figure No. 3.13

10.4.3.6 When it is required to keep the door in escape means path closed for preventing fire and smoke spread or for any other reason it should be provided with self automatic closure device of recognized type and with a suitable power which closes the door completely after opening.

10.4.3.7 When the use necessitates to keep fire preventive escape door open automatic closure means should be made available.

Fitted door with Automatic Closure Means



Balanced Door

Figure 3.14

10.5 Opening means of escape means doors: In accordance with buildings preventive requirements as per the type of use the escape (exit) doors should be provided with quick opening means which open the doors to the outside area in emergency cases to be recognized by the civil defense (panic bar).

10.5.1 This mean should be a bar or a board or connecting rod the moving part of which shall not be less than 75cm and the height from ground level not more than 10cm.

10.5.2 Such means should not be fitted with any lockers or tools which may obstruct or prevent the opening of the doors during emergency.

10.6 Automatic and private doors of escape means: Automatic doors which are opened through light cell on being approached by somebody or through any other mean and also the doors which are opened or closed by automatic means. Such doors should be provided when closing and opening mean when automatic means are not operational.

10.7 Roller doors are not accepted as part of escape means and if they are available they should be beside recognized types of doors according to the requirements.

10.8 On limiting the movement of the occupants of the building with regard to the use of the escape means for security purposes or other reasons the necessary actions should be taken to facilitate the use of escape means immediately in the emergencies.

10.8.1 If it is necessary to close escape doors the key should be kept in closed tin with glazed cover to fixed on top the door for use during the emergency. If this is not possible each case should be considered separately with the civil defense in order to arrange the suitable measurements.

10.8.2 On the occasion of the placement of barriers, ropes or chains for controlling the access due to organization or tickets sale purposes such barriers should be easy to remove immediately in the event of emergency or should not be in a position which may obstruct or prevent the use of escape means doors. As in the case of seesaw doors in both directions and in internal rooms doors an opening should be created on the door to be covered with transparent reinforced glass to enable visibility so that the height of the glass plate is at the same level of normal visibility (150 – 170 cm) and in case of disabled people (100 cm).

11. Escape means Corridors: In the event that it is not possible to reach the exit directly and easily due to designing requirements, safe and easy corridors should be provided to lead directly to the exits and without closed ends. If this is not possible the distance of the closed end should not be more than 7.5m.

11.1 The corridors should be in accordance with general requirements as part of the escape means components in addition to these requirements.

11.2 The corridors should be protected from fire and smoke hazard and such protection may be through readymade sections which have the required resistance degree when the building is provided with automatic water sprayer's network or when special requirements permit that.

11.3 The width of the corridors should be satisfactory to absorb the persons who use them so that it should not be less than the width of the exit they lead to and not less by all means than 50cm in the main corridors inside the flats.

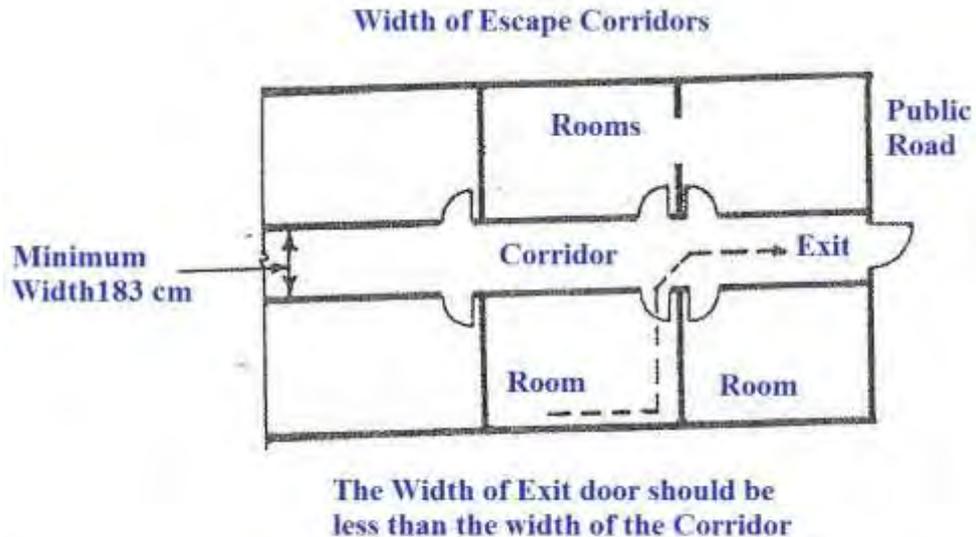


Figure No. 3.15

- 11.4** The corridors should be distributed in a manner that enables every person to reach all exits in the floor easily, freely and in more than one direction. It is also preferred to organize these corridors to facilitate the reach to other remaining exits if one becomes non operational due to the fire impact.
- 11.5** Resistant smoke preventive doors should be fitted in the corridors which automatically close in accordance with preventive precautionary requirements in construction areas in the following cases:
- 11.5.1 When the corridor length exceed (30m)
 - 11.5.2 At the joining point of the main corridors with the sub – corridors.
 - 11.5.3 At any point as the protection from smoke hazard requires.
- 11.6** In case there is a difference in the corridors floor levels stair or a ramp should be provided for movement from one level to another. If the difference is less than 45cm a ramp should be used instead of stair.
- 12. Internal stair:** Internal stair forms an important part of the escape means as it is located in a well which vertically penetrate the building.
- 12.1 The escape stair should be constructed of non combustible materials and isolated from other parts of the building through fire resistant doors and walls for a period not less than one hour and easily lead directly to the exit or to empty obstructions free hall which also lead to the exit.
 - 12.2 The floor of all stair parts should be solid and non slippery and without holes.

- 12.3 Preventive barriers from falling should be installed according to protection from falling requirements.

Internal Stair is Important Part of Escape Exits

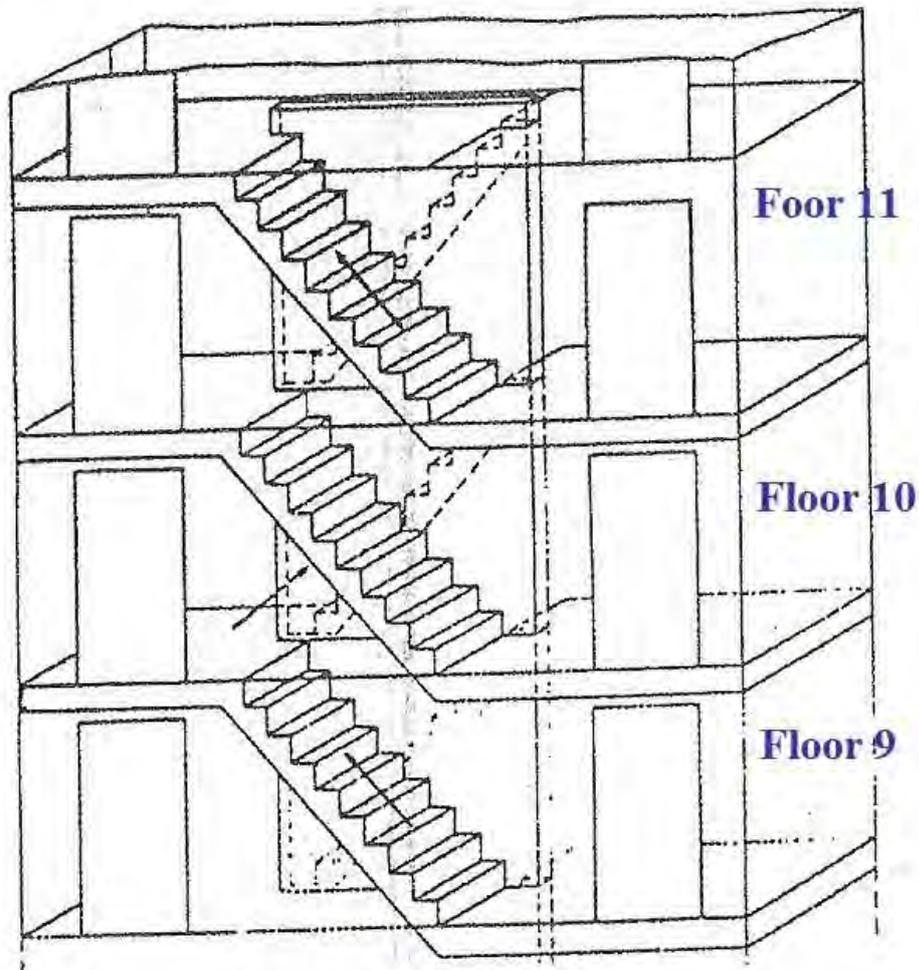


Figure 3.16

13. **Internal stair:** Internal stair forms an important part of the escape means as it is located in a well which vertically penetrate the building.

13.1 Stair width is the net distance between the front of the rail or the other wall.

13.2 The stair width should be satisfactory to absorb the occupants of the building in accordance with the buildings preventive requirements as per the type of use and the minimum level table of the width of escape means - Table No. 3.2

- 13.3 Completion method may be used for calculating the confined figures between 100 – 300 persons of the building occupants for reaching the minimum level of net width of the escape means by meters in the floor as mentioned in Para 5.2.3
- 13.4 In case there are more than 300 persons of the building occupants the net width should be increased by 0.05m for each additional 10 persons for using the corridors and 8 persons for using the stair as mentioned in Para 5.2.4.
- 13.5 If the number exceeds 1000 persons an additional exit should be made available with a width of 152cm for each additional 500 persons. The width of the stair and carpets should be equal at all stages until the final exit.
- 13.6 The depth of the flat stair should not be less than 28cm and the height of the upright one should range between 15 – 18 cm. the relationship between the stair width and its height remains governed by the following equation: $(2 \times \text{height} + \text{width} = 60 - 65) \text{ cm}$.

Relationship between upright and flat Stair

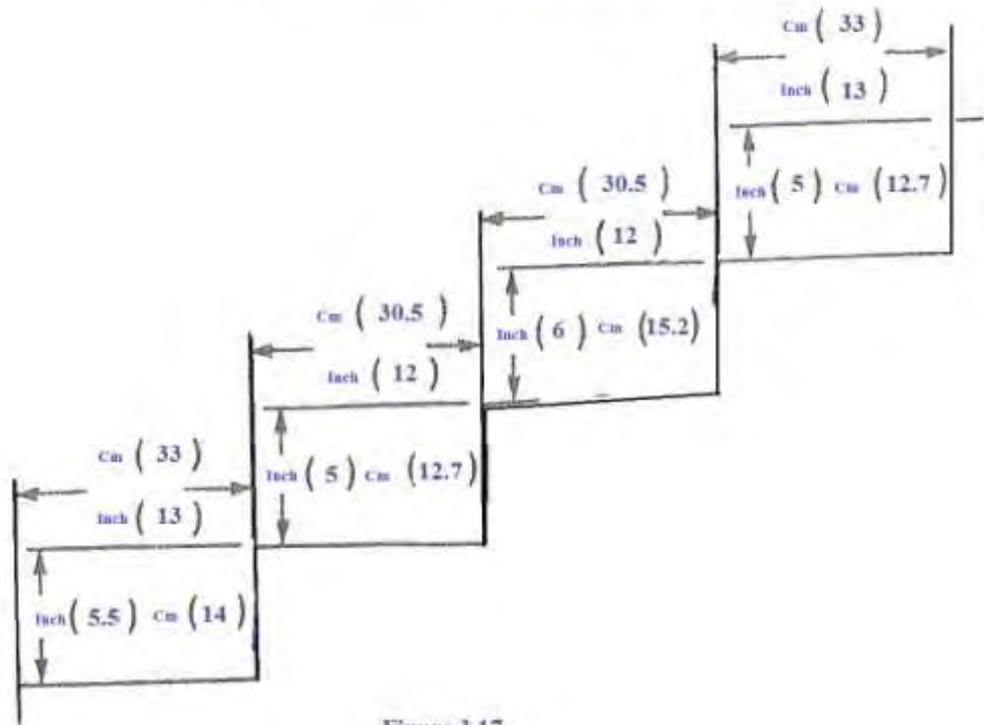


Figure 3.17

- 13.7 The stairs should be organized in a group of sets each not exceeding (14) stairs and not less than (3) stairs and ends with a platform.

- 13.8 The platform width should not be less than the width of the stair itself
- 13.9 The group of consecutive stairs in each set should be equal in the depth and height without any difference exceeding 10mm between the highest and the lowest height or stair depth in the sets groups.

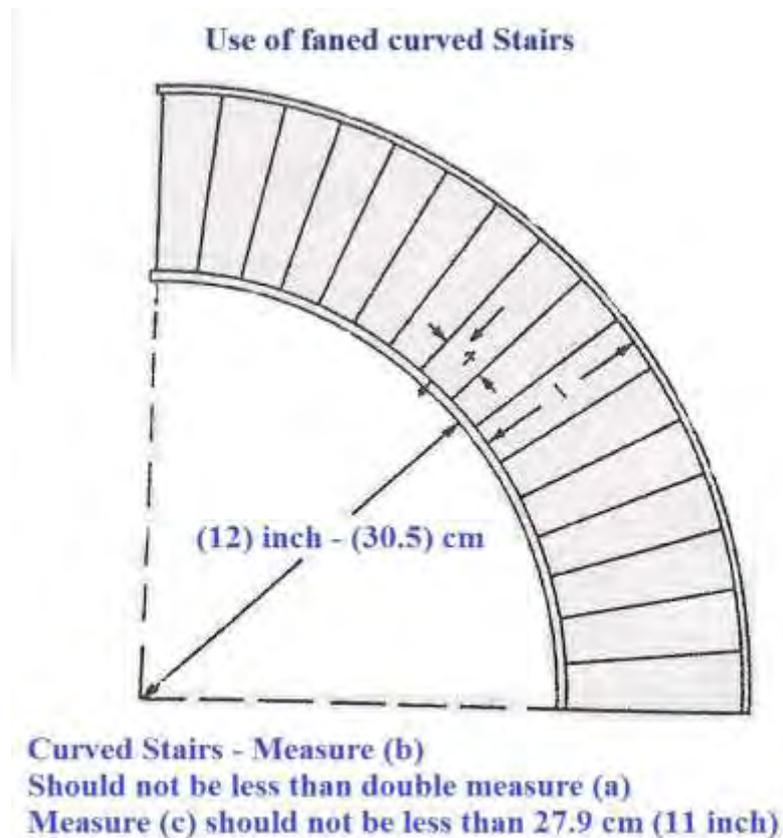


Figure 3.18

- 13.10 Fan shaped curved stairs may be used provided that the minimum width level should not be less than 25cm and the distance from the curve center to the beginning of the stair curve from the center direction should not be less than double the stair width.
- 14. Protection of escape means stairs from fire and smoke:** The stairs should be provided with the general requirements for protection from fire and smoke in accordance with the preventive requirements in construction areas in addition to these requirements.
 - 14.1 In the buildings the height of which is not exceeding six floors or those prescribed in the preventive requirements of buildings as per the type of use the stairs well should be separated from the building through insulated yard constructed in accordance with the stair itself requirements in terms of construction, ventilation and doors etc. so that double protection is provided to the stair.

14.2 It is preferred to keep the fire equipment in the insulating yard to ensure that they are placed in a protected position from fire hazard and can be used by fire extinguishing men as a beginning point for Firefighting.

15. Ventilation of escape means stairs: The staircase as the only escape mean in the repeated floors should be provided with satisfactory ventilation for discharging the smoke on leaking to the staircase well.

15.1 Ventilation may be provided through natural means as in the following cases:

15.1.1 Susceptive windows to opening on the external wall of the building with an area not less than 1.5 m^2 in each floor.

15.1.2 Permanent opening in the roof of stairs well with an area equal to 5% of the area of stairs well floor and not less than 1 m^2 or a susceptible window to opening by recognized manual mean which can be easily operated from ground floor through one motion.

15.1.3 In the buildings where it is not permitted to establish the stair on the external wall of the building the ventilation doors may face special light hole designed for this purpose which should not contain any services that could cause fire hazard.

15.1.4 Under any circumstances when it becomes necessary to keep the ventilation windows closed for any reason the windows should be susceptible to opening by the civil defense men during emergency through easily operated manual means by single motion. Such means should be placed in recognized salient positions such as the entrance and distinguished with guiding signal (written on it manual ventilation key).

15.2 Ventilation may be through mechanical means in the permitted buildings according to the preventive requirements of buildings as per the type of use.

15.2.1 The stair could be protected by pressure increase system rather than ventilation systems in order to keep them free of smoke. The pressure increase system should be designed in accordance with the recognized specifications.

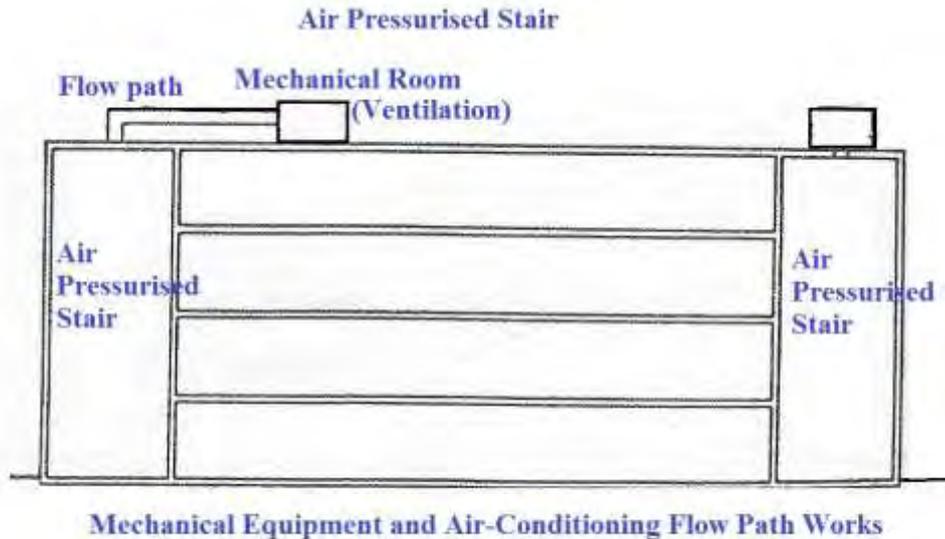


Figure 3.19

16. **Distribution of escape means stairs:** With the exception of the cases where the preventive requirements of buildings as per the type of use permit the stair should be on external walls of the buildings to avoid the creation of closed ends. As for single stair buildings the stair should be on the external wall of the building.

16.1 The stair should not continue from upper floors to the basement. The basement should have an independent stair. In the case where it is not possible to construct such independent stair the continuation should be in the ground floor through fire spread preventive barrier which rise to the roof. The entry to the basement should be directly from outside.

16.2 Guiding signals should be fixed inside stair well to indicate the floors numbers.

Relationship of Stair with the Building

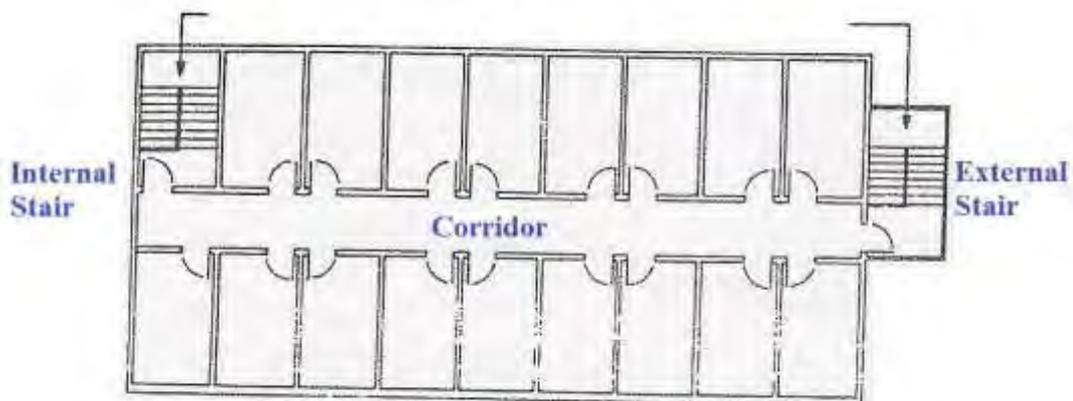


Figure 3.20

17. **External stair:** When the external stair is considered as part of the escape means it should be consistent with the internal stair requirements in addition to these requirements with the exception of fire protection requirements.

- 17.1 In certain special cases where the civil defense permits the external stair may be constructed of metal frame provided that it is treated for protection from climate factors.
 - 17.2 The external stair should be separated from the building by constructed walls from non combustible materials with the required fire resistant degree and the facing openings to the stair should be covered with fire preventive doors of automatic closure type and windows of fire resistant reinforced glasses per the following:
 - 17.2.1 Within a distance of 3m horizontally, vertically and in-depth.
 - 17.2.2 There is no need for such construction in the last floor if the stair is not extended to the surface.
 - 17.3 Guiding signals should be placed on the stair doors for indicating the floor number to which they lead.
- 18. Bridges, halls and external corridors:** When the bridges, halls and external corridors constitute part of the escape means the external stair requirements and these requirements should apply.
- 18.1 The height of the sides of openings facing the halls, bridges or external corridors should not be less than 2m and they should be constructed of bricks or concrete.
 - 18.2 The width should be satisfactory to absorb the persons who use them provided that it should not be less than 1,5m.
- 19. Ramps:** They are beveled roads, the alternative of the stair in the movement from one level to another in escape means. The prescribed stair requirements in general in addition to these requirements should apply.
- 19.1 The floors should be firm, coarse and non slippery
 - 19.2 The bevel percentage should be the same in all ramp parts.
 - 19.3 The platform should be used on changing path direction.
 - 19.4 The ramps percentage should not exceed 1:10.

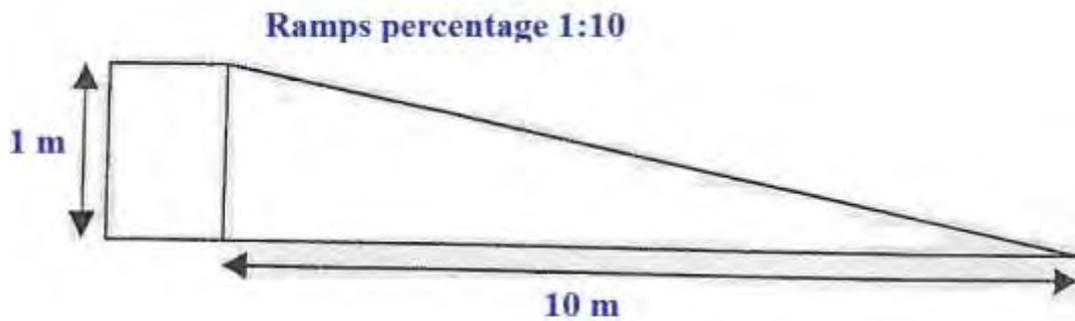
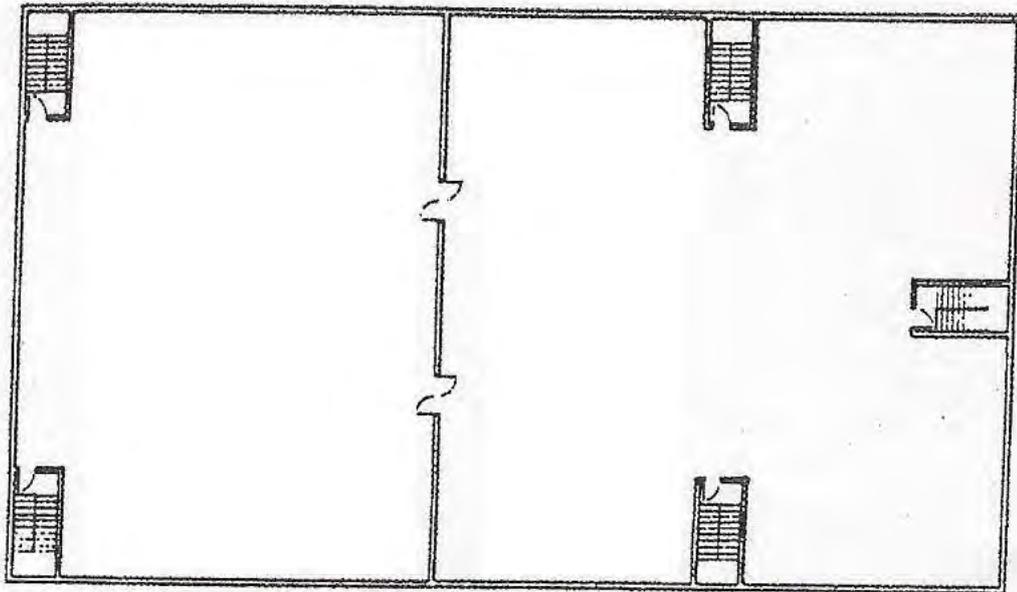


Figure 2.1

- 20. Final exit of escape means:** The escape mean should end at final exit that leads to outside part of the building or to the high way.
- 20.1 In the cases where special requirements permit 50% of the escape means at the most may end at positions inside the building with similar level to the final exit (ground floor normally) provided that the following is observed:
- 20.1.1 The movement from the end of the path such as the lower part of the stair to the final exit should be easy, clear and without any obstructions and distance should not exceed 15m
- 20.1.2 Provision of automatic water sprayers network.
- 20.2 The escape mean path may end at the surface if all escape means requirements are met so that another easy and safe path is made available which leads to the high way.
- 20.3 The wideness of the exit or the final exits should be satisfactory for discharging the existing persons in the building and should not by all means be less than the wideness of the escape paths which lead to them.
- 21. Vertical escape means exits:** Vertical escape mean is the one which leads to a safe point inside or outside the building and provides safe shelter for the people who are exposed to fire hazard.

Horizontal Escape Means Exits



Three Stairs to be used for two vertical exits

Figure 3.22

- 21.1 If both sides are considered safe positions another exit on the opposite direction so that safety is secured for all parts is secured for all parts with the suitable guiding signals.
- 21.2 The temporary exits should be alternative to the half of the original exits in the building at the most provided that the distance requirement is met and the temporary exits should include at least one stair which leads to the final exit.
- 21.3 The area of the safety place should be satisfactory to absorb the maximum number of people assumed to be in both sides on the basis of 0,3m² per person.
- 21.4 The safety place may be outside the building in a neighboring building, bridge or corridor which leads on their part the high way in accordance with the general escape means requirements.
- 21.5 The safety places to which the temporary exits lead should be attached to one user or tenant only with the exception of special cases which are approved by the civil defense.
- 21.6 Under any circumstances no lockers should be installed on temporary exits or any other mean which prevent their use at any time.

22. Private escape means: They are spiral stair ways, fixed upright ladders ,fixed beveled ladders and automatic emergency stairs.

22.1 Private escape means may be permitted to use in accordance with these requirements in the following cases:

22.1.1 Upright buildings where it is not possible to implement suitable escape means in accordance with the necessary requirements.

22.1.2 In limited cases and for serving limited persons such as machinery rooms and stair room on the surface, towers, factories ... etc.

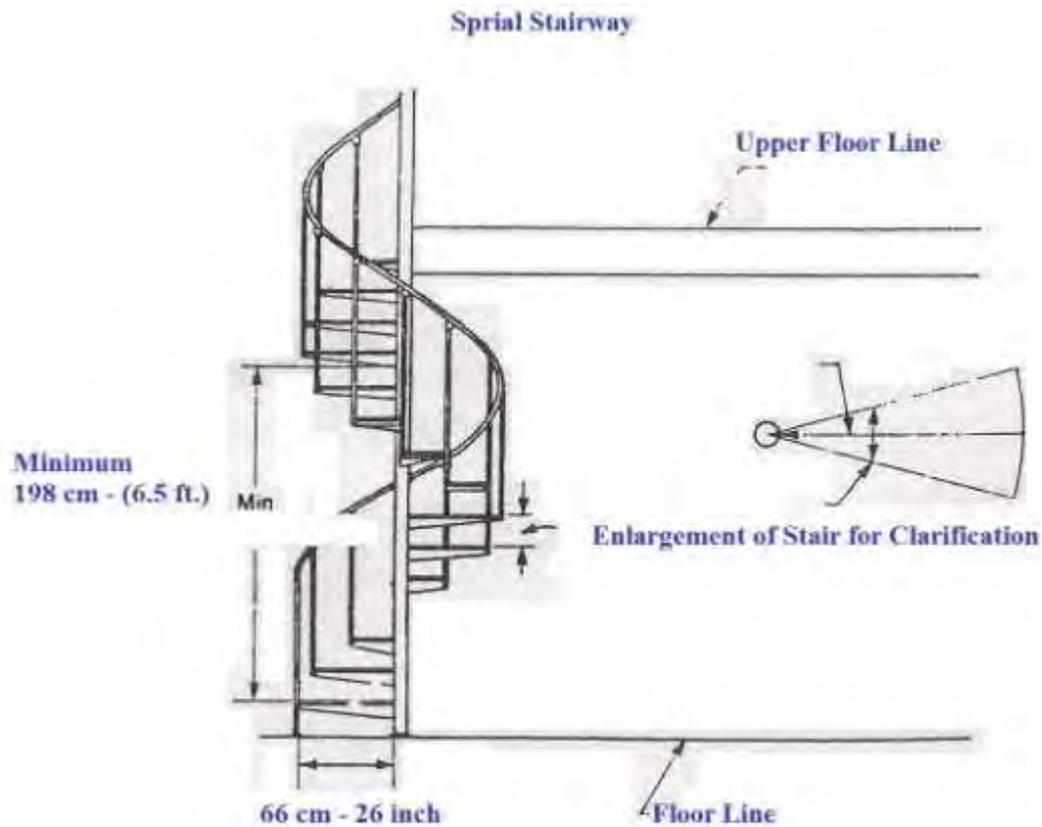
22.1.3 The private escape means may be one of the prescribed means in these requirements or any other means recognized by the civil defense.

22.2 The spiral stairway is permitted to be used for serving (5) persons at the most and in three floors only provided that the following specifications are met:

22.2.1 Diameter not less than 1,5m.

22.2.2 Stairway width not less than 19cm at a distant point of 30 cm from the center.

22.2.3 Single stair height should not exceed 25cm with height field of 2m.



- 22.3 **Fixed upright ladder:** It is permitted to use fixed upright ladder on the wall in exceptional cases for serving few number of persons working on the site only provided that a barrier is installed on its both sides which extends for one meter distance over the surface level where the ladder ends. If the ladder height is more than 9 m it should be totally covered with grid barrier for protection from falling.
- 22.4 **Fixed beveled ladder:** The fixed beveled ladder may be permitted to be used provided that the bevel angle with horizon is not exceeding 60 degree and the stairs width is not less than 13cm and the distance between them not exceeding 20cm. all these means should be constructed from non combustible materials which are treated for protection from corrosion and climatic factors and they should be firm, stable and connected firmly with the building.
- 22.5 **Automatic emergency stair:** In the cases where the civil defense permits the automatic emergency stair may be used which operates automatically provided that it is a recognized type by the civil defense.
23. **External windows:** It is prohibited to fix the barriers and obstructions on the windows of the external facades on the ground floor of the building unless they are easy to open and in accordance with special approval from the civil defense.

- 23.1 On the use of external windows as emergency exits their openings should be of satisfactory wideness for easy exit of people.

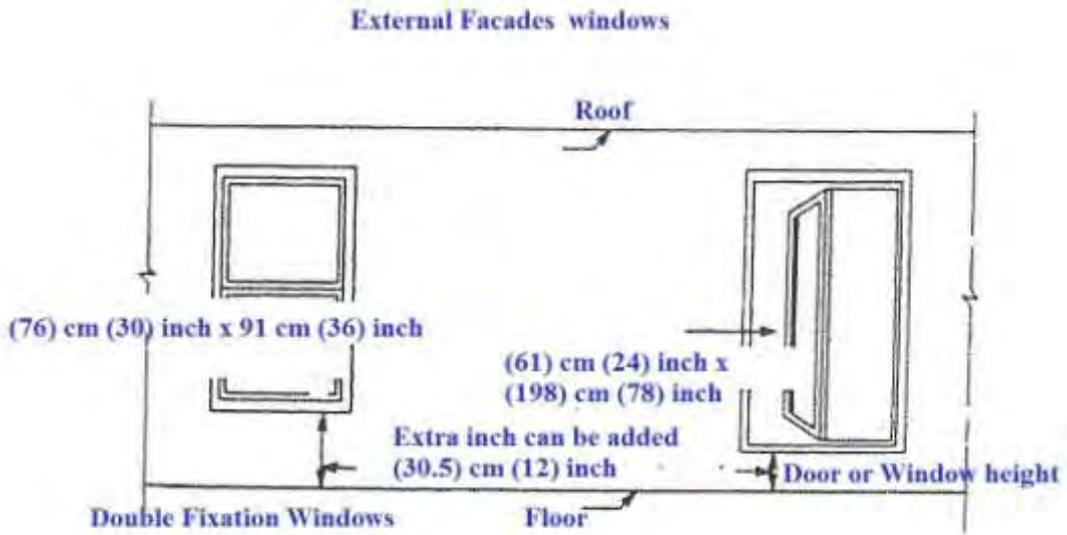


Figure 3.24

Chapter four

General requirements of engineering services

Code	General requirements of engineering services.
1	Ventilation and central air conditioning
2	Electrical extensions
3	Waste collection and disposal
4	Steam and hot water boilers
5	Mobile electrical stairs
6	Electrical lifts
6.4	Fire lift
6.5	Lift well
6.6	Lift motors room
6.7	Lift cabin
6.8	Lift supply with electrical current
6.9	Periodical maintenance and inspection of lifts
7	Liquid fuel tanks
8	Liquid fuel storage room
9	Gaseous fuel tanks
10	Cooking or heating vapors disposal chimneys
11	Ventilation and smoke discharge
12	Fire protection requirements for the central system of liquid gas fuel used in the buildings
12.1	Assessment of the size of central gas fuel tank
12.2	Selection of the size of central gas fuel tank

Code	General requirements of engineering services.
12.3	Specifications of central gas fuel tank and its fittings
12.4	Selection of the site of central gas fuel tank
12.5	Fence of the central gas fuel tank
12.6	Prevention requirements on using cylinders (mobile liquidated gas) in the central system
12.7	Storage of mobile liquidated gas cylinders
12.8	Organizer of mobile liquidated gas cylinders
12.9	Supply of liquidated petroleum gas through central network
12.10	Prevention requirements in supply pipes of liquidated petroleum gas (extensions)
	12.10.2 Prevention requirements for supply pipes of liquidated petroleum gas
	12.10.3 Prevention requirements in the selection of the site of supply pipes of liquidated petroleum gas.
	12.10.4 General prevention precautionary for protection from fire in the central liquidated petroleum gas system.
12.11	Ventilation and central air conditioning

1. The designing of the central air conditioning system include satisfactory precautionary for preventing fire and smoke spread through air conditioning channels in accordance with these conditions.
 - 1.1 On selection of the site of external air sources for air conditioning system it should be observed that they should not be neighboring places or sources which can be exposed to fire hazard.
 - 1.2 It is preferred to distribute air conditioning channels into decentralization form, i.e. to be distributed in independent sections each covers part of the building. As for the exposed locations to fire hazard such the kitchens and toilets separate air conditioning devices should be provided for them.
 - 1.3 The civil defense may request in special cases the installation of emergency key on the air conditioning device at the right time for serving the civil defense men.
 - 1.4 The buildings with closed facades due to air conditioning designing reasons should be provided with
 - 1.5 Special windows or openings in these facades to enable civil defense men to discharge the smoke in the building when fire occurs.
 - 1.6 The main channels of the air conditioning system should pass through vertical or horizontal corridors constructed of non combustible materials as fire preventive unit. There also should be suitable openings with fire preventive doors for facilitating the maintenance process.
 - 1.7 When the air conditioning channels penetrate the fire preventive walls or roofs in the building they should be of the same fire resistance degree as the walls and automatically closed by melting connection impact at temperature degree ranging between 68 -84 centigrade.
 - 1.8 The channels of central ventilation and air conditioning system should be provided with smoke detectors which operate automatically and stop the operation of the whole system on detecting the smoke and operate at the same time sucking fans for discharging the smoke from the building.

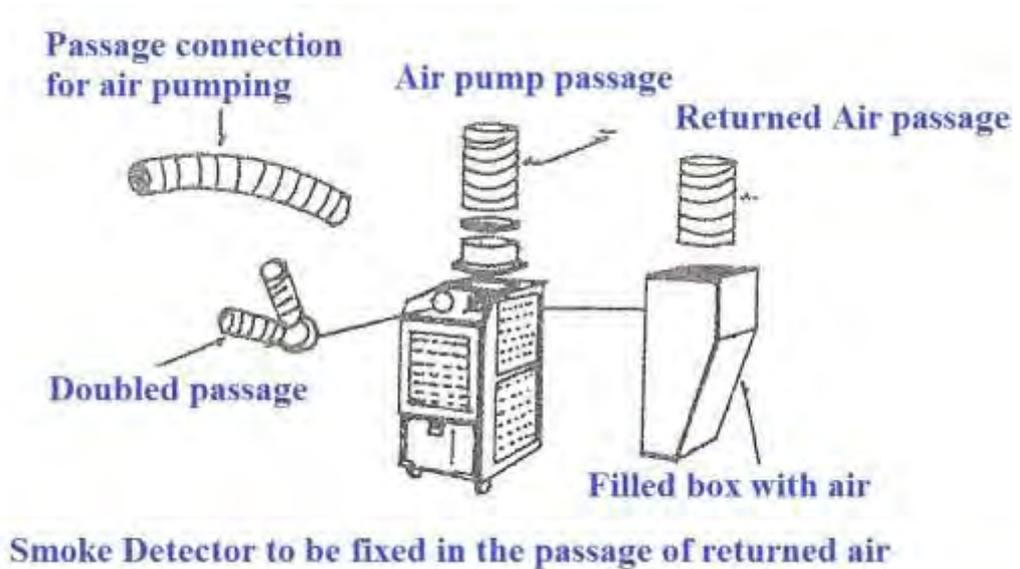


Figure 4.1

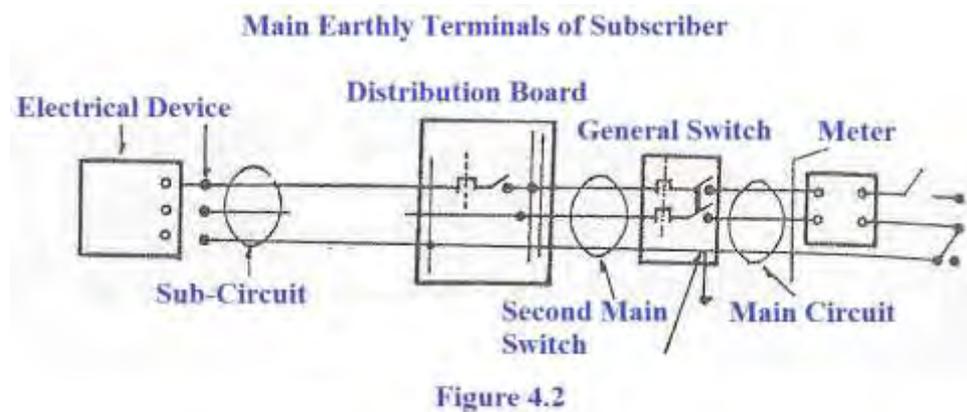
- 1.9 The insulating materials used in the wrapping of air channels both inside and outside should be of non combustible type with thickness not less than 3cm. combustible materials should not be used.
- 1.10 Air conditioning channels may be wrapped with combustible material in special cases to be determined by the discretion of the civil defense provided that the following is taken into consideration.
 - 1.10.1 The distance should be short.
 - 1.10.2 They should pass through corridors constructed of non combustible materials.
 - 1.10.3 Flexible connections of air channels should meet the following requirements.
 - 1.10.3.1 Should be of fire resistance material for at least half an hour.
 - 1.10.3.2 Should not generate heavy smoke on burning.
 - 1.10.3.3 Should not exceed a length of 25cm if they are at the beginning of the channels near air driving fans.
 - 1.10.3.4 If they are at the end of the channels their length should not exceed 4m and should not penetrate fire preventive wall or roof and should be placed in a location where fire hazard could occur such as kitchens.

1.11 In case the central air conditioning system is used for heating in addition to cooling it should be observed to comply with the preventive requirements of boilers and storage and burning of liquid fuel.

2. Electrical extensions:

2.1 The specifications of electrical extensions should be in accordance with the specifications of the Ministry of Electricity.

2.2 The electrical extensions and fittings should be proper in general so that they do not constitute a direct or indirect reason for fire and the network should be provided with electrical shock preventive device which operates automatically through ground connection or any mean recognized by the Ministry of Electricity.



2.3 The cables with firm connections should be extended through preventive pipes which do not allow any manipulation.

2.4 Open electrical extensions are accepted only in limited cases and for short distance not exceeding 3m provided that they are fixed and without any connections.

2.5 The connections which supply the devices and equipment with the current should be inside preventive, flexible and firm pipes.

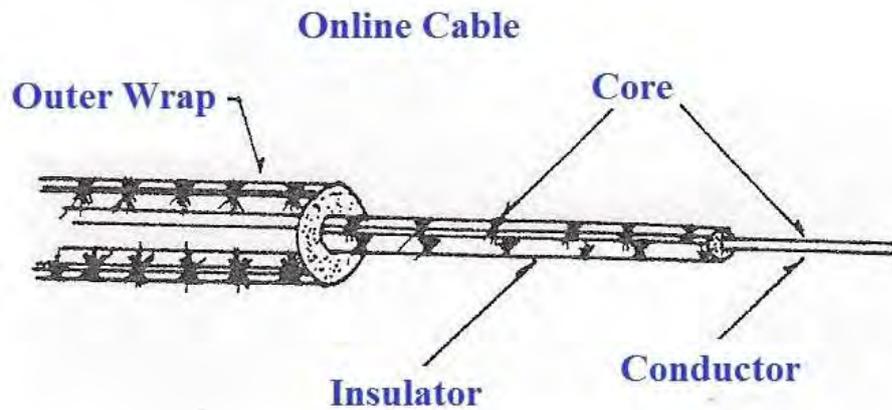


Figure 4.3

- 2.6 The extensions and existing electrical devices in the locations which are used for storage of powders, liquid or combustible gases should be of flame preventive type and firmly closed so that no electrical spark arises on operation and no gas leak inside the fittings such as the keys above 1,5 m on ground level.
- 2.7 The light bulbs at the storage locations should be with preventive cover made of grid and glass which form separation preventing the movement of heat through radiation to the combustible materials.
- 2.8 If electrical generator exists in the building it should be kept in a room specially constructed for this purpose from fire resistant materials for a period not less than (4) hours and isolated from the building as independent fire preventive unit which meet the following requirements:
 - 2.8.1 Its entry directly from outside
 - 2.8.2 Any existing openings in these units should not be connected with any section in the building.
 - 2.8.3 A pit under the generator should be allocated for the collection of oil in case of leakage so that it becomes easy to discharge and clean.
 - 2.8.4 It is preferred that the oil used for cooling is of non combustible type.
 - 2.8.5 The room should be provided with separate ventilation.
 - 2.8.6 Provision of the required safety equipment in accordance with the civil defense requirements.

- 2.9 The keys and sub –distribution boards should be placed in salient and easily accessible locations.
- 2.10 The main key and main distribution board should be placed in suitable location approved by the civil defense provided that:
- 2.10.1 It is adjacent to the main entrances.
- 2.10.2 It is preferred to be in isolated room from the building and opened directly.

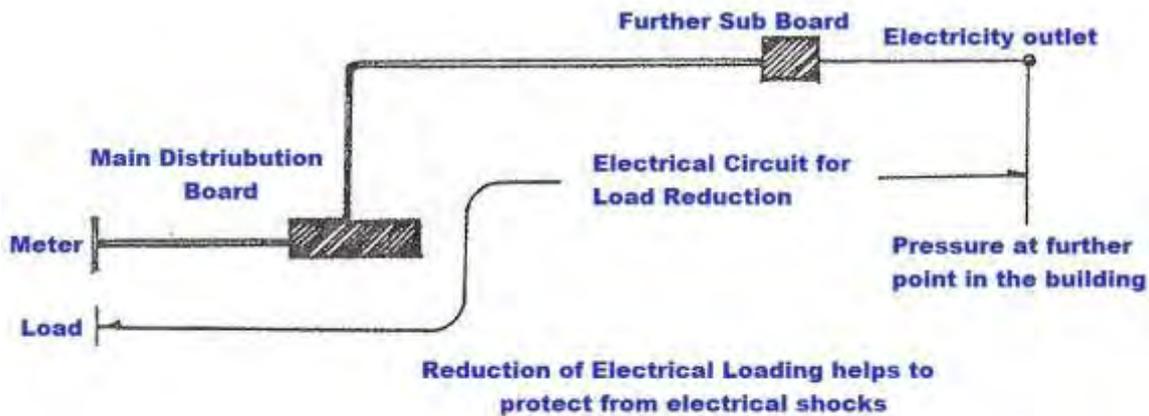


Figure 4.4

- 2.11 The indicative distinguished boards and guiding instructions should be placed on main and sub – key locations explaining the field and use purpose.
- 2.12 **The illuminant advertisement:** High pressure illuminant advertisements fixed on the facades and surfaces should be provided with circuit breaker key to be installed in a suitable location which does not allow any misuse and should be covered with glazed plate which can be broken for use by the civil defense men during emergency.
- 2.13 Necessary measures should be provided for protection from electricity through leaking electrical loads to the ground. These measures include placement of lighting preventive device in high buildings in accordance with civil defense and Ministry of Electricity requirements.

3. Waste collection and disposal:

- 3.1 The waste collection room should be constructed from non combustible materials with fire resistance degree not less than 4 hours provided that its door is also of similar fire resistance degree and closes automatically.
- 3.2 Waste transportation pipe should be established within the floors from non combustible material and should pass through separated vacuum from other parts of the building by fire resistant walls.

- 3.3 The waste room and the vertical pipe in major important buildings should be provided with automatic and manual means for closing the pipe in case of emergency and in accordance with the civil defense recommendations.
- 3.4 The pipe should be made of non combustible material and of fire resistance degree of 2 hours at least.
- 3.5 The pipe opening which receive the waste from the floors should be closed by fire and smoke preventive doors which close automatically.

4. Steam and hot water boilers:

- 4.1 The vapor and hot water boilers should be installed, used and maintained in accordance with the standard Gulf specifications “ principles and requirements of steam and hot water boilers inspection and selection” inclusive of all parts and special requirements prescribed by the civil defense.
- 4.2 The location of boilers room is preferred to be facing the external wall of the building and if this is not possible it should be observed on selection of the location that the direction of the explosion discharge should be towards the least damage location.
- 4.3 The boilers room should be constructed from fire resistant materials with resistance degree not less than 4 hours.
- 4.4 The entrance to the boilers room should be directly from outside and if this is not possible it should be observed that the room will not constitute any fire hazard to the main exit path in the building.
- 4.5 The boiler room door should be of fire resistant type for a period not less than 4 hours and automatically closed. Distinguishing sign should be fixed on this door.
- 4.6 Satisfactory natural ventilation should be provided to the boiler room in accordance with the ventilation and smoke discharge requirements.
- 4.7 Electrical extensions should be of special flame preventive type.

5. Mobile electrical lifts:

- 5.1 Each mobile lift requires study by the civil defense separately
- 5.2 On fixing mobile lifts it should be observed to prevent fire smoke spread through the existing openings on these lifts

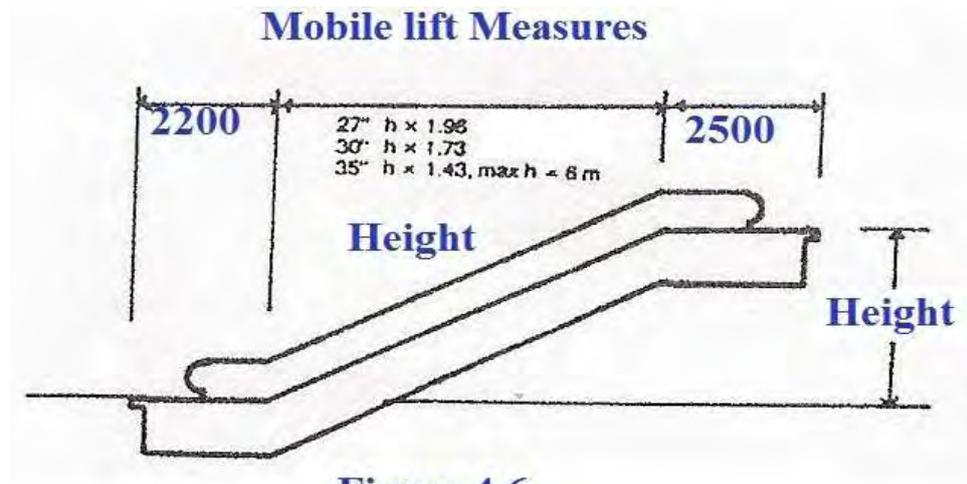


Figure 4.6

Explanatory Mobile Lift Drawing

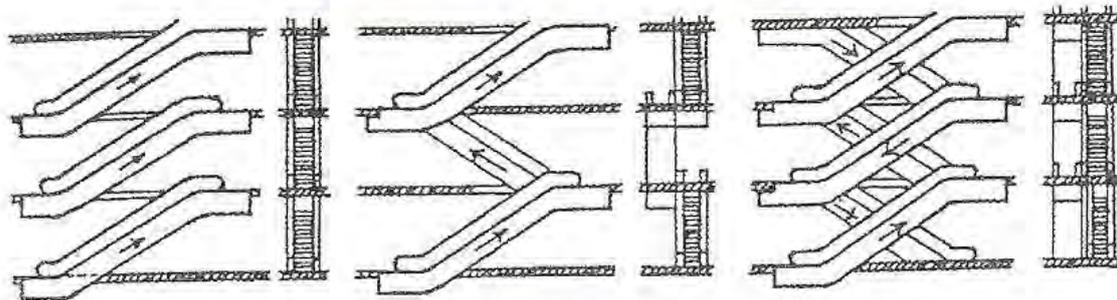


Figure 4.7

6. Electrical lifts:

- 6.1 The electrical lifts should be installed, used and maintained in accordance with Gulf standard specifications pertaining to electrical lifts for people, goods and the requirements issued by the civil defense.
- 6.2 It is totally prohibited to over load the lifts by more than the authorized load.
- 6.3 All lifts should come back to the ground floor and open their doors in case of fire event.

6.4 Fire lift:

- 6.4.1 When the height of the building exceeds 28m one lift or more should be allocated for the use of civil defense men.
- 6.4.2 Special key should be provided to the fire lift in order to control lift during the emergency. It should be kept in a closed tin fixed on the wall and covered with glass cover distinguished with clear sign and placed in a suitable location in the ground floor.

- 6.4.3 It is appropriate to supply the fire lift with the current from other source than the source which supply the building with the electrical current so that it will be operating even if the electrical current is disconnected during emergencies.

6.5 Lift Well:

- 6.5.1 The lift well and the equipment and transformers room should be built from fire resistant materials with a resistance degree not less than two hours.
- 6.5.2 The lift well should be protected from the vertical fire and smoke movement to other floors.
- 6.5.3 The lift well in the floors should face a separated yard from the building by walls and doors which are preventive to spreading of fire and close automatically.
- 6.5.4 The lift well may be permitted to exist in the stair well as long as prevention requirements for protection from fire are made available.
- 6.5.5 The lift well should not form part of the ventilation system in the building.
- 6.5.6 Satisfactory ventilation should be made available for discharging the smoke in the event of fire incident in the lift well.
- 6.5.7 It is totally prohibited to use the lift well for any other purpose other than lift fittings.
- 6.5.8 It is prohibited to create any openings on the lift well other than the allocated doors for the lift.
- 6.5.9 It is prohibited to cover or paint the internal walls of the lift well with non fire resistant materials.
- 6.5.10 A copy of the key of the external door of the lift well should be handed over to the civil defense.

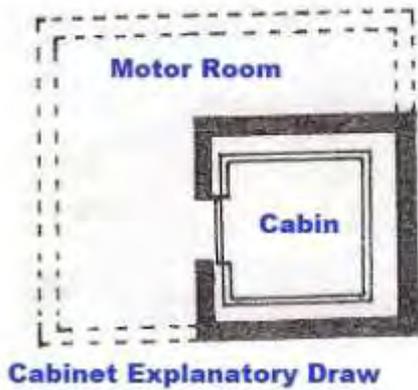


Figure 4.8

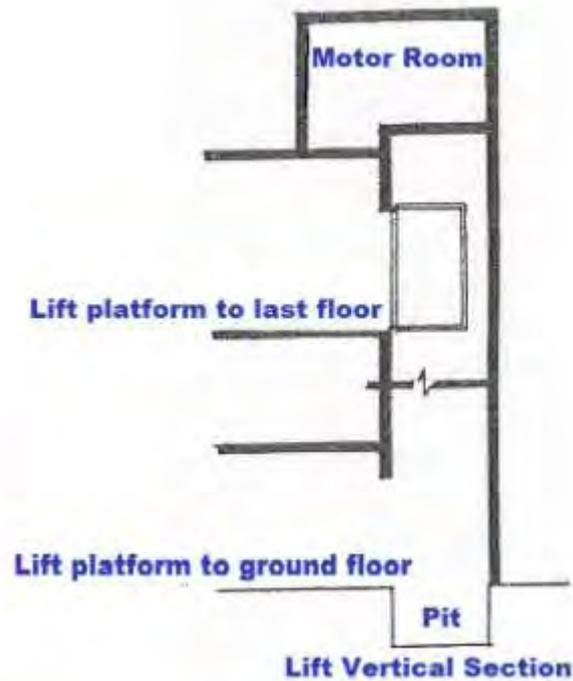


Figure 4.9

6.6 Lift Motors room:

- 6.6.1 The lift motors room should be constructed from non combustible materials in accordance with Gulf standard specifications” electrical lifts for individuals and goods”
- 6.6.2 It is prohibited to allow the existence of any openings between the lift motors room and the lift well with the exception of the openings designated for the ropes and other necessary extensions.
- 6.6.3 Satisfactory ventilation and lightening should be provided to the motors room.
- 6.6.4 If the building stair does not reach to the motors room level stable and proper stair should be provided from non combustible materials.
- 6.6.5 Barriers should be installed for protection from falling around surface edges or existing openings in the path of motors room.
- 6.6.6 A box should be fixed in the motors room with reinforced glass cover for keeping the manual tools and equipment such as the keys, operation tools, rope extension, fixing tools, the key of the external door of the lift well and any other tools and equipment pertaining to the operation and light maintenance of the lift.

6.7 Lift cabin:

- 6.7.1 The cabin frame and internal covers and paint should be of non combustible materials.
- 6.7.2 Internal door should be provided to the individuals lift cabin so that it will not operate before it is closed to prevent stuffing the users' organs or their clothes between the cabin and the lift well wall.
- 6.7.3 The roof of the lift cabin should be provided with an opening for rescue purpose satisfactory for the entrance or exit of one person in accordance with Gulf standard specifications, “ Electrical lifts for individuals and goods”.
- 6.7.4 The cabin should be provided with ventilation fan suitable for the size and capacity of the lift.
- 6.7.5 The individual lifts should be provided with guiding boards which include:
 - 6.7.5.1 A board indicating that children under fourteen years of age are not allowed to use the lift on their own without being accompanied with an adult person.
 - 6.7.5.2 A board indicating that smoking is not permitted inside the lift cabin.
 - 6.7.5.3 A board indicating the permitted load of the lift and the maximum number of the users.
 - 6.7.5.4 Placement of distinguishing signs on the keys of cabin buttons indicating the type of use.
 - 6.7.5.5 A board indicating the name of the agent and his telephone number and the responsible authority of the maintenance and its emergency telephone numbers.

6.8 Lift Supply with Electrical Current:

- 6.8.1 The electrical current lines which supply the lift with the power and light should be provided with special main switch (other than the existing switch in the motor room) at the main switches of the building.
- 6.8.2 The electrical current lines are connected with special electrical circuit not linked with any other services other than the lift.
- 6.8.3 Special sign should be placed to indicate the electrical switches of the lift.

6.9 Periodical maintenance and inspection of the lifts.

- 6.9.1 After lift installation it should be inspected and approved by specialized and technically authorized agent who is recognized by the civil defense as per the Gulf standard requirements.
- 6.9.2 Each lift should receive regular service covering periodical maintenance works from experienced agents in lift s maintenance works recognized by civil defense.
- 6.9.3 The periodical maintenance and repair works and their dates records should be kept in the lift motors room.
- 6.9.4 The responsible authority of periodical maintenance works is also responsible of meetings repairs requirements when the lift is not operational and its services should be available throughout the day (24 hours).
- 6.9.5 The responsible authority of the periodical maintenance and the entrusted agent with the inspection should notify the official responsible authority immediately in the following cases.
 - 6.9.5.1 On formulation or cancellation of lift maintenance contract.
 - 6.9.5.2 When the inspector notices any defect that may affect the safety of lift users.
 - 6.9.5.3 When the building owner refuses to implement the required maintenance works.
- 6.9.6 The civil defense is the arbitrator for the settlement of the disputes that may arise between the relevant parties in this regard or the violations that may occur to these requirements.
- 6.9.7 The building owner should take the necessary action for securing the safety of the lift.
- 6.9.8 A responsible person such as the guard of the building or lift operator should be trained on lift operation in the normal conditions and how to act during emergencies and out of work incidents and to notify the authorized maintenance agent and to report to the civil defense in the event that they refuse to comply with the maintenance request.

7 Liquid fuel tanks:

- 7.1 The liquid fuel tank should be buried under the ground and if that is not possible it should be kept in an independent room from the building and should be provided with fire protection requirements including:

- 7.2 The design of the connecting pipes with fuel and oil burning equipment in general in accordance with the recognized specifications by the countries of Gulf co operative council for Arabian Gulf countries.
- 7.3 The tank should be stable and firm and does not permit any leakage or filtration.
- 7.4 The liquid fuel supply pipes should be made of firm and durable pipes which do not permit leakage.
- 7.5 Liquid fuel supply network should be provided the necessary valves for closure at suitable locations so that they become easily accessible and indicated by distinguished signs the most important of which are:
 - 7.5.1 Main closure valve at the beginning of the line at the tank.
 - 7.5.2 Main closure valve at fuel burning device.
 - 7.5.3 Automatic valve operates by heat impact to be installed outside fuel burning device room so that fuel supply to the burning device will be stopped on fire incident which operates through melting connection or any other suitable mean. In addition to that other manual closure mean should be provided to be used in the event the automatic valve becomes non operative.
- 7.6 The design of fuel burning device should provide fire preventive means on operation.
- 7.7 The extensions or their path should not be constructed adjacent to any heat source.

8 Liquid fuel tank room:

- 8.1 Stable fuel tank should be kept in special room constructed from fire resistant materials and with resistance degree not less than 4 hours and it is preferred to bury the tank under the ground.
- 8.2 Satisfactory natural ventilation should be made available to the liquid fuel tank room at the upper and lower part levels of the room so that it will drive out the vapors outside the building.
- 8.3 It is preferred that the room will be facing the external wall of the building.
- 8.4 The fuel tank room should be distant from boiler room in order to prevent heat movement to it.
- 8.5 Electrical extensions should be of special flame preventive type.

- 8.6 The room door should be of fire resistant type with resistance degree not less than 4 hours and automatically closed with distinguished sign fixed on it.
- 8.7 A sill should be constructed at the door with suitable height so that it will form with the walls satisfactory basin for withholding the stored liquid quantity with 10% increase.

9 Gaseous fuel tank

- 9.1 The extension and storage and burning of gaseous fuel should be in accordance with the specifications and requirements pertaining to central gas system and the civil defense requirements in general.
- 9.2 The extensions and gas supply pipes should be painted in yellow color.
- 9.3 The gaseous gas fuel extensions network should be provided with main closure valve to be outside the building if the source is from the main gas pipelines in the city and at the beginning of the line if the source is normal gas cylinders.
- 9.4 The gas pipe line network should be provided with sub – closure valves at the beginning and end of each flexible connection in the building.
- 9.5 The gaseous fuel use locations should be provided with sensing devices for liquid fuel vapors and gases.
- 9.6 The main and sub – closure valves should at easily accessible locations which are approved by the civil defense and distinguished by clear and remarkable signs.
- 9.7 The gas pipes and their path should not be constructed adjacent to any heat source.

10 Cooking or heating vapors discharge chimneys:

- 10.1 The furnaces and burners and their alike such as cooking and heating equipment should be provided with smoke exits which lead to the outside area.
- 10.2 The chimneys should be made of non combustible materials and with satisfactory fire resistance degree.
- 10.3 If the chimneys location is inside the building the internal surface should be arranged for facilitating the removal process of accumulated carbon and any other precipitations.
- 10.4 If the chimney is of metal plates, its thickness should be satisfactory and the chimney connections should be fixed firmly and it should be fixed on surrounding walls by durable tension cables.

- 10.5 The chimney should be provided with openings for cleaning and inspections. These openings should be with suitable measures in accordance with the nature of the location especially at the curves.
- 10.6 The height of the chimney over the highest point in the building should be one meter and 3 meters over the height point of the surrounding buildings within a circle with half diameter of 23m.
- 10.7 The chimney should not be connected close to combustible materials.

11 Ventilation and smoke discharge: The ventilation and smoke discharge is addressed for the sake of prevention from fire as follows:

- ▶ Ventilation for smoke discharge in order to secure the safety of the individuals and protect the building
- ▶ Ventilation for driving away combustible vapors and gases and powders.
- ▶ Ventilation for smoke discharge in order to assist the civil defense men in controlling the fire incident.

11.1 **Ventilation for safety of individuals:** Satisfactory ventilation should be provided in the exit path and in any part of the building where people may meet.

11.2 **Ventilation for controlling fire incident:** Satisfactory ventilation should be provided for driving away combustible vapors, gases or powders so that their concentration in the air will not reach burning or explosion degree. This ventilation means are as follows:

11.2.1 Pumping or providing local ventilation means at the various locations used for storage, operating the liquid burning devices or burning gases.

11.2.2 Pumping or providing local ventilation means to the mechanical equipment and vapors as per their preventive requirements.

11.2.3 Mechanical ventilation when the natural ventilation is not satisfactory or not efficient.

11.3 The natural or mechanical ventilation process should be integrated so that it will secure the required efficiency for renewal of air in the location within certain period of time based on the size of the location and type of use and the contents and in accordance with the preventive requirements of fire incident. The concerned engineer should submit the required study in this regard

11.4 Natural or mechanical ventilation should be provided in all buildings and establishments.

- 11.5 The ventilation is carried out through openings in the upper roof which remain opened permanently and if it is necessary to close them they should be fitted to be susceptible to opening in the event of fire incident by any one of the following means or any other mean approved by civil defense.
- 11.5.1 **Automatically:** through melting connection or warning system.
- 11.5.2 **Manually:** through easy manual mean to be placed at suitable height from ground level in easily accessible location to be approved by civil defense.
- 11.5.3 **Openings coverage:** through plates made of quick melting material by the impact of the heat arising from fire incident in special cases to be determined by the civil defense.
- 11.5.4 The ventilation system calculation should be in accordance with the international systems and the civil defense requirements.

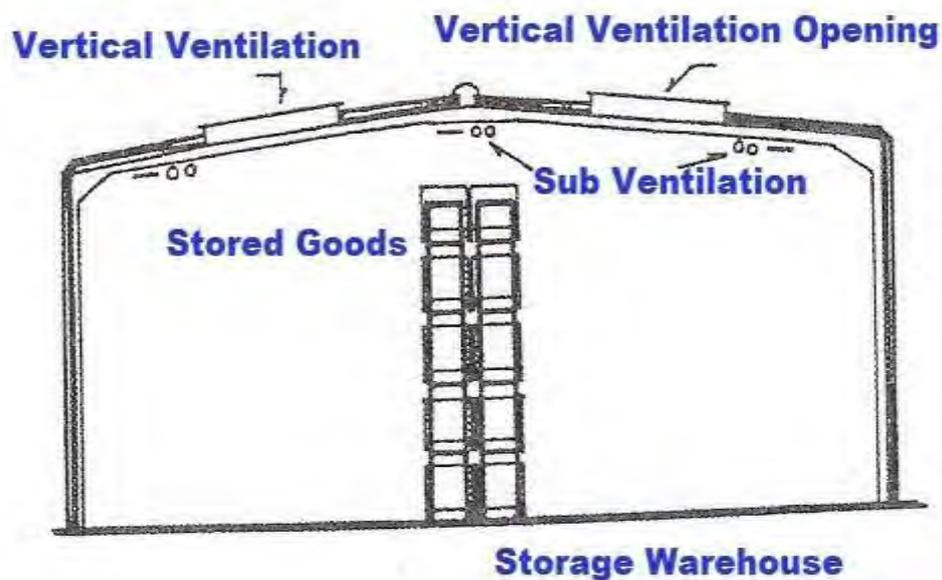


Figure 4.10

- 12 **Fire Protection requirement for central system of liquidated gas fuel used in the buildings:** Include gas extensions from tank or cylinder or small gas station meter to the consumer unlike mobile cylinders which are transported each time for filling.

12.1 Assessment of the size of central fuel gas:

- 12.1.1 The size of the tank is estimated on the basis of the highest gas with drawl per hour and the quantity of the required storage in addition to the area of location where the tank will be placed in accordance with the security and safety requirements.

$$\frac{\text{Size of the tank in liters} = \text{Consumption quantity in pounds per month} \times 1.5}{0.7 \times 1.272}$$

As 70% of the utilized size of the tank = 0.7

(Maximum use is 58% of the tank size)

One liter of liquidated gas petroleum = 1.272 pound.

12.2 Selection of the size of central gas fuel tank:

- 12.2.1 The tank size selection is usually done as per the estimation and comparison with the manufactured sizes which range between 380 – 880 liters for residential projects and up to 500 liters for commercial projects. It is preferred that the size of the tank will be satisfactory for (6) weeks i.e. one month and a half in order to secure gas supply with more safety and without disconnection to the consumer.

12.3 Specifications of central gas fuel tank and its fittings:

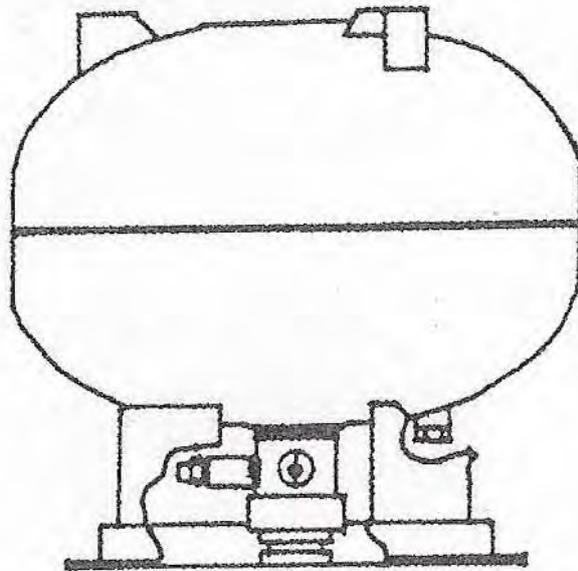
- 12.3.1 The tank should be made in accordance with standard international specifications. The tank should be provided with the necessary fittings on a yard which permits the filling and use of the gas with complete safety. Such fittings should be under closed cover if the tank is at a fence less location.
- 12.3.2 The central gas fuel tank contains the following fittings:
- 12.3.2.1 Gas level watch
 - 12.3.2.2 Small valve (1.5 mm or less) for monitoring the highest level on filling.
 - 12.3.2.3 Closure valves on the connected lines with the tank. i.e. the filling and use lines with the addition of withdrawal monitoring valve on gas fuel line.
 - 12.3.2.4 Relief valve which should be of internal or external type provided that the relief is carried out at the rate of one cubic meter per minute.

- 12.3.2.5 Monitoring valve on filling line if the filling point is above the tank surface. If the filling point is at the end of connected with the tank a second monitoring valve should be placed at the end of the line.
- 12.3.2.6 Gas level watch allows the opportunity to the consumer to know the percentage of the liquid gas level.
- 12.3.2.7 First grade pressure organizer on use line which provides the gas with the appropriate pressure for the consumer. There is also a closure valve between the tank and pressure organizer when necessary. The valve has a red color key.

12.4 Selection of the site of central gas fuel tank:

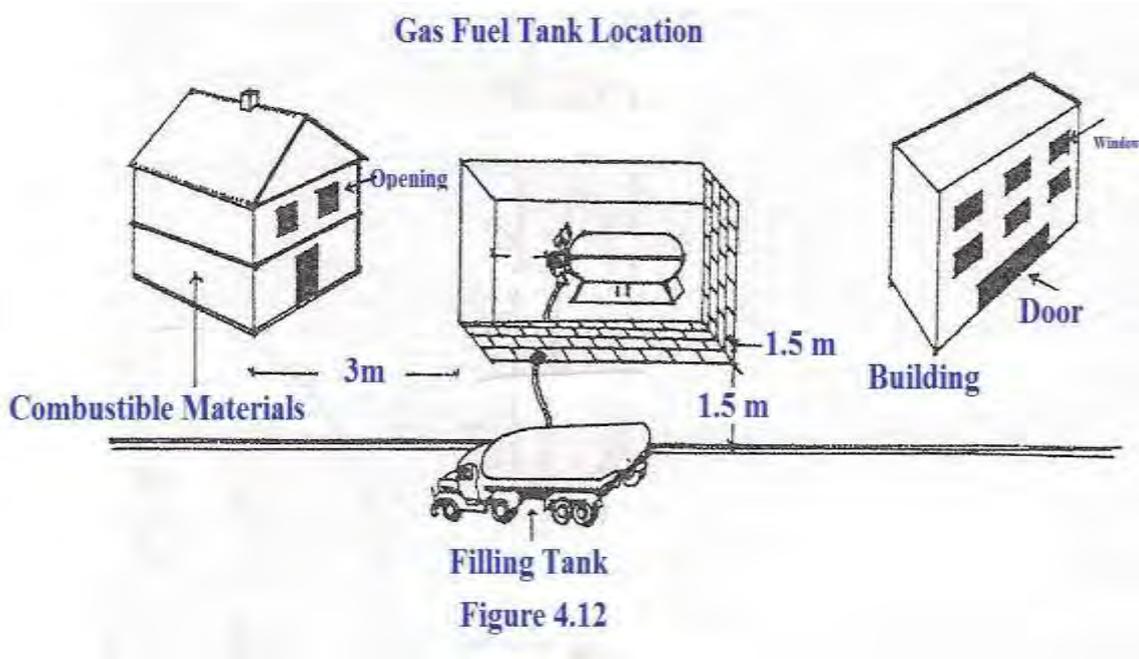
- 12.4.1 The tank under any circumstances should not be surrounded by anything at a distance of 60 cm.
- 12.4.2 Any opening at any beginning should be at a distance from the tank wall not less than 1.5 m.
- 12.4.3 The distance from the tank wall to the ownership end line should not be less than 1.5m and this distance may be 60cm if there is a wall at the end of ownership line.
- 12.4.4 The distance from the tank wall to the point where combustible materials are existing should not be less than 3 m.
- 12.4.5 The distance from the tank wall to the burning point should not be less than 3 m.
- 12.4.6 The distance from the tank wall to the high way should not be less than 1,5m provided that a distance not less than 3m should be kept from the tank fittings.
- 12.4.7 The distance from the tank fittings to the electrical equipment should not be less than 3 m if they are of non acceptable type to be used in susceptible mean to burning.
- 12.4.8 The distance from the tank fittings to the non protected ground openings should not be less than 3 m.
- 12.4.9 The distance from the tank wall to the filling tank should not be less than 1.5m.
- 12.4.10 The separating distance between the tanks should not be less than 60cm.

12.4.11 The civil defense on issuing the permit for the construction or operation may request suitable preventive alternative to the selection of central gas fuel tank location



Explnatory Gas Tank Drawing

Figure 4.11



Filling Tank
Figure 4.12

12.5 Central gas fuel tank fence:

12.5.1 It should not be permitted to build more than two walls and the height of each wall should be suitable so that the horizontal distance for any gas leak will not be less than the previously mentioned distances.

12.6 Prevention requirements on the use of cylinders (mobile liquidated gas):

12.6.1 The station should be composed of two cylinders over regulator change. If the station is to supply several types of use, the number of cylinders should not be less than four or six big size types while selecting the suitable size for the regulator. The most used ones are (100 pound) and (50 pound) capacity as for the operation of normal cookers.

12.7 Mobile liquidated gas cylinders storage.

12.7.1 The cylinders should be placed in vertical position and should be stable so that it will not require more protection. The distance between the cylinders and any opening in the building should not be less than 1m and the heads of the cylinders and the regulator should be of less weight than the windows line by 30cm.

12.8 Mobile liquidated gas cylinders regulator:

12.8.1 The connected regulator with the cylinders through special hoses reduces the pressure to 37mmb. If the regulator power is 4kg/hr at one stage, or to 1.5 mmb. if the regulator is of higher size up to (40 kg/hour). The regulator should reduce the pressure to 37mmb. in the second stage.

12.8.2 When the operating cylinders become free of gas the regulator withdraws gas from reserve cylinders and isolates the empty cylinders.

12.9 Supply of liquidated petroleum gas from central network:

12.9.1 For supplying two locations or more from one tank a meter should be installed with the second pressure regulator at each consumption point. The gas should be distributed to the consumption point by pressure regulator which begins immediately after the tank. Each location should also be provided with second pressure regulator which includes several safety devices.

- 12.9.2 One of the second pressure regulators is the provision of safety inside the building through monitoring the withdrawal and the normal pressure. Therefore it performs the role of monitoring valve which closes the gas automatically whenever the pressure is changed from the normal level. If it becomes defective it should be re operated under the supervision of specialized technician to ensure the safety of the extensions.

12.10 Prevention requirements in liquidated petroleum gas supply pipes (extensions):

12.10.1 Materials:

12.10.1.1 The pipes should be of good quality type from iron or copper (with operation pressure 4b) and should be manufactured in accordance with the recognized international specifications.

12.10.1.2 The distribution should be in copper or iron pipes and the selection should be based on the size and light pressure (28 – 37 or 50 mmb. operation pressure). For example if its intended to provide short distance extensions including cookers the proper selection will be to choose copper pipes (3/8 or ½ inch) manufactured in accordance with the standard specifications.

12.10.1.3 This should be for the internal extensions which operate through light pressure.

12.10.1.4 Galvanized iron pipes also may be used for internal extensions which operate through light pressure for industrial and commercial projects and also domestic projects.

12.10.2 Prevention requirements for liquidated petroleum gas supply pipes:

12.10.2.1 The internal lines installation should apparent at high, low level, hung on the roof level or under the ground.

12.10.2.2 The pipes may be installed in readymade canals on the ground which should be protected from corrosion by the protective tape.

12.10.2.3 The pipes may be also tightened on the building wall at a high or low level until the consumption point.

12.10.2.4 In case of penetrating the wall especially the two fold one the pipe should pass upright through protective

pipe of greater size. The wall width should be estimated without any welding. The gas pipe should be fitted in the protective pipe in a manner which secures that the gas will not second pipe or from the latter to the wall or the ground. The gap between the two pipes should be filled with flabby materials and provided with barrier at the utmost parts.

12.10.2.5 Regardless of the gas pipe passage form it should be accurately tightened and tied to the wall.

12.10.2.6 In case that the gas pipe is placed directly in a ditch, its gravel free flatten depth should not be less than (50cm) so that the pipe protection will not be affected.

12.10.3 Prevention requirements in the selection of the site of liquidated petroleum gas supply pipes:

12.10.3.1 If the liquidated petroleum gas supply pipes are under the ground, the distance which separates the gas pipe from other services lines should not be less than the following:

12.10.3.1.1 30cm from petroleum, water and sewerage lines.

12.10.3.1.2 20 cm from electrical cables.

12.10.3.1.3 10cm from any other lines.

12.10.3.3 If the liquidated petroleum gas supply pipes are apparent the distance which separate the gas pipe from other service lines should not be less than the following:

12.10.3.3.1 3cm if it is parallel to electrical line, steam or hot water line.

12.10.3.3.2 1 cm if it is crossing electrical line, steam or hot water line.

12.10.3.3.3 If the pipe is buried under ground or in a wall, the distance of the pipe from the final surface should not be less than 1cm.

12.10.4 Prevention requirements of connection of burners with the liquidated petroleum gas pipes:

12.10.4.1 The burners should be connected with copper or iron pipes and bolt should be fitted to facilitate the dismantling and fastening in future.

12.10.4.2 Rubber hoses may be used after the second regulator of the low pressure provided that the length of the hose should not exceed 6 feet (180cm).

12.10.4.3 A valve should be provided to each gas device which shall be close to it to facilitate isolation and disconnection without interrupting gas supply to other units. This valve should be in accordance with recognized specifications.

12.11 General prevention precautionary for protection from fire in the central liquidated petroleum gas system:

12.11.1 The civil defense should be notified about the precautionary means against fire at the designing stage of the project and during implementation stages and after operational stage.

12.11.2 All extensions of the central gas system should be exposed to trials with the suitable pressure to ensure that they are fully accurate and free of any defects or short comings before operating them with gas.

12.11.3 Provision of the appropriate warning and extinguishing systems for the liquidated petroleum gas and placing them in strategic and close locations to the gas station.

12.11.4 Placement of warning boards for the safety of the surrounding area of the tank such as no smoking, signs of gas tank and location of combustible materials etc.

12.11.5 The internal kitchens should be provided with warning devices against gas leakage. These devices should automatically disconnect the gas supply in the event of the leakage.

Chapter five

Prevention and protection requirements from fire in assembly buildings:

Code	Prevention and protection requirements from fire in assembly buildings.	
1	Definition	
2	Fire hazard	
3	Construction requirements.	
4	Mixed use.	
5	Fire spread control.	
	5.1	Horizontal spread.
	5.2	Vertical spread.
	5.3	External spread
	5.4	Arrival of civil defense machinery
6	Escape means	
	6.1	Absorption capacity
	6.2	Wideness
	6.3	Movement distance
	6.4	Exits.
	6.7	Stair way
	6.8	Final exit
	6.9	Warning and firefighting equipment.
7	Engineering services.	
8	Special preventive requirements.	
9	“ Cinema and theatre premises”	

Prevention and protection requirements in assembly buildings

Table number	Table title
5.1	Number of exits for public halls in cinema and theater premises.
5.2	Firefighting equipment for assembly buildings as per the category, height and construction classification.
5.3	Firefighting water sprayers requirements for assemblies buildings as per the category, height and construction classification
5.4	Engineering services concerning the prevention from fire in assembly buildings

1 Definition of assembly buildings:

1.1 They are the designated building or their parts for the assembly of (50) persons or more for the creation, cultural, sports, presentation purpose such as:

- ▶ Worship halls
- ▶ Lectures halls
- ▶ Presentation halls
- ▶ Museums and theatres
- ▶ Sport clubs.
- ▶ courts
- ▶ meetings halls
- ▶ banks halls
- ▶ main libraries
- ▶ Covered play grounds.

1.2 Assembly buildings are divided in terms of absorption to the following categories:

- 1.2.1 Category (a) buildings include more than 1000 persons.
- 1.2.2 Category (b) buildings include between 300 – 1000 persons.
- 1.2.3 Category (c) buildings include between 50 – 300 persons.

- 2 **Fire hazard:** Fire hazard classification in the buildings: Assembly as of light hazard
- 3 **Construction requirements:**
 - 3.1 Preventive precautionary requirements should be applied in engineering fields in general for securing the safety of construction frame from fire hazard.
 - 3.2 The validity of buildings from construction point of view for use purpose by assembly should be determined in accordance with table no. 1.2 buildings classification in terms of fire resistance.
- 4 **Multipurpose use:**
 - 4.1 In case the assembly building is used for other purposes or the assembly forms a part of buildings which are used for other purpose they should be separated from each other to constitute a fire section provided with independent escape means.
 - 4.2 The buildings of (a) category or their parts should not be sharing any other type of use with the exception of the attached or connected uses with the assembly nature such as restaurants, cafeterias etc. As for the other cases they should be studied each one separately and the civil defense will take the proper decision in this regard.
- 5 **Fire spread control:** General requirements for preventive precautionary should be applied in engineering fields in addition to these requirements:
 - 5.1 Various sections in the assembly building should be separated from each other and each should be considered as separate fire section such as the public hall, theatre, waiting hall, dressing room, actors and decoration room. The multipurpose use location also should be separated.
 - 5.2 **Vertical spread:** Each floor is considered independent fire section. In case there is atrium special requirements should apply.
 - 5.3 **External spread:** The preventive precautionary requirements in engineering fields should apply with regard to the distance between the buildings and external walls.
 - 5.4 **Arrival of civil defense machinery:** It should be made easy for the arrival of civil defense machinery and equipment to the assembly buildings.
 - 5.4.1 A road or path should be made available to reach the surrounding area of the assembly buildings. So that the civil defense machinery can reach to two facades of the building at least to be facing the main entrance of the building

- 5.4.2 Designated parking locations should be made available for the machinery and vehicles of the civil defense around the building in accordance with the site organization requirements.

6 Escape means (emergency exits):

- 6.1 The general requirements of escape means should be applied in addition to these requirements.
- 6.1.1 The escape means from the assembly hall should be totally independent from other sections in buildings of category (a) and (b) such as theaters, actor's room, stores, workshops etc. which should be provided with totally independent escape means leading directly to the outside area.
- 6.1.2 All escape means should be protected from fire as fire section constructed of non combustible materials with fire resistance degree not less than one hour and fire preventive doors for one hour which close automatically.
- 6.1.3 In all buildings of (a) and (b) category the access to the exit or stair should be through protected space from fire in accordance with the requirements.
- 6.2 **Absorption capacity:** the absorption is estimated in accordance with the contents of escape means chapter table no: 3 -4 and the number of seats should be taken into consideration if they are independent such as restaurants each use should be calculated separately.
- 6.3 **Wideness:** Measure of escape means width should be calculated on the basis of the persons who use them as indicated in escape means chapter.
- 6.4 **Movement distance:** The movement distance from any point to reach the final exit or protected stair should not exceed the below mentioned figures:
- 6.4.1 The movement distance from any point to the final exit or protected stair in the hall with comfortable seats (20m).
- 6.4.2 The movement distance from any point to the final exit or protected stair in the hall with normal seats (15m).
- 6.4.3 The movement distance from any point to the stair or protected exit in open multi – purpose hall (30m).
- 6.5 Direct distance from any point to the exit or protected stair in small halls (15m) provided that its capacity should not exceed (30) persons.

- 6.5.1 Direct distance from any point to the exit or protected stair in the attached rooms or sections to the theater (7.5m).
- 6.5.2 In the open large multipurpose halls such as exhibition halls and celebration halls the direct distance may exceed (30m) provided that the stairs and exits are distributed around the building and the distance between them is not more than (60m).
- 6.6 **Corridors:** The general requirements for corridors in addition to these conditions should apply:
 - 6.6.1 The corridors should be organized and properly leveled so that they lead directly to the exits.
 - 6.6.2 Graded corridors should be provided with rail in accordance with the requirements.
 - 6.6.3 The width of the corridors should be satisfactory to absorb the flow of the persons who use them provided that it should not be less than (2 m) for main corridors and (1.5) for sub corridors.
- 6.7 **Exits:** The general requirements of exits should be provided as indicated in escape means chapter.
 - 6.7.1 The number of exits should be in accordance with the general requirements and the attached sections such as theater stage, actor's rooms, the staff work shop etc. the following Table No. 5.1 1 indicates the number of exits for public halls in the cinema, theater and lectures halls.

Number of exits for public halls in cinema and theater premises

Type of seats	Number of persons	Number of exits	Width of exit
	3000	4	As per number of persons
Normal	600 - 1000	3	
	50 - 300	2	
Comfortable	-	2	18cm

Table No: 5 -1

- 6.7.2 The hall exists should be independent from the rest of sections especially the theater and lead directly to the outside area.

6.8 **Stair way:** General requirements of escape means should apply in addition to these requirements.

6.8.1 The number of stairs should not be less than two for each floor.

6.8.2 The stair should be protected and separated from the building by isolation space which is protected from fire and leads directly to the outside.

6.8.3 The width of the stair should be satisfactory for the people who use it and should not be less than the total width of the corridors which lead to it.

6.8.4 In case it is permitted to use the assembly halls in the upper or lower floors of the building the stair should with greater width and the platform with large area for resting.

6.9 **Final exit:** Under all circumstances the escape means should lead to a final exit which guide directly to the outside.

6.9.1 In the buildings or their parts of category (c) half of the escape means may end at a location inside the building if general requirements for escape means are met.

7 **Firefighting and warning Equipment:** The preventive precautionary should be provided in accordance with the general requirements of engineering services.

7.1 Firefighting, warning equipment and engineering services should be provided for protection from fire in the assembly buildings.

7.2 The Firefighting and warning equipment should be in accordance with part two requirements in terms of designing and implementation and maintenance.

7.3 On issuing the permit civil defense may request additional equipment as alternative for the required preventive precautionary.

**Firefighting equipment for assembly buildings according to the
Category, height and construction classification**

S. No.	Type	Required cases
1	Manual extinguishing equipment:	
a	Manual extinguishers	All floors
2	Fixed installations	
a	Rubber hoses network	All floors
b	Dry hydrants network	More than 4 floors and with height less than 30 m or two floors with total area exceeding 1000 m.
c	Moisture hydrants network.	With height more than 30m or more than two floors with area exceeding 1000 m ² per floor.
d	External hydrants network.	According to the size of the building
3	Automatic systems	
a	Automatic network for firefighting water sprayers.	As per Table No. 5.3 requirements of Firefighting water sprayers for assembly buildings.
b	Automatic network for other materials sprayers.	Special hazard locations where it is not possible to use water.
4	Fire warning systems	
a	Manual warning network.	In multipurpose halls and corridors.
b	Automatic warning network.	All floors.

Table No. 5.2

**Requirements of firefighting water sprayers for
Assembly buildings as per the category, height and construction classification**

Category	Number of persons	Floor	Construction classification	Sprayers requirements
a	More than 1000 persons.	Basement	All types	Required.
		Ground to 3 rd floor	First type	Not required
		Fourth to upper	All types	Required
b	300 – 1000 persons	Basement	All types	Required.
		Ground and second only	First and second only.	Not required
c	50 – 300 persons	Basement	All types	Required
		Ground and first floor only	First, 2 nd and 4 th	Not required
		Ground only	5 th floor temporarily	Required

Table No. 5.3

- 8 **Engineering services:** It should be complied with the contents of engineering services chapter and items of Table No. 5.4
- 8.1 **Ventilation in the theater area:** It should be observed to provide a ventilation system in accordance with the international specifications to be approved by the civil defense in the civil defense in the theater area.
- 8.2 The civil defense may request additional equipment or as alternative to the other preventive requirements.

**Engineering services for prevention of
Fire in assembly buildings**

S. No.	Type	Required cases
1	First prevention engineering services:	
(i)	Ventilation system.	As per the international specifications approved by the civil defense.
(ii)	Illuminated guidance signs.	Basement and escape means (exits)
(iii)	Emergency lightening network.	Basement and escape means.
(iv)	Electricity reserve source.	If the height is more than 6 floors or 20m whichever is less.
(v)	Fire lift	If the height I exceeding 6 floors or 20 M whichever is less
(vi)	Automatic Fire doors	In accordance with the preventive requirements in the engineering areas

9. Special preventive requirements:

9.1 As for the cinema and theater premises each case should be studied separately in order to recommend the appropriate requirements. The American (N.F.P.A 101) requirements or the international specifications may be used as a reference for further details in addition to these requirements:

9.1.1 **Seats:** Fixing of the seats should be organized as follows:

9.1.1 **Measures:**

9.1.1.1 Net distance between seats rows (0cm) of normal type

9.1.1.2 Net distance between comfortable seats rows (50cm) if the number of seats is (25) or less

9.1.1.3 Net distance between comfortable seats rows (60cm) if the number of seats is more than 45 seats.

9.1.2 **Number of seats:**

- 9.1.2.1 Number of seats in each row should be (4) at least.
- 9.1.2.2 Number of seats in each row (7) at most when they face one corridor for normal type.
- 9.1.2.3 Number of seats (14) for each row at most when they fall two corridors
- 9.1.2.4 Number of comfortable seats per row (100) at most when they face two corridors
- 9.1.2.5 The number of seats of normal type may be increased per row to (11) seats facing one corridor if the distance between the seats is increased by 25mm for each seat.

9.1.3 **Fixing:**

- 9.1.3.1 The seats should be fixed on the ground firmly in all designated halls for the public such as the cinema and theater and lecture halls.
- 9.1.3.2 In other cases where it is not possible to fix the seats permanently alternative measures should be taken such as:
 - 9.1.3.2.1 Tightening the seats with each other in groups not less than 4 seats per group and each case should be studied separately.

9.1.4 **Floor:**

- 9.1.4.1 Slope angle of ground surface at the base should exceed (35) degree.
- 9.1.4.2 In multipurpose halls which can be used as exhibition halls preventive requirements in commercial buildings should be applied in addition to these requirements:

9.2 The exhibition areas should be organized so that organized corridors should be maintained according to these requirements.

- 9.2.1 The shelves and stands should be made of non combustible materials.
- 9.2.2 Suitable guidance signs and firefighting equipment should be made available.

- 9.2.3 The civil defense should be consulted in the event of temporary or seasonal exhibitions for obtaining the appropriate advice and preventive recommendations.

Chapter six

Prevention and protection requirements from fire in education buildings

Code	Prevention and protection requirements from fire in education buildings.	
1	Definition	
2	Fire hazard	
3	Construction requirements.	
4	Mixed use.	
5	Fire spread control.	
	5.1	Horizontal spread.
	5.2	Vertical spread.
	5.3	External spread.
	5.4	Arrival of civil defense machinery
6	Escape means.	
	6.2	Absorption capacity.
	6.3	Wideness.
	6.4	Movement distance.
	6.5	Direct distance.
	6.6	Corridors.
	6.7	Exits
	6.8	Ramps.
	6.9	Stair way
	6.10	Final exit.
7	Firefighting and warning equipment.	
8	Engineering services.	

Prevention and protection requirements from fire in education buildings

Table Number	Table Title
6.1	Validity of buildings from construction point of view for use for educational purposes.
6.2	Calculation of movement distance and direct distance to the educational buildings.
6.3	Firefighting equipment for educational buildings according to the category, height and construction classification.
6.4	Distribution of Firefighting and warning equipment in educational buildings.
6.5	Engineering services pertaining to prevention in educational buildings.

1. **Definition of education buildings:** They are the designated buildings or their parts for education purposes which accommodate (6) regular students with attendance rate not less than 4 hours per day and not less than 12 hours per week such as kindergartens and school (preparatory, elementary, secondary, colleges etc)
 - 1.2 As for specialized schools for educating the disabled (students of special needs) each case should be studied separately for recommending the appropriate additional requirements.
3. **Construction requirements:**
 - 3.1 The preventive precautionary requirements in engineering areas in general should be applied for securing safety for the construction frame from fire incident.
 - 3.2 The validity of buildings from construction point of view for use for education purposes should be determined in accordance with Table 1.2 classification of buildings in terms of fire resistance and the following Table 6.1 suitability of buildings from construction point of view for use education purposes.

Validity of buildings from construction point of view for use for education purposes in accordance with area, height and classification.

Construction classification	Area and height.
First type.	Suitable for all cases
Second and fourth type.	Suitable for buildings with height not exceeding two floors
Third and fifth type	Temporary buildings not exceeding one class area and in accordance with special requirements.

Table no: 6 -1

3.3 The following requirements should be observed in determining the location of study classes in a building:

3.3.1 Study classes for children below elementary level should not be in a basement or above the ground level.

3.3.2 The elementary study classes should not be in a floor higher than first floor.

3.3.3 The study classes in school may be in a basement provided that stair or exit should be provided on external wall leads directly to the outside and to be protected with automatic water sprayer network.

3.3.4 All study classes should be directly facing the external façade of the building.

4. Mixed use:

4.1 In case the education building forms a part of buildings of other use they should be separated from each other to constitute independent fire section with independent escape means.

4.2 Mixed use which may contain high fire hazard or industrial purpose should not be permitted.

4.3 Designated parts for buildings or their parts allocated for other purposes should be separated from each other.

4.4 The buildings or their designated parts for other purposes than education should be treated in accordance with their type of use.

5. **Fire spread control:** General requirements for preventive precautionary in engineering area should apply in addition to these requirements.
 - 5.1 **Horizontal spread:** The fire section area should not exceed 2000m² and there should be space separating various areas of use.
 - 5.1.1 Various areas of use should be separated from each other and each one should be considered separate fire section.
 - 5.1.2 Hazard sites or locations should be separated.
 - 5.1.3 Each study class should be considered as secondary independent fire section.
 - 5.2 **Vertical spread:** Vertical spread control requirements should apply with regard to the preventive requirements for residential buildings.
 - 5.3 **External spread:** The external spread control requirements should apply with regard to the preventive requirements of residential buildings.
 - 5.4 **Arrival of civil defense machinery:** The arrival of civil defense machinery should be made easy to the education buildings.
6. **Escape means: (exits)**
 - 6.1 General requirements of escape means should apply in addition to these requirements.
 - 6.2 **Absorption capacity:** The absorption is estimated in accordance with the escape means chapter – table no: 3 – 4 and as for other uses locations each in accordance with its type of use nature.
 - 6.3 **Wideness:** The width of the escape means should be calculated on the basis of the number of persons who use them as indicated in escape means chapter.
 - 6.4 **Movement distance:** The movement distance from any point to the final exit or protected stair should not be less than the figures indicated in table 6.2
 - 6.5 The direct distance from any point inside the classes to the exit or the protected stair should not exceed 15m and not more than 10 m in the basement.

Calculation of movement distance and direct distance to education buildings

Table no: 6 -2.

Location	Distance by meters	Floor	Cases and remarks
Direct distance	15	Ground	-
Inside study class	10	Basement	-
Movement distance	15	Basement	In case of more than one exit.
From class door or exit	20	Other floors	Internal corridors.
Or protected stair	30	Other floors	External corridors.

- 6.6 The general corridors requirements should be provided as indicated in escape means chapter in addition to these requirements.
- 6.6.1 The corridors should be organized and smoothly leveled so that they lead directly to outside.
- 6.6.2 The graded corridors should be provided with rail in accordance with the requirements.
- 6.6.3 The corridors width should be satisfactory for absorption of the people who use them provided that it should not be and 1.5m for sub-corridors.
- 6.6.4 Corridors should be external as much as possible. If this is not possible they may be internal provided that they are constructed in accordance with the preventive precautionary requirements in construction areas.
- 6.6.5 Corridors inside the study classes should not be less than 1,10m per corridor which serves two rows of seats and (90 cm) for the one which serves one row.
- 6.6.6 Any seat should not be distant from the internal corridor by more than a distance of six seats.
- 6.7 **Exits:** The general exits requirements of exits as prescribed in escape means chapter should be provided.
- 6.7.1 All exits should lead directly to outside or to protected stair or corridor from fire and isolated from the building by isolating space.

- 6.7.2 The number of exits should be in accordance with the general requirements provided that they will not be less than two distant exits to utmost building parts and on the external wall each leading to outside.
- 6.7.3 Each class should be provided by two distant exits leading to outside or to protected corridor leading to two exits in the following cases:
 - 6.7.3.1 If the class absorption capacity exceeds (50) students
 - 6.7.3.2 If the class absorption exceeds (30) child (kindergarten)
 - 6.7.3.3 If the class area exceeds (90m²) or its depth (15m)
- 6.7.4 The allocated windows for ventilation should be of an area not less than (0,5m²) (50cm width x 60cm height) and the step height from tile surface (110cm) so that it can be used rescue works. They should be easily opened from inside without a need for special tools or lockers.
- 6.8 **Ramps:** Ramps should be provided in education buildings for use by the disabled.
- 6.9 **Stair way:** The general escape means requirements should apply in addition to these requirements.
 - 6.9.1 The number of stairs should not be less than two for each floor distant at utmost parts of the building and on the external wall leading directly to outside.
 - 6.9.2 The stair should be protected and separated from the building by isolating space which is protected from fire and leads directly to outside.
 - 6.9.3 The width of the stair should be satisfactory for the number of people who use them and should not be less than the total width of the corridors which lead to it.
 - 6.9.4 In the event that the assembly halls in the upper or lower floors of the building are permitted to be used the width should be greater and the platform with a large area for resting.
- 6.10 **Final exit:** Under any circumstances all escape means should lead to a final exit which leads directly to outside.
 - 6.10.1 Other sections with other types of use in education buildings should be treated in accordance with their special requirements or the higher ones whichever is with more prevention capacity.

7. Firefighting and warning equipment:

- 7.1 Manual warning device should be installed in multi – purpose halls and management corridors and closed classes corridors at all levels with the exception of open classes.
- 7.2 Automatic warning device should be installed in multipurpose hall, workshop, laboratory, library, stores and also in the locations of special hazard and the air conditioning path and basement at all stages.
- 7.3 General warning means (in the form of whistle or bell) should be installed so that it could be heard in all parts of the school and with distinguished voice or verbal messages operated by the management.
- 7.4 The Firefighting and warning equipment should be in terms of designing, implementation and maintenance in accordance with the requirements of part two or civil defense directory.
- 7.5 The civil defense on issuing the permit may request additional equipment as alternative of some required preventive precautionary measures.

Firefighting equipment for education buildings
As per the category, height and construction classification

Sl. No.	Type	Required cases
1	Manual extinguishing equipment	
	(a) Manual extinguishers	All floors
2	Fixed installations	
	(a) Rubber hoses network	All floors
	(b) Dry hydrants network.	More than 3 floors and with height less than 30m or two floors with total area exceeding 1000m ²
	(c) Moisture hydrants network.	With height more than 30m or more than two floors with area exceeding 1000m ² per floor
	(d) External hydrant network.	In the yards of the universities and high colleges
3	Automatic fixed system.	
	(a) Automatic network for Firefighting fire sprayers	Basement, higher floors exceeding 4 th floor, constructed buildings of third and fifth type
	(b) Automatic network for other materials sprayers.	Special hazard locations where water cannot be used
4	Fire warning equipment: Manual warning network	In multipurpose halls, management halls, closed classes, corridors at all levels with the exception of open classes corridors
	(a) Automatic warning network	In the workshops, laboratories, library, multipurpose halls along with manual warning, special hazard locations, air conditioning path and basement

Table 6.3

Distribution of fire warning equipment in education buildings

Education level	System type	Corridors of closed classes	Hall	Laboratory	Work shop	library	Management corridors	Remarks
Kindergarten	Manual	*	*				*	General warning system (like whistle or bells at least) should be installed to be heard in all parts of the school with distinguish voice or verbal messages operated by the management
			*					
Elementary	Manual		*					
	Automatic		*					
Intermediate	Manual		*					
	Automatic		*	*	*	*		
Secondary	Manual		*				*	
	Automatic		*	*	*	*		

Table 6.4

Engineering Services Pertaining to Prevention from Fire in Education Buildings

Sl. No.	Type	Required cases
1	Engineering services for prevention from fire in education buildings:	
1	Ventilation system	▶ As per the information specifications approved by the civil defense.
2	Illuminated guidance signs	▶ Basement and escape means
3	Emergency lightening network.	▶ Basement and escape means. ▶
4	Electrical reserve source.	▶ Universities
5	Fire lift.	▶ If the height is more than 6 floors or 20m whichever is less
6	Automatic fire doors	▶ In accordance with prevention requirements in engineering area ▶

Table 6.5

Chapter seven

Prevention and Protection Requirements from Fire in Caretaking Buildings

Code	Prevention and protection requirements from fire in caretaking buildings.	
1	Definition	
2	Fire hazard.	
3	Construction requirements.	
4	Mixed use.	
5	Fire spread control.	
	5.1	Horizontal spread.
	5.2	Vertical spread.
	5.3	External spread.
	5.4	Arrival of civil defense machinery
6	Escape means.	
	6.2	Absorption capacity.
	6.3	Wideness.
	6.4	Movement distance.
	6.5	Direct distance.
	6.6	Corridors.
	6.7	Exits.
	6.8	Ramps.
	6.9	Stair way
	6.10	Horizontal exit.
	6.11	Final exit.
7	Firefighting and warning equipment	
8	Engineering services.	

**Prevention and Protection Requirements from
Fire in Caretaking Buildings**

Table number	Table title
7.1	Validity of buildings from construction point of view for use for caretaking
7.2	Calculation of movement distance and direct distance to the caretaking buildings
7.3	Firefighting equipment for caretaking buildings in accordance with the category, height and construction classification
7.4	Engineering services pertaining to caretaking buildings.

1. Definition of caretaking buildings:

They are the designated buildings or their parts for health or social caretaking purposes the occupant of which are unable to move or because of the withholding impact they become movement limited persons. These include the hospitals and elder people caretaking buildings and nurseries and social care premises, psychological clinics and prisons.

1.1. Health care buildings: The buildings or their parts which are designated for providing health services and arrange not less than 4 beds for hospitalization of the sick persons. It is understood that the people who consult these places are unable to protect themselves due to the old age or infected by physical or mental diseases. These places also include recovery, ambulance and emergency buildings.

1.2. Social care buildings: They are buildings or their parts which are designated for providing social care. They provide at least 4 beds for serving disabled, elder people or the children as in nursery buildings.

1.3. Social rehabilitation buildings (prison): The buildings where the prisoners who are detained for more than one day (24 hours) live and they are considered unable to rescue themselves and their life in the event of fire as they cannot escape or get out. They include the prisons of all types, sizes and detention rooms.

2. Fire hazard: Fire hazard in social care buildings is classified as light hazard.

3. Construction requirements:

3.1 Preventive precautionary requirements in engineering areas should apply in general to provide safety for the construction frame from fire hazard.

- 3.2 The validity of buildings from construction point of view for use of social care should be determined according to Table No. 1.2 classification of buildings in terms of fire resistance and Table 7.1 validity of buildings from construction point of view for use for social care.

Validity of Buildings from Construction point of view for use for Social Care

Construction classification	Area and height
First and second type.	More than two floors.
First, second and fourth	Two floors.
All types, fifth type temporarily and special requirements.	One floor.

Table No. 7.1

- 3.3 It should be taken into consideration to comply with other competent authorities requirements and the civil defense should co ordinate in this regard with the Ministry of Health as for health care buildings and with Ministry of social affairs as for the social affairs as for the social rehabilitation buildings.

4. Mixed uses:

- 4.1 If the social care buildings form a part of buildings form a part of buildings used for other purpose they should be separated to constitute independent fire section with independent escape means.
- 4.2 The mixed use should not be of a type that may cause high fire hazard or involve industrial purpose.
- 4.3 The designated buildings or their parts for other purposes should be separated from each other.
- 4.4 The escape means allocated for the social care buildings or their parts should be independent and separated from other parts and lead directly to outside.

5. Fire spread control: The general requirements of preventive precautionary in engineering areas should be applied in addition to these requirements.

5.1 Horizontal spread: The fire section area should not exceed 2000m²

- 5.1.1 Use areas other than education should be separated and each should be considered independent fire section.
- 5.1.2 The areas and locations of hazard should be separated.

5.1.3 Any floor or part of floor used for treatment, sleeping or its capacity is exceeding (50) persons or its side is more than 45m should be considered secondary independent fire section.

5.2 Vertical spread: Vertical spread control requirements in preventive requirements for residential buildings should apply.

5.2.1 The vertical vacuum as light holes and stair way and lift well should be separated from the building by fire preventive walls and doors.

5.2.2 The medium vacuum (Atrium) is exempted in case the following requirements are met:

5.2.2.1 The dimensions of the medium vacuum should not be less than (6m).

5.2.2.2 Provision of automatic Firefighting water sprayers network or a system for preventing vertical fire and smoke spread to be approved by civil defense.

5.2.2.3 Provision of overhead ventilation (recognized).

5.3 External spread: External spread control requirements of preventive requirements in residential buildings should apply.

5.4 Arrival of extinguishing machinery and equipment access to the caretaking buildings should be made easy.

6. Escape means:

6.1 General requirements of escape means should be applied in addition to these requirements.

6.2 **Absorption capacity:** The absorption should be estimated as per escape means chapter Table 3.4. As for other uses locations the capacity should be determined in accordance with the nature of their use:

6.3 **Wideness:** The width of escape means is measured on the basis of the number of persons who use them as indicated in escape means chapter provided that the main corridors width should not be less than (240cm) under any circumstances.

6.4 **Movement distance:** The movement distance from any point to the final exit or protected stair should not exceed the indicated figures in Table No. 7.2

6.5 The direct distance from any point inside sleeping rooms or wards to the exit or protected stair should not exceed 15m and not more than 10m in the basement.

Calculation of Movement Distance and Direct Distance for Education Buildings

Location	Distance by Meters	Floor	Remarks
Direct distance inside sleeping rooms and wards	15	Ground	-
Movement distance from the door of sleeping rooms or wards to the exit or protected stair.	20	Any floor	Due to the exits of more than one exit and the internal corridors.
Closed end	7,5	Any floor	In closed end case

Table 7 -2

- 6.6 General requirements of corridors should be provided as indicated in escape means chapter provided that the width of main corridors should not be less than (240m) under any circumstances.
- 6.7 **Exits:** The general requirements of exits should be provided as indicated in escape means chapter.
- 6.7.1 Each floor should be provided with two distant exits.
- 6.7.2 The number of exits should be in accordance with the general requirements provided that they should not be less than two distant exits at utmost parts of the building and on external wall leading to the outside area.
- 6.7.3 All exits should lead directly to the outside or to protected stair or corridor from fire and separated from the building by isolating space.
- 6.7.4 Each sleeping room or ward should be provided with two distant exits leading to the outside or to a protected corridor leading to two exits in the following cases.
- 6.7.4.1 If the movement distance exceeds the indicated figures in the above mentioned table
- 6.7.4.2 If the movement distance exceeds 90m.
- 6.7.4.3 If the area of the sleeping room or ward exceeds 230m².

- 6.8 **Ramps:** Ramps should be provided in caretaking buildings in accordance with the general requirements of escape means and as per caretaking building use conditions in co ordination with the competent authorities.
- 6.9 **Stair way:** The general requirements of escape means should apply in addition to these requirements.
- 6.9.1 The number of stairs should not be less than two for each floor to be distant and on external wall each leading directly to outside.
- 6.9.2 The stair way should be protected and separated from the building by fire protected isolation space which lead directly to outside.
- 6.10 **Horizontal exits:** Temporary refuge area should be provided in all caretaking buildings which exceed two floors or the area of their floor exceeds 2000m².
- 6.10.1 With the exception of the allocated floors or sections for sleeping 50% of the escape means may end in safe location inside the building.
- 6.11 **Final exit:** Under any circumstances all escape means should lead to exit which leads directly to outside.
- 6.11.1 As for sections of other type of use their special requirements should apply or any higher requirements with further prevention capacity.
- 6.11.2 Lockers may be used in health care premises for mental disorder persons and social care buildings for prisoners or detainees provided that there should be permanent guarding or supervision throughout the day hours which allow the evacuation of the building users to other safe locations during emergency.
- 7 **Fire fighting and warning equipment:** The preventive precautionary in engineering area should be applied in addition to the indicated requirements in table 7.3
- 7.1 The fire fighting and warning equipment should be in terms of designing, implementation and maintenance in accordance with the requirements of part two or civil defense directory.

Firefighting and Warning Equipment as per Category Height and Construction Classification

Sl. No.	Type	Required cases
1	Manual extinguishing equipment:	
	(a) Manual extinguishers	All floors.
2	Fixed installations:	
	(a) Rubber hoses network.	All floors
	(b) Dry hydrants network.	More than 3 floors with height less than 28m or two floors with total area exceeding 100m ² .
	(c) Moisture hydrants network.	With height less than 28m or more than two floors with area exceeding 1000m ² per floor
	(d) External hydrants network.	As per the size of the building.
3	Automatic fixed systems:	
	(a) Automatic fire fighting water sprayers network.	Basement, sleeping wards if the building exceeds two floors and type three and five buildings.
	(b) Automatic other materials sprayers network	Locations with special hazard where water cannot be used.
4	Fire warning equipment:	In all floors.
	(a) Manual warning network.	
	(b) Automatic warning network.	In sleeping rooms, wards and corridors and in special hazard locations and air conditioning path and basement.

Table 7.3

8. Engineering services: It should be complied with the contents of engineering services chapter with concentration on Table 7.4

8.1 In civil defense may request additional equipment or as alternative to some preventive requirements.

8.2 The alternative of the required equipment in psychological health care buildings and social care premises related to nurseries and social rehabilitation (prisons) buildings should be determined in coordination with the competent civil defense.

Engineering Services pertaining to Fire Prevention in Caretaking Buildings

Sl. No.	Type	Required Cases
1	Ventilation system	As per the international specifications approved by civil defense.
2	Illuminated guidance signs	Basement and emergency exits
3	Emergency lightening network	Basement and emergency exits
4	Electrical reserve source	All care taking buildings
5	Fire lift	If the height exceeds 6 floors or 20 m whichever is lesser
6	Automatic fire doors.	As per preventive precautionary in engineering areas.

Table 7.4

Chapter Eight
Prevention and Protection Requirements from
Fire in Residential Buildings

Code	Prevention and protection requirements from fire in residential buildings:	
1	Residential buildings sections as per the type of use	
First	Preventive requirements in collective residential areas.	
	1.1	Definition of collective residential buildings.
2	Fire hazard.	
3	Construction requirements.	
4	Joint use.	
5	Fire spread control.	
	5.1	Horizontal spread.
	5.2	Vertical spread.
	5.3	External spread.
	5.4	Arrival of civil defense machinery.
6	Escape means.	
	6.2	Absorption capacity.
	6.3	Wideness.
	6.4	Movement distance.
	6.5	Direct distance.
	6.6	Corridors.
	6.7	Exits
	6.8	Ramps
	6.9	Stair way
	6.10	Horizontal exit
	6.11	Final exit.
7	Fire fighting and warning equipment.	
8	Engineering services.	
Second	Preventive requirements for special residential buildings.	
	1.2	Definition of special residential buildings.
2	Fire hazard.	
3	Construction requirements.	
4	Fire spread control.	
	4.1	Horizontal spread.
	4.2	Vertical spread.
	4.3	External spread
	4.4	Arrival of civil defense machinery.
5	Escape mean.	
	5.1	Exits.
	5.2	Stair way.
	5.3	Final exit.
6	Fire fighting and warning equipment.	
7	Engineering services.	
8	Application.	

Table's Index

Table number	Table title
8.1	Validity of buildings from construction point of view for use as residential buildings.
8.2	Calculation of movement distance and direct distance to residential buildings.
8.3 (a)	Firefighting equipment for residential buildings category (a) – buildings formed of permanent residential units for one family (flats) as per the category, height and construction classification.
8.3 (b)	Firefighting equipment for residential buildings category (b) buildings formed of rooms or barracks for permanent individual or collective residence as per category, height and construction classification.
8.3 (c)	Firefighting equipment for residential buildings category (c) for buildings formed of rooms for stay overnight such as hotels and furnished apartments as per the category, height and construction classification.
8.4 (a)	Engineering services pertaining to prevention in residential units for one family (flats) as per the category, height and construction classification.
8.4 (b)	Engineering services pertaining to prevention in residential buildings category (b) – buildings formed of rooms or barracks for individual or collective residence as per the category – height and construction classification
8.4 (c)	Engineering services pertaining to prevention in residential buildings category (c) – buildings formed of rooms for temporary stay overnight such as hotels and furnished flats as per the category, height and construction classification.

- 1 The residential buildings are divided in terms of the type of use to two types:
 - 1.1. **Collective residential buildings:** Such as flats, barracks and hotels
 - 1.2. **Special or private residential buildings:** Such as small villas (private residences) or private palaces.

First: Preventive requirements for collective residential buildings:

- 1.1. **Definition of collective residential buildings:** The buildings or their parts which are allocated for neighboring residence.
 - 1.1.1 Collective residential buildings are divided in terms of use purpose to three categories as follows:
 - 1.1.1.1 Category (a), buildings formed of permanent residential units for one family (flats) such as the investment residential buildings.

Category (b) – buildings formed of rooms or four barracks for permanent collective residences of the students, employees, labours and the soldiers.

Category (c) – buildings formed of rooms for temporary stay overnight by payment or without payment such as hotels, motels, hospitality premises, furnished flats etc.
- 2 **Fire hazard:** The fire hazard in residential buildings is classified as light hazard.
- 3 **Construction requirements:**
 - 3.1 The preventive precautionary requirements in engineering areas in general should be applied to provide safety to the construction frame from fire hazard.
 - 3.2 The validity of the building from construction point of view for use for residential purposes should be determined in accordance with table 1.2 classification of buildings in terms of fire resistance and table 8.1. Validity of buildings from construction point of view for use for residential purposes.
 - 3.3 Residence in the basement is totally prohibited with the exception of the special cases approved by the civil defense and additional exit should be provided in addition to automatic water sprayers' network and any other equipment requested by the civil defense should be also provided.

**Validity of Buildings from Construction point of view for
Use for Residential Purposes.**

Construction classification	Suitable Uses.
First and second type only	Category buildings formed of permanent residential units for one family (flats) such as investment residential buildings.
First and second type only.	Category (b) buildings formed of rooms or barracks for individual or collective residence such as students and employees residences and soldiers' barracks.
All types and the first type temporarily and with special requirements.	Category (c) – buildings formed of temporary stay overnight rooms with or without payment such as hotels, motels and furnished flats.

Table 8 -1

4 Joint use:

- 4.1 The joint use should not be of the type which contains high fire hazard or industrial purpose.
- 4.2 Join use of light hazard type may permitted such as commercial shops, offices etc provided that the escape means should be independent and integrated preventive precautionary for each part of the building should be provided in accordance with the type of use.
- 4.3 In case the residential buildings constitute part of the buildings with other form of use they should be separated to be independent fire section provided with independent escape means.
- 4.4 The designated parts for the buildings or their allocated parts for other attached purposes should be separated from each other.
- 4.5 The escape means of residential buildings should be independent and separated from other parts and lead directly to outside.

5 Fire Spread Control: The general requirements of preventive precautionary in engineering areas should apply in addition to these requirements.

5.1 Horizontal spread: The area of the fire sector should not exceed 3000m².

- 5.1.1 The residential units should be separated from each other and each should be considered independent fire sector.

5.1.2 Fire preventive barrier or door should be made available if the corridor exceeds 30m and at joining point of corridors.

5.2 Vertical spread:

5.2.1 The vertical vacuum such as light holes and stair way and lift well should be separated from the building through fire preventive walls and doors.

5.2.2 The medium vacuum (Atrium) should be exempted if the following requirements are met:

5.2.2.1 The vacuum dimensions are not less than 6m.

5.2.2.2 Provision of automatic fire fighting water sprayers' network or a system for preventing the spread of fire and smoke vertically to be approved by civil defense.

5.3 External spread: The preventive construction precautionary should be applied with regard to the distance and materials for controlling external fire spread.

5.4 Arrival of civil defense machinery: It should be made easy for the civil defense machinery to reach the residential buildings.

6 Escape means (emergency exits).

6.1 General requirements of escape means should be applied in addition to these requirements.

6.2 **Absorption capacity:** The absorption capacity should be estimated as indicated in escape means chapter table no: 3 -4. As for other uses locations their absorption capacity should be determined in accordance with the nature of their use.

6.3 **Wideness:** The width of escape means should be calculated on the basis of the persons who use them as indicated in escape means chapter.

6.4 **Movement distance:** Movement distance from any point to the final exit or protected stair way should not exceed the prescribed figures in table 8.2

6.5 Direct distance from any point inside the rooms to the exit or protected stair way should not exceed 15m and not more than 10m in the basement.

Calculation of Movement of Distance and Direct Distance of Residential Buildings

Location	Distance by meters	Floor	Cases and remarks
Direct distance	10	Basement	-
Inside residential flat.	15	Higher floors	Buildings category (a)
	10	Higher floors	Buildings category (b – c)
Movement distance from the door of residential flat to the exit or	20	Basement	If there are more than one exit.
Protected stair way.	30	Other floors	-
	5	Basement	In closed end case.
Closed end	7.5	Any floor	In closed end case.

Table 8.2

- 6.6 **Corridors:** General requirements of corridors should be provided as indicated in escape means chapter.
- 6.6.1 The width of main corridors should not be less than (150cm) and sub-corridors not less than (120cm) in buildings such as investment residential buildings.
- 6.6.2 The width of main corridors should not be less than (220 cm) and sub – corridors should not be less than (120cm) in residential buildings category (b) formed of rooms or barracks for permanent individual or collective residence such as students, employees, labours residence and soldiers barracks.
- 6.6.3 The width of main corridors should not be less than (200cm) and sub – corridors should not be less than (120cm) for the buildings category (c) formed of rooms for temporary stay overnight with or without payment such as hotels, motels, hospitality premises and furnished flats.
- 6.7 **Exits:** General requirements of exits should be provided as indicated in escape means chapter.
- 6.7.1 All exits should lead directly to outside or to protected stairway or corridor from fire and separated from the building by isolation space.
- 6.7.2 Emergency exit should be provided to the second floor in the flat (villa type) which leads to the corridor or the main stairway of the building if the internal stair is not leading to the external door of the flat.

- 6.7.3 Additional exit should be provided for each residential unit or room which leads to the outside or to protected corridor if the distance exceeds the prescribed figure in table 8 -2.
- 6.8 **Ramps:** it is preferred to provide ramps in residential buildings (for ground floor) in accordance with the general requirements of escape means to be used by the disabled.
- 6.9 **Stairway:** The general requirements of escape means in addition to these requirements should apply.
- 6.9.1 The stair way should be protected and separated from the building by isolation space protected from fire and leads directly to outside.
- 6.9.2 The number of stairs should not be less than two for each floor distant and utmost parts of the building and on external wall each leads directly to outside .
- 6.9.3 In special cases where the civil defense permits for residential buildings category (a) – formed of permanent residential units for one family (flats) with commercial facades such as investment residential buildings only one stair way may be provided in accordance with the following requirements and the building system requirements.
- 6.9.3.1 The number of floors should not exceed (6) floors excluding ground floor.
- 6.9.3.2 The stair way of the residential part should be totally independent and separated from the commercial part stair way in the building.
- 6.9.3.3 The area of each floor should not exceed (600m²) and total floors area should not exceed (1800m²) and the total area should be calculated according to the building system.
- 6.10 **Horizontal exits:** The general requirements of escape means should be applied
- 6.10.1 Temporary horizontal refuge area should be provided in residential buildings category (b) – buildings formed of rooms or barracks for individual or collective residence such as students, employee, labour s residence and soldiers barrack in which the area of the floor exceeds (3000m²).

6.11 **Final exit:** Under any circumstances all escape means should lead to final exit which leads directly to outside.

6.11.1 As for the sections which involve other types of use in residential buildings their special requirements should apply.

7 Fire fighting and warning equipment: The preventive precautionary in engineering areas should be provided in accordance with the general requirements of engineering services in addition to the indicated requirements in table 8.3 (a), 8.3 (b) and 8.3 (c)

7.1 The fire fighting and warning equipment should be in terms of designing and implementation and maintenance in accordance with the requirements of part two or the civil defense directory.

7.2 The Civil Defense may request additional equipment or alternative to some required preventive precautionary in accordance with the requirements.

7.3 The motels and furnished flats buildings allocated for temporary stay overnight without full hotel services with height not exceeding (6) floors should be treated as open buildings category (a).

Firefighting equipment for residential buildings

Category (a) – buildings formed of permanent residential units for one family (flats) as per the category, height and construction classification.

Sl. No.	Type	Required cases
1	Manual extinguishing equipment:	
	(a) Manual extinguishers.	All floors
2	Fixed installations	
	(a) Rubber hoses net work.	In collective residence buildings or with height more than 30m.
	(b) Dry hydrants network.	More than 3 floors and with height less than 30m or two floors with area not exceeding 1000m ²
	(c) Moisture hydrants network.	Height more than 30m or the area of the floor exceeds 1000m ²
	(d) External hydrants network.	For complexes only
3	Automatic fixed systems	
	(a) Automatic fire fighting water sprayers net work.	Basement – partial coverage of all high buildings and complexes specially escape means and type (3) and (5) buildings and specified locations as per automatic fire fighting systems requirements.
	(b) Automatic other materials sprayers network.	Special hazard locations where water cannot be used
4	Fire warning equipment.	
	(a) Manual warning network.	In all floors of the buildings the height of which exceeds 30m and complexes buildings
	(b) Automatic warning network.	In all floors of high buildings, corridors and in special hazard locations, air conditioning path and basement.

Table 8 -3 (a)

Firefighting equipment for residential buildings

Category (b) – buildings formed of barracks for permanent individual or collective residence as per the category – height and construction classification.

Sl. No.	Type	Required cases
1	Manual extinguishing equipment.	
	(a) Manual extinguishers.	All floors
2	Fixed installations	
	(a) Rubber hoses network.	All floors
	(b) Dry hydrants network.	Higher than 3 floors and with height less than 30m or two floors with area not exceeding 1000m ²
	(c) Moisture hydrants network.	With height more than 30m or the area of the floor exceeds 1000m ² .
	(d) External hydrants network.	Complexes only.
3	Automatic fixed systems	
	(a) Automatic fire fighting water sprayer's network.	Basement – all floors of high buildings and complexes specially escape means and buildings of 3 rd and fifth type and designated locations as per automatic
	(b) Automatic other materials sprayers network.	Special hazard locations where water cannot be used.
4	Fire warning equipment.	
	(a) Manual warning network.	All floors.
	(b) Automatic warning network.	All floors especially those without fire extinguishing water sprayers, corridors, special hazard locations and air conditioning path.

Table 8 -3 (b)

Firefighting equipment for residential buildings

Category (c) – buildings formed of rooms for temporary stay overnight such as hotels and furnished flats.

Sl. No.	Type	Required cases
1	Manual extinguishing equipment	
	(a) Manual extinguishers.	All floors
2	Fixed installations	
	(a) Rubber hoses network.	All floors
	(b) Dry hydrants network.	Higher than 3 floors and with height less than 30m or two floors with area not exceeding 1000m ² .
	(c) Moisture hydrants network	With height more than 30m or the area of the floor exceeds 1000m ² .
	(d) External hydrants network.	Complexes only
3	Fixed automatic systems	
	(a) Automatic fire fighting water sprayer's network.	Basement – all floors especially escape means and specified locations as per automatic fire fighting systems requirements
	(b) Automatic other materials sprayers network.	Special hazard locations where water cannot be used
4	Fired warning equipment	
	(a) Manual warning net work	
	(b) Automatic warning network.	All floors and special hazard locations and air conditioning path and basement.

Table 8 -3 (c)

8 Engineering services: It should be complied with the contents of engineering services chapter with concentration on Table 8.4 (a) and 8.4 (b) and 8.4 (c).

8.1 The civil defense may request additional equipment or as alternative to other preventive requirements.

8.2 Motels and buildings of furnished flats allocated for temporary stay overnight without full hotel services and with height not exceeding 6 floors should be treated as residential buildings category (a)

Engineering services for protection from fire in residential buildings

Category (a) – buildings formed of permanent residential units for one family (Flats) as per category – height and construction classification

Sl. No.	Type	Required cases
1	Engineering services pertaining to prevention from fire:	
1	Ventilation system.	As per international specifications approved by civil defense.
2	Illuminated guidance signs.	Basement and escape means.
3	Emergency lightening network.	Basement and escape means.
4	Electricity reserve source.	High buildings and complexes and buildings which require fire lift.
5	Fire lift	If the height exceeds 6 floors or 20m whichever is lesser.
6	Automatic fire doors.	As per preventive requirements in engineering areas.

Table 8.4 (a)

Engineering services for protection from fire in residential buildings

Category (b) – buildings formed of rooms or barracks for permanent individual or collective residence.

Sl. No.	Type	Required cases.
1	Engineering services for prevention of fire	
1	Ventilation system.	As per international specifications approved by civil defense.
2	Illuminated guidance signs.	Basement and escape means.
3	Emergency lightening network	
4	Electricity reserve source	High buildings and buildings which require lift
5	Fire lift	If the height exceeds 6 floors or 20m whichever is lesser
6	Automatic fire doors	As per preventive requirements in engineering areas

Table 8.4 (b)

Engineering services for prevention of fire in residential buildings

Category (c) – buildings formed of temporary stay overnight such as hotels and furnished flats.

Sl. No.	Type	Required cases.
1	Engineering services for prevention of fire	
1	Ventilation system	As per international specifications approved by civil defense
2	Illuminated guidance signs.	Basement and escape mean
3	Emergency lightening network.	Basement and escape means
4	Electricity reserve source	High buildings and complexes and buildings which require fire lift
5	Fire lift	If the height exceeds 6 floors or 20m whichever is lesser
6	Automatic fire doors	As per preventive requirements in engineering areas

Table 8.4 (c)

Preventive requirements of private residential buildings Small villas or private palaces

1.1. **Definition of private residential buildings:** Small villas or private palaces

1.1.2 They are one family residence and include independent houses owned or occupied by one family. These houses could be of villa type (one floor) or two floors or three independent floors or houses with open balconies and also include constructed houses on commercial shops provided that they constitute private residences.

- 2 **Fire hazard:** The fire hazard in residential buildings is classified as of light hazard type.
- 3 **Construction requirements:** The fire resistance degree of construction frame, external walls, bridge and roofs of the floors should not be less than one hour.

4 Fire spread control:

- 4.1 **Horizontal spread:** It is preferred that the fire resistance of the doors of the rooms and wings in the buildings of a family should not be less than 45 minutes.
- 4.2 **Vertical spread:** It is preferred that the vertical openings should be separated from other parts of the house by fire preventive wall with fire resistance degree not less than one hour and doors opening resistance not less than 45 minutes.
- 4.3 **External spread:** The buildings of one family should be separated from each other with fire preventive walls with fire resistance not less than one hour.
 - 4.3.1 If the family house joins a different type of building by fire preventive wall, the fire resistance degree of such wall should not be less than one hour.
- 4.4 **Arrival of civil defense machinery:** Civil defense machinery should be provided with easy access to the residential buildings.
 - 4.4.1 The extinguishing teams should be enabled to approach the houses with extinguishing water hoses attached to fire hydrants or water supply tank.

5 Escape means:

- 5.1 **Exits:** It is preferred that each private residential unit should be provided with two exits at least which lead to a safe place.
 - 5.5.1 One of the exits could be a rescue opening or balcony accessible to the civil defense men besides the exit or the main door of the house.
- 5.2 **Stair way:** Whenever a house is constructed on commercial shops the stair should lead to the outside of the shops. If the stair passes through the isolated and surrounded with a wall with a resistance degree not less than one hour.
- 5.3 **Final exit:** Under all circumstances all escape means should lead to a final exit which leads directly to outside.

6 Fire fighting and warning equipment: The preventive precautionary in engineering services should be provided in accordance with the general requirements of engineering services in addition to the indicated requirements in table 8.3 (a), 8.3 (b) and 8.3 (c).

- 6.1 It is preferred to provide manual fire extinguishers in the kitchens and at the end of corridors leading to exits.

6.2 It is preferred to install uni-function fire detectors or fire warning system.

7 Engineering services:

7.1 The electrical connections should be implemented according to the specifications of the competent authorities such the Ministry of Electricity.

8 Application:

8.1 The application of the requirements pertaining to fire prevention in private residences (small villas or private palaces) should be left to the member countries in accordance with their prevailing systems.

CHAPTER NINE

Preventive requirements for protection from fire in Commercial buildings and public markets.

Code	Preventive requirements for protection from fire in commercial buildings and public markets	
1	Definition	
2	Fire hazard	
3	Construction requirements.	
4	Mixed use.	
5	Fire spread control.	
	5.1	Horizontal spread.
	5.2	Vertical spread.
	5.3	External spread
	5.4	Arrival of civil defense machinery
6	Escape means	
	6.1	Absorption capacity
	6.3	Wideness
	6.4	Movement distance
	6.5	Corridors
	6.6	Exits.
	6.7	Ramps
	6.8	Stair way
	6.9	Horizontal exit.
	6.10	Final exit.
7	Fire fighting and warning equipment.	
8	Engineering services.	
9	Special preventive requirements (shops and central markets)	

Preventive requirements for protection from fire in commercial buildings and public markets

Table number	Table title.
9.1	Validity of buildings from construction point of view for use for commercial purpose.
9.2	Calculation of movement distance and direct distance to the commercial buildings.
9.3 (a)	Fire fighting and warning equipment for commercial buildings category (a) – shops as per category, height and construction classification.
9.4 (a)	Engineering services for prevention in commercial buildings category (a) – shops.
9.4 (b)	Engineering services for prevention in commercial buildings category (b) – shops.

1. Definition: The commercial buildings are divided in terms of the type of use to two types:

1.1 **Category (a):** Commercial shops: buildings or their parts which are allocated for serving the public such as:

- ▶ Whole and retail sale shops
- ▶ Commercial centers.
- ▶ Central markets.

Light occupations services.

(a) Tailoring and barber's shops

(b) Photography and its alike.

1.2 **Category (b):** offices : the buildings or their parts of which the users number does not exceed 50 persons at one time and designated for the following offices uses such as:

- ▶ Business management offices.
- ▶ Institutions offices.
- ▶ Consultative and engineering offices

- ▶ Small banks.
- ▶ Companies offices.
- ▶ Real estate offices.

2. Fire hazard: The fire hazard is classified in commercial buildings in accordance with the category.

2.1 Fire hazard in commercial buildings category (a) – commercial shops is classified as medium hazard.

2.2 Fire hazard in commercial buildings category (b) – offices is classified as light hazard.

2.3 Fire hazard in mixed commercial buildings as medium hazard.

3. Construction requirements:

3.1 The requirements of chapter one should be provided to secure the safety of construction frame from fire hazard.

3.2 The validity of buildings from construction point of view for use as commercial buildings as per Table No. 1.2 classification of buildings in terms of fire resistance and Table No. 9.1 validity of buildings from construction point of view for use as commercial buildings.

Validity of buildings from construction point of view for uses as commercial buildings as per area, height and construction classification.

Construction classification	Area and height
First and second type only.	With height exceeding 3 floors or an area more than 3000m ²
All types with the exception of the fifth type.	With height exceeding two floors or an area less than 3000m ²
All types and fifth type temporarily with special requirements.	One floor or an area less than 300m ² .

Table No. 9 -1

4. **Mixed use:**

- 4.1 In case the commercial buildings constitute part of buildings of other use or use for the purposes of categories (a) and (b) the uses should be separated from each other so that each one will form independent fire section which has its independent escape means.
- 4.2 The mixed use should not be of a type which contains fire hazard or industrial purpose.
- 4.3 The preventive requirements of residential buildings should be applied in case the commercial buildings are used for residential purpose as the case in investment residential buildings with commercial facades.

5. **File spread control:** The general preventive precautionary in engineering areas should be applied in addition to these requirements.

5.1 **Horizontal spread:** Fire section area should not exceed the following:

5.1.1 **Category (a) commercial shops:** the fire section area should not exceed 2000m² and each leased unit should be considered independent secondary fire section.

5.1.2 **Category (b) – offices,** the fire section area should not exceed 3000m² and each leased unit should be considered as independent secondary fire section.

5.2 **Vertical spread:** Vertical spread control requirements in the residential buildings preventive requirements should be applied.

5.2.1 Each floor should be considered independent fire section.

5.2.2 The vertical vacuum should be separated in accordance with the preventive precautionary requirements in engineering area with the exception of atrium if the following requirements are met:

5.2.2.1 The height of the atrium should not be more than 3 floors (basement, ground, mezzanine)

5.2.2.2 All floors of commercial shops should be protected by automatic fire fighting water sprayers' network and approved mechanical or natural ventilation means on top of the vacuum.

5.2.3 The atrium may extend to other floors of the building if the following requirements are met:

5.2.3.1 The dimensions of atrium should not be less than 6 m.

5.2.3.2 Automatic fire fighting water sprayers' network should be provided to operate as a curtain around the atrium and a system for prevention of vertical fire and smoke spread to be approved by civil defense.

5.2.3.3 Over head ventilation system to be approved by civil defense.

5.3 External spread: The requirements of external spread control in residential buildings preventive requirements should be applied

5.4 Arrival of civil defense machinery: The civil defense machinery should be provided with easy access to the commercial buildings.

6 Escape Means

6.1 General requirements of escape means should be applied in addition to these requirements

6.2 **Absorption Capacity:** The absorption capacity should be calculated as indicated in escape means chapter Table 3.4 and as for other se locations it should be calculated in accordance with the nature o fuse in these locations.

6.3 **Wideness:** The width of escape mean should be measured on the basis of the people who use them as indicated in escape means chapter.

6.4 **Movement Distance:** The movement distance from any point to the final exit or protected stair should not be less than the indicated figures in Table 9.2.

Calculation of movement distance and direct Distance to the Commercial Buildings

Location	Distance by mts.	Maximum number of persons	Floor	Case & remarks
Direct distance inside commercial shop or office	15	30	Ground	Independent and not connected with basement or mezzanine
	15	10	Basement	Independent shop and connected with escape means
	10	10	Basement	The shop connected with ground floor
	15	3	Mezzanine	Independent and connected with the building
	10	15	Mezzanine	Connected with ground floor
	15	30	All floors	In case of the office
Direct distance from further point in the floor to the stair door	12	-	All floors	In case of medium stair in commercial buildings offices
Movement distance from shop or office door to protected stair door or final exit	20	-	Basement	When exits in more directions are available
	30	-	All floors	When exits in more directions are available
	7.5	-	All floors	In closed ends

Table 9.2

6.5 **Corridors:** General corridors requirements should be provide as indicated in escape means chapter in addition to these requirements.

6.5.1 The corridors should be organized and smoothly leveled so that they lead directly to the outside.

6.5.2 Graded corridors should be provided with railing according to the requirements.

6.5.3 The width of the corridors should be satisfactory for absorption of the people who use them provided that it should not be less than 2 m in commercial buildings category (a) – commercial shops and not less than 1.5 m. in commercial buildings category (b) offices.

- 6.6 **Exits:** The general requirements of exits as indicated in escape means chapter should be provided.
- 6.6.1 All exits should lead directly to outside or to stair or protected corridor from fire and separated from the building by isolation space.
 - 6.6.2 The ground exit should be independent from the basement and mezzanine exits.
 - 6.6.3 The number of exits should be in accordance with the general requirements provided that they should be not less than two distant exits at the utmost parts of the building on external wall and each lead directly to outside.
 - 6.6.4 One exit may be accepted in commercial buildings – category (b) – offices after obtaining the approval of the civil defense if the following requirements are met:
 - 6.6.4.1 The direct distance inside the office should not exceed 15 m.
 - 6.6.4.2 The movement distance from the office door to the final exit or protected stair should not exceed 30 m.
 - 6.6.4.3 The movement distance to the closed ends should not exceed 7.5 m
 - 6.6.4.4 Other escape means requirements should be provided especially stairway.
 - 6.6.5 Additional floor may be added to the commercial shop formed of 3 levels (basement, ground and mezzanine) when additional independent exit is provide in ground floor leading directly to outside or to the protected corridor in the building.
- 6.7 **Ramps:** Ramps should be providing in commercial buildings to be used by the disabled.
- 6.8 **Stairway:** The general requirements of escape means should be applied in addition to these requirements
- 6.8.1 The number of stairs should not be less than two stairs for each floor, distant from each other at utmost parts of the building on external wall each leads directly to outside.
 - 6.8.2 The stair should be protected and separated from the building by isolation space protected from fir and leads directly to outside.

- 6.8.3 The descending stair from first floor ascending one from the basement should lead directly to outside or to a point not distant by more than 3 m from outside in the commercial shop which is formed of (basement, ground floor) or (ground, mezzanine) or (basement, ground, mezzanine, first floor)
- 6.8.4 One stair may be accepted in the commercial buildings after obtaining the approval of civil defense if the following requirements are met:
 - 6.8.4.1 The distance and absorption capacity requirement should be met.
 - 6.8.4.2 The building height should not exceed level including ground floor and mezzanine in commercial buildings category (a) – commercial shops or mixed ones ((a) and (b)).
 - 6.8.4.3 The building height should not exceed 5 floors above ground level including ground floor and mezzanine in commercial buildings category (b), offices only.
 - 6.8.4.4 If the area dose not exceeds 600 m² per floor and 1800 m² total areas of the floors including ground and mezzanine and services if available.
 - 6.8.4.5 The only one stair should be protected from fire hazard and on external wall of the building with isolation space protected as per the general requirements
- 6.8.5 Open internal stair should not be considered as one of the emergency exits in commercial buildings category (b), offices.
 - 6.8.5.1 The stair may be internal if the following requirements are met:
 - 6.8.5.2 Provision of general requirements of stairway especially with regard to the movement distance and ventilation and lightening.
 - 6.8.5.3 Provision of protected isolation space
 - 6.8.5.4 Separation of the stair and the isolation space by fire and smoke spread preventive walls and doors
 - 6.8.5.5 Separation of stairs totally and should not be connected with each other through one corridor so that they will not be out of operation by fire impact.

- 6.8.5.6 If there is internal corridor it should continue in circular manner and smoke preventive doors shall be provided in the corridor so that they will separate it into sections as per the number of stairs.
 - 6.9 **Horizontal exits:** A temporary refuge area should be provide in high commercial buildings or buildings with considerable areas which exceeds 3000 m² per floor
 - 6.9.1 50% of the escape means may end at safe location inside the building.
 - 6.10 **Final exit:** Under any circumstances all escape means should lead to a final exit which lead directly to outside.
 - 6.10.1 Sections with other use type in commercial buildings and public markets should be subject to the application of their special requirements or whichever is of more prevention capacity.
- 7. **Firefighting and warning equipment:** The preventive precautionary of engineering services should be provided in accordance with the general requirements of engineering services in addition to the indicated requirements in Table 9.3 (a) and 9.3 (b)
 - 7.1 The preventive requirements of residential buildings should be applied when the commercial buildings are used for residential purpose as in investment residential buildings with commercial facades.
 - 7.2 The Firefighting and warning equipment should be in terms of designing and implementation and maintenance in accordance with part two requirements or civil defense directory.
 - 7.3 The civil defense may request addition equipment or as alternative to some other required preventive precautionary

**Firefighting equipment and warning systems for commercial buildings-
Category (a) – Shops as per Category – height and construction classification:**

Sl. No.	Type	Required Cases
1	Manual extinguishing equipment:	
1	Manual extinguishers	All floors
2	Fixed installments	
1	Rubber hoses network	All floors
2	Dry hydrants network	More than 3 floors and with height less than 28 m or two floors with area more than 1000 m ²
3	Moisture hydrants network	With height more than 28 m or the area of floor is more than 1000 m ²
4	External hydrants network	Complexes only
3	Automatic fixed systems	
1	Automatic Firefighting water sprayers network	All floors with full coverage
2	Automatic other materials sprayers network	Special hazard locations where water cannot be used
4	Fire warning equipment	
1	Manual warning network	All floors
2	Automatic warning network	All floors in high buildings and special hazard locations and air conditioning path and basement.

Table 9.3 (a)

**Firefighting equipment and warning systems for commercial buildings-
Category (b) – Offices as per Category – height and construction classification:**

Sl. No.	Type	Required Cases
1	Manual Extinguishing Equipment	
1	Manual extinguishers	All floors
2	Fixed installments	
	1 Rubber hoses network	All floors
	2 Dry hydrants network	Higher than (3) floors and with height less than 28 m or two floors with area exceeding 1000 m ²
	3 Moisture hydrants network	With height more than 28 m or where the floor area is more than 1000 m ²
	4 External hydrants network	Complexes only
3	Automatic fixed systems	
	1 Firefighting water sprayers network	Basement – all floors of high buildings and complexes and escape means and 3 rd and fifth type buildings and specified locations as per Firefighting systems requirements.
	2 Automatic other materials sprayers network	Special hazard locations where water cannot be used
4	Fire warning equipment.	
	1 Manual warning network	All floors
	2 Automatic warning network	All floors especially where water sprayers are not available and corridors and special hazard locations and air conditioning system path and basement.

Table 9.3 (b)

8 Engineering Services: It should be complied with the contents of engineering services chapter with concentration on Table 9.4 (a) and 9.4 (b)

- 8.1 The preventive requirements of residential buildings should apply when the commercial buildings are used for residence purpose.
- 8.2 The civil defense may request additional equipment or as alternative to source other preventive requirements.

**Engineering services pertaining to fire prevention in
Commercial buildings – Category (a) – Shops as per category and
Height and construction classification**

Sl. No.	Type	Required cases
	Engineering services pertaining to fire prevention	
1	Ventilation system	As per the international specifications approved by civil defense
2	Illumination guidance signs	All floors
3	Emergency lightening network	All floors
4	Electricity reserve source	High buildings and complexes and buildings which require fire lift
5	Fire lift	If height exceeds 6 floors or 20 m whichever is lesser
6	Automatic fire doors	As per preventive precautionary in engineering areas

Table 9.4 (a)

9 Special preventive requirements:

- 9.1 As for the shops and central markets and their alike the requirements of this chapter in addition to the following requirements should apply:
- 9.1.1 At least half of the exits should end at the highway and away from the accountant barrier.
- 9.2 As for the shops and central markets and their alike the requirements of this chapter in addition to the following requirements should apply:
- 9.3 The shop should be separated from the store by a wall or fire preventive door.
- 9.4 The sub corridors which separate between exhibition areas should be with width not less than (1.5 m) and main corridors not less than (2 m) and organized in a clear and easy manner and lead directly to outside without any difficulty.
- 9.5 The public corridor leading to the exit at the accountant barrier should be less than (1 m)

- 9.6 The barriers and shelves of presentation should be organized so that they will not obstruct escape means or block the visibility of the guidance signs.
- 9.6.1 The store is protected by barrier and fire preventive door as per the requirements.
- 9.6.2 The number of exits passing through the shop should not exceed half of the number of required exits for the shop.
- 9.6.3 There should be a protected corridor from fire hazard leading directly to outside or protection of the store by automatic water sprayers' network.

Chapter 10

Prevention and protection requirements from fire in industrial buildings

Sl. No.	Prevention and Protection requirements from give in industrial buildings	
1		Definition
2		Fire hazard
3		Construction requirements
4		Mixed use
5		Fire spread control
	5.1	Horizontal spreads
	5.2	Vertical spread
	5.3	External spreads
	5.4	Arrival of civil defense machinery
6		Escape means
	6.2	Absorption capacity
	6.3	Wideness
	6.4	Movement distance
	6.6	Exits
	6.7	Stairway
	6.8	Final exit
7		Firefighting and warning equipment
8		Engineering Services

Prevention and Protection requirements from fire in Industrial Buildings

Table Number	Table Title
10.1	Validity of buildings from construction point of view for use for industrial purpose
10.2	Area of fire section in industrial buildings as per the risk of their operation
10.3	Calculation of movement distance and direct distance to the industrial buildings
10.4	Firefighting equipment for industrial buildings as per category – height and construction classification
10.5	Engineering Services pertaining to fire prevention in industrial buildings

- 1 **Definition of industrial buildings:** They are the buildings or their parts which are allocated for industrial purposes or industrial purposes or industrial professions. They include various industrial establishments such as dairy establishments – furniture factories – central laundries – hazardous chemical materials laboratories – printing presses and industrial professions buildings and various industrial workshops.
 - 1.1. **Industrial establishment's buildings:** the buildings or their parts designated for industrial purposes where the composition and mixing and wrapping operations are carried out.
 - 1.2. **Industrial professions buildings:** The buildings or their parts which are allocated for repairs operations

- 2 **Fire hazard:** the fire hazard in industrial buildings is classified in accordance with the type of processing operations which are performed in these buildings as per the following:
 - 2.1 **Medium hazard:** they are the factories which manufacture or collect or produce non combustible materials or those the contents of which burn with medium spread speed or remarkable quantity of smoke emission but do not produce poisonous vapours or cause explosions on burning as indicated in table 1.1 the general preventive requirements for protection from fire in the buildings.

- 2.2 **High Hazard:** the factories which process or collect or produce combustible materials or the contents of which burn at high speed or produce poisonous vapors or explosions as indicated in table 1.1 the general preventive requirements for protection from fire in the buildings.

3 Constructive Requirements

- 3.1 The requirements of chapter one should apply for securing the safety of construction frame from fire hazard.
- 3.2 The validity of the buildings from construction point of view for use for industrial purposes should be in accordance with Table 1.2 classification of buildings in terms of fire resistance and Table 10.1 suitability of buildings from construction point of view for use for industrial purposes.

Validity of buildings from construction point of view of ruse for industrial purposes as per the risk degree of their operations

Construction classification	Risk Degree
First and second only	High risk buildings
All types and fifth type temporarily and as per special requirements	Medium risk buildings

Table 10.1

4 Mixed Use:

- 4.1 In case the industrial buildings and establishments or professions shops form part of other buildings with other use type they should be separated from each other so that each forms independent fire section with independent escape means.
- 4.2 The parts of the buildings which are allocated for other use than industrial should be treated in accordance with their type of use.
- 4.3 The allocated parts of the buildings or their parts which are designated for other use should be separated from each other.

5 Fire spread control: The general requirements of preventive precautionary in engineering areas should apply in addition to these requirements.

- 5.1 **Horizontal Spread:** The fire section area should not exceed the specified figure in Table 10.2 and in case the division is not possible due to the nature of the processing the civil defense may decide the alternative precautions as per the requirement.
- 5.1.1 The basement should be protected by firefighting water sprayers network if its area exceeds 150 m.

Fire Section areas in industrial buildings as per the risk of their operations

Industrial buildings risk	Areas of fire section in square meters as per the floor	
	Ground floor	Basement and upper floor
Medium risk buildings	5000 m ²	1500 m ²
	1000 m ²	500 m ²

Table 10.2

5.2 **Vertical Spread:** The preventive precautionary requirements in engineering areas should be applied.

5.2.1 If the buildings are multi-floor building each floor should be considered independent fire section.

5.3 **External Spread:** The preventive precautionary requirements in engineering areas should apply.

5.3.1 The external walls at the boundary with the neighbor should be constructed of concrete and bricks.

5.4 **Arrival of civil defense machinery:** The civil defense machinery should have easy access to the industrial buildings

6 Escape Means:

6.1 The general requirements of escape means should be applied in addition to these requirements.

6.2 **Absorption Capacity** – The absorption capacity should be in accordance with the contents of escape means chapter table 3.4. As for other use locations the absorption should be determined in accordance with the nature of use.

6.3 **Wideness:** The width of the escape mean should be calculated on the basis of the number of people who use it as indicated in escape means chapter provided that the width of the main corridors in industrial buildings should not be less than (2 m) and the sub-corridors not less than (1.5 m) under any circumstances.

6.4 **Movement Distance:** The movement distance from any point to the final exit or to the protected stair should not exceed the indicated figures in table 10.3.

Calculation of movement distance and direct distance of the industrial buildings

Location	Risk Type	Floor	
		Ground	Basement
Direct distance inside the section	Medium	15	10
	High	7.5	7.5
Movement distance to the exit or protected stair	Medium	40	20
	High	20	10
Closed end	Medium	7.5	7.5
	High	Not permitted	Not permitted

Table 10.3

- 6.5 **Corridors:** General requirements of corridors should be provided as indicated in escape mean chapter provided that the width of the main corridors should not be less than (12 m) and sub corridors not less than (1.5m)
- 6.5.1 If the processing areas are not stable and the corridors are not clear the corridors should be planned with reflective paint to show the corridors clearly and the work or storage area.
- 6.6 **Exits:** The general requirements of exits should be provided as indicated in escape means chapter.
- 6.6.1 Each floor should be provided with two distant exits
- 6.6.2 The number of exits should be in accordance with the general requirements provided that they should not be less than two distant exits at the utmost parts of the building on the external wall and lead to the outside.
- 6.6.3 All exits should lead directly to outside or protected stair or corridor from fire and separated from the building by isolation space.
- 6.6.4 In the industrial buildings with medium risk degree one exit may be accepted after obtaining the approval of civil defense if the following requirements are met.

- 6.6.4.1 The depth of the direct distance inside the section should not exceed 15 m.
 - 6.6.4.2 The movement distance from the door of the section to the final exit or protected stair should not exceed 30 m.
 - 6.6.4.3 The movement distance to the closed ends should not exceed 7.5 m
 - 6.6.4.4 Other escape means requirements should be provided especially the stairway.
- 6.7 **Stairway:** The general escape means requirements should apply in addition to these requirements
- 6.7.1 The number of stairs per floor should not be less than two distant stairs at the utmost parts of the building on the external wall and lead directly to outside.
 - 6.7.2 The stair should be protected and separated from the building by isolation space protected from fire and leads directly to outside.
 - 6.7.3 The civil defense may accept one stair in industrial buildings with medium risk degree if all preventive requirements of industrial buildings are satisfied.
- 6.8 **Final Exit:** Under any circumstances all escape means should lead to final exit which leads directly to outside.
- 6.9 Other sections with other type of use in industrial buildings with high risk degree should be treated in accordance with their special requirements or whichever is of more prevention capacity.

7. Firefighting and warning equipment: The preventive precautionary in engineering areas should be provided in accordance with the general requirements of engineering services in addition to the indicated requirements in Table 10.4

- 7.1 The Firefighting and warning equipment should be in terms of designing and implementation and maintenance complying with the requirements of part two or civil defense directory.
- 7.2 The Firefighting methods differ as the industrial operations and the materials used in the processing also differ. Accordingly the required Firefighting and warning equipment differ from one factory to another. Table No. 10.4 indicates the minimum level of requirements and the civil defense may request additional equipment as they consider necessary.
- 7.3 The Civil defense on issuing the permit may request additional equipment or as alternative to some other preventive precautionary requirements.

**Firefighting and warning equipment for industrial buildings
as per category – height and construction requirements**

Sl. N.	Type	Required case
1	Manual extinguishing equipment:	
1	Manual extinguishers	All floors
2	Fixed installations	
1	Rubber hoses network	All floors
2	Dry hydrants network	More than 3 floors and with the height less than 28 m or two floors with total areas exceeding 1000 m ²
3	Moisture hydrants network	With height more than 28 m. or more than two floors with areas exceeding 1000 m ² per floor
4	External hydrants network	In high risk industrial establishments
3	Automatic fixed systems	
1	Automatic Firefighting water sprayers network	In all industrial buildings and the civil defense may exempt the buildings with medium risk degree.
2	Automatic other materials sprayers network	Special hazard locations where water cannot be used
4	Fire warning equipment	
1	Manual warning network	All floors
2	Automatic warning network	In high risk degree industrial establishment or high risk locations in industrial buildings with medium risk degree.

Table 10.4

8. **Engineering Services:** It should be complied with the contents of engineering services chapter with concentration on table 10.5.

8.1 The civil defense may request additional equipment or as alternative to some other preventive requirements.

**Engineering services for prevention from fire in
Industrial buildings**

1	Engineering services of fire prevention:	
1	Ventilation system	As per the international specifications approved by civil defense
2	Illuminated guidance signs	Basement and escape means
3	Emergency lighting network	Basement and escape means
4	Electricity reserve source	All high risk industrial building
5	Fire Lift	Not required
6	Automatic fire doors	As per the requirements of preventive precautionary in engineering areas

Table 10.5

Chapter Eleven

**Prevention and Protection requirements from fire in the
Warehouses buildings and car parking**

Code		Prevention and Protection Requirements from fire in the warehouses buildings and car parking's
1		Definition
2		Fire hazard
3		Construction requirements
4		Mixed use
5		Fire spread control
	5.1	Horizontal spread
	5.2	Vertical spread
	5.3	External spread
	5.4	Arrival of civil defense machinery
6		Escape means
	6.2	Absorption capacity
	6.3	Wideness
	6.4	Movement distance
	6.5	Corridors
	6.6	Exits
	6.7	Stairway
	6.8	Final exit
	6.9	Sections with other use type
7		Firefighting and warning equipment
9		Special preventive requirements (car parking)

Table No.	Table Title
11.1	Validity of buildings from construction point of view for use for storage purpose
11.2	Area of fire section in warehouses buildings in accordance with their risk degree
11.3	Calculation of movement distance and direct distance of warehouses buildings
11.4	Firefighting equipment in warehouses buildings as per category – height and construction classification.
11.5	Engineering services pertaining to fire prevention in warehouses buildings
11.6	Firefighting equipment in care parking building as per category height and construction classification
11.7	Engineering services pertaining to protection in car parking buildings

1. Definition of warehouse buildings:

- 1.1 They are the buildings or their parts designated for storage of raw materials and processed or half processed products. This type of buildings could be independent or part of processing or sales buildings
- 1.2 The warehouses buildings are divided in terms of their risk degree to the following categories:
 - 1.2.1 **Category (a):** light hazard buildings where noncombustible materials are stored such as building materials and devices and spare parts.
 - 1.2.2 **Category (b):** Buildings with medium risk degree where combustible materials or noncombustible materials wrapped with combustible materials are stored such as thick cartons or plastic or foam covers or sawdust.. etc.
 - 1.2.3 **Category (c):** Buildings with high risk degree where hazardous material are stored in general and combustible gases and liquids and very susceptible materials to burning such as wood and papers and loose fibers and also foam plastic.. etc.

2. **Fire Hazard:** The fire hazard in warehouses buildings is classified in accordance with the storage operations type which is carried out in these buildings as follows:

2.1 **Light Hazard Category (a):** they are the building so the warehouses the contents of which are of low burning nature as indicated in Table 1.. General preventive requirements for buildings chapter such as noncombustible materials such as building materials and spare parts... etc.

2.1.2 **Medium hazard category (b):** they are the buildings of the warehouses the contents of which burn with medium spread speed or from which remarkable smoke could emit but without producing poisonous vapours or causing explosions on burning as indicated in Table 1.1 general preventive requirements in buildings chapter such as the warehouses where combustible materials or noncombustible materials wrapped with combustible materials are stored such as thick cartons and plastic or foam bubbles and sawdust .. etc.

2.2 **High Hazard Category (c):** they are the warehouse buildings, the contents of which burn at high speed or produce poisonous vapours or explosions as indicated in Table 1.1 general preventive requirements in buildings chapter or they are the buildings where hazardous materials are stored in general and combustible gases and liquids and very susceptible materials to burning such as wood and papers and loose fibers and foam plastic.

3. **Construction Requirements:**

3.1 The requirements of chapter one should be provided to secure safety of construction frame from fire.

3.2 The validity of buildings from construction point of view for use for storage purposes should be determined in accordance with Table No. 2.1 – buildings classification in terms of their fire resistance degree and Table 11.1 suitability of buildings from construction point of view for use for storage purpose.

**Validity of buildings from construction point of view for use for
Storage purpose as per the risk degree of their contents**

Construction classifications	Risk degree
First and second type only.	High risk buildings
First, second and third type with special requirements	Medium risk buildings
All types and fifth type temporarily and with special requirements	Light risk buildings

Table 11.1

4. Mixed use:

- 4.1 If the warehouse buildings form part of buildings with other type of use they should be separated so that each one will constitute independent fire section with independent escape means. 3
- 4.2 The parts of the buildings which are allocated for other use than storage should be treated in accordance with the nature of their use.
- 4.3 The designated parts for buildings or their allocated parts for other uses should be separated from each other.

5. Fire Spread Control: The general preventive requirements in engineering areas should be applied in addition to these requirements.

- 5.1 **Horizontal spread:** The areas of fire section should not exceed the indicated figures in Table 11.2
 - 5.1.1 The basement should be protected by the provision Firefighting water sprayers network if its area exceeds (150 m²)
 - 5.1.2 Different uses should be separated from each other regardless of the area.
 - 5.1.3 The special risk locations should be separated from each other regardless of the area

Fire section area in warehouses buildings as per their contents risk

Risk type in warehouses buildings	Area of fire section in squire meter as per floor	
	Floor	Basement and upper floors
Light risk	5000 m ²	
	3000 m ²	
	1000 m ²	

Table 11.2

5.3 **External Spread:** The preventive precautionary requirements in engineering areas should apply.

5.3.1 The external walls on the boundary with neighbor should be constructed form concrete and bricks.

5.4 Arrival of civil defense machinery. The civil defense machinery should be granted easy access to the warehouses buildings

6. Escape Means:

6.1 The general requirements of escape means should be applied in addition to these requirements.

6.2 **Absorption Capacity:** The absorption capacity should be estimated in accordance with the contents of escape means chapter Table 3.4 and as for other use locations the capacity should be determined in accordance with the nature of their use.

6.3 **Wideness:** The width of the escape mean should be measured on the basis of the number of people who use it. As indicated in escape means chapter provided that the width of main corridors in the warehouses buildings should not be less than (2 m) and in sub corridors should not be less than (1.5m) under any circumstances.

6.4 **Movement distance:** The movement distance from any point to the final exit or to the protected stair should not be less than the indicated figures in Table 11.3

**Calculation of movement distance and direct distance in
Warehouses buildings**

Location	Type of risk	Floor	
		Ground	Basement
Direct distance in the section	Light or medium	15	10
	High	7.5	7.5
Movement distance to the exit or protected stair	Medium	30	15
	High	20	10
Closed end	Light or medium	7.5	7.5
	High	Not permitted	Not permitted

Table 11.3

- 6.5 **Corridors:** The general requirements of corridors as indicated in escape means chapter should be provide, provide that the width of the main corridors should not be less than (2m) and the sub corridors not less than (1.5m) – under any circumstances
- 6.5.1 If the storage locations are not stable and the corridors are not clear the corridors should be planned with reflective paint to show the corridors and the storage and work areas.
- 6.5.2 The corridors between the storage locations should be clear and organized so that they lead to the outside.
- 6.6 **Exits:** The general requirements of exits should be provided as indicated in escape means chapter
- 6.6.1 The number of exits should be in accordance with the general requirements provided that they should not be less than two distant exits at the utmost parts of the building on the external wall and each lead to the outside.
- 6.6.2 All exit should lead directly to the outside or to a protected stair or corridor from fire and isolated from the building by isolation space
- 6.6.3 One stair may be accepted in warehouses buildings with light risk degree or medium risk degree after obtaining the approval of civil defense if the following requirements are met.

- 6.6.3.1 The depth or direct distance inside the section should not exceed 15 m.
 - 6.6.3.2 The movement distance from the door of the section to the final exit or protected stair should not exceed 30 m.
 - 6.6.3.3 The movement distance to closed ends should not exceed 7.5m
 - 6.6.3.4 Other escape means requirements should be made available.
- 6.7 **Stairway:** The general requirements of escape means should apply in addition to these requirements
- 6.7.1 The number of stairs should not be less than two stairs per floor, distant and at utmost parts of the building on external wall and each leads to outside directly.
 - 6.7.2 The stair should be protected and separated from the building by isolation space protected from fire and leads directly to outside.
- 6.8 **Final Exit:** Under all circumstances all escape means should lead to a final exit which leads to outside directly.
- 6.9 The sections in warehouses buildings with other types of use should be treated in accordance with their special prevention requirements or whichever is of more prevention capacity.
7. **Firefighting and warning Equipment:** The preventive precautionary equipments in engineering areas should be provided in accordance with the general requirements or engineering services in addition to the requirements in Table 11.4
- 7.1 The Firefighting and warning equipment should be in terms of designing and implementation and maintenance in accordance with the requirements of part two or civil defense directory
 - 7.2 The civil defense may request additional equipment or as alternative to some other preventive requirements.

Firefighting equipment for warehouses buildings and car parking as per category and height and construction classification.

S. Nos.	Type		Required Cases
I	Manual extinguishing equipment:		
1	Manual extinguishers		All floors and cases
2	Fixed Installations		
	(i)	Rubber hoses network	All floors and cases
	(ii)	Dry hydrants network	Not required
	(iii)	Moisture hydrant network	Not required
	(iv)	External hydrants network	In high risk and warehouse buildings
3	Automatic Fixed Systems		
	(i)	Automatic Firefighting water sprayers	Basement and high and medium risk warehouses buildings
	(ii)	Automatic other materials sprayers	Special hazard locations
4	Fire warning equipment		
	(i)	Manual warning network	In all floor and cases
	(ii)	Automatic warning network	In medium or high risk warehouses and high risk locations in light risk warehouses

Table 11.4

8. **Engineering Services:** it should be complied with the contents of the engineering services chapter with concentration on Table 11.5

8.1 The civil defense may request additional equipment or as alternative to some other preventive requirements.

**Engineering services pertaining to prevention of fire in
warehouses buildings and car parking**

Sl. No.	Type	Required cases
4	Engineering Services for fire prevention:	
1	Ventilation system	As per international specifications approved by civil defense
2	Illumination guidance signs	Basement and escape means
3	Emergency lighting network	Basement and escape means
4	Electricity reserve source	Not required
5	Fire lift	Not required
6	Automatic fire doors	In accordance with the preventive precautions in engineering areas

Table 11.5

9. Special Preventive requirements for car parking

9.1 Definition of car parking buildings:

9.1.1 They are buildings used of the storage and parking of cars in continuous or temporary form and in this sense they are considered as attached to the warehouses buildings. Therefore, the general preventive requirements for protection from fire in warehouses buildings should apply in general to the car parking in addition to these requirements.

9.1.2 The car parking are divided from architectural point of view to the following categories:

Category (a): Open sided buildings in which cars are driven to the parking location and to the exit.

Category (b): Closed side buildings in which cars are driven to their parking locations and to the exit

Category (c): Buildings where cars are driven to their location and to the exit point automatically.

- 9.2 **Fire Hazard:** The fire hazard in car parking buildings are classified as medium risk as indicated in Table 1.1 general preventive requirements for buildings chapter.
- 9.3 **Ramps for car parking underground:**
- 9.3.1 The ramps are not considered as escape means unless part of it is allocated for this purpose to be protected by a protective barrier and satisfies the general requirements of escape means
- 9.3.2 Ramp percentage from and to the basement should not exceed (1:10) and two ramps at least should be provided preferred to be distant and on two directions facing each other and if this is not possible the civil defense should decided the appropriate action.
- 9.3.3 **Floor:** necessary bending should be made on the basement floor which leads to water or oils collection channels so that they can be discharged through discharge openings and general sewerage system as per engineering principles.
- 9.4 **Side Wall:**
- 9.4.1 The side windows facing the highway should be covered with reinforced glass or thick mesh grid to prevent the entry of the wastes and cigarette residuals.
- 9.4.2 If the sides of the car parking are open by not less than 25% percentage of the area of external wall of the building and on two facing directions this parking should be considered as an open one and accordingly there will be no need for automatic Firefighting water sprayers.
- 9.5 **Firefighting and warning equipment:** The preventive precautionary requirements as per the general requirements of engineering services should be applied in addition to these requirements.
- 9.5.1 The Firefighting and warning equipment should be in terms of designing and implementation and maintenance in accordance with the requirements of part two or the directory of the civil defense.
- 9.5.2 It should not be permitted to carry out any construction or install any equipment for storage or supply of fuel in the building according to private requirements.
- 9.5.3 The civil defense may request additional or equipment or as alternative to some other requirements.

**Firefighting equipment and warning systems in
car parking buildings as per category and height and construction classification.**

S. Nos.	Type	Required Cases
1	Manual extinguishing equipment:	
1	Manual extinguishers	All floors and cases
2	Manual Extinguishers	
	(i) Rubber hoses network	All floors and cases
	(ii) Dry hydrants network	Not required
	(iii) Moisture hydrant network	Not required
	(iv) External hydrants network	Inside the fence of major projects
3	Automatic Fixed Systems	
	(i) Automatic Firefighting water sprayers network	Car parking underground (basement) with closed sides
	(ii) Automatic other materials sprayers network	Special hazard locations where water cannot be used
4	Fire warning equipment	
	(i) Manual warning network	In all floors and cases
	(ii) Automatic warning network	In car parking with closed sides

Table 11.6

9.6 **Engineering Services:** it should be complied with the contents of engineering services chapter with concentration on table 11.7

9.6.1 Ventilation and smoke discharge

9.6.1.1 Natural or mechanical appropriate ventilation should be provided in accordance with the international specifications approved by the civil defence

9.6.1.2 The mechanical ventilation in the basement should be separated from any other system in the building and should be designed to operate on separated two units to control the worst situations.

**Engineering Services Pertaining to
Prevention from fire in the warehouses buildings and car parking**

S. No.	Type	Required Cases
1	Engineering Services for prevention of fire:	
1	Ventilation system	As per international specifications approved by civil defence
2	Illuminated guidance signs	Basement and all floors
3	Emergency lighting network	Basement and all floors
4	Electricity reserve source	Required in closed car parking building
5	Fire lift	Buildings which do not exceed four floors height
6	Automatic fire doors	As per the preventive precautionary in engineering areas

Table 11.7

Arabic References:

1. Safety and protection from fire - regulations and instructions issued in U.A.E.
2. Safety from fire - regulations and instructions issued in the Sultanate of Oman
3. Safety and protection from fire - regulations and instructions issued in Kuwait
4. Safety and protection from fire - regulations and instructions issued the kingdom of Saudi Arabia
5. Electrical service supply to buildings regulations issued in Kingdom of Saudi Arabia
6. Electrical extensions to buildings principles regulations issued in Kingdom of Saudi Arabia
7. Regulations of the principles of securing reserve electrical power sources issued in Kingdom of Saudi Arabia
8. Regulations of Organization and issuing of permits for practicing electrical works issued in the Kingdom of Saudi Arabia.
9. Standard Gulf Specifications for electrical lifts for individuals and goods issued in Saudi Arabia
10. Safety and security requirements for individuals or goods issued by civil defence in kingdom of Saudi Arabia

Foreign References:

1. Life safety code handbook – NFPA – Seventh Edition – 1997
2. Fire Protection handbook – NFPA – Eighteenth Edition – 1997
3. Neufert Ernst Architects – Data Black Well Science – Second (International) English Edition - 1978