

BUILDING CODE ON THE SAFETY BASIS

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INTRODUCTION

The Near Eastern States, and particularly the Arab countries are in need of a uniform and regular "Building Code on the Safety Basis" whereby the building construction in these countries may be standardized and whereby dangerous circumstances arising from fire or other hazards can be minimized. Most of these countries already have some set rules and regulations regarding Building Construction, but in most cases these regulations are incomplete and at the same time they lack some safety measures.

The need for this code to remedy such prevailing situation can not be underestimated, so that the author has made an attempt to form up some definite and set down rules and regulations, to the best of his knowledge and understanding, based on a number of codes, particularly on the American Codes, for which he expresses his deep and sincere gratitude.

It should be borne in mind that the writer is in no position to create a new code particularly that he still lacks experience; nevertheless a trial has been attempted to compile information from the aforesaid codes and at the same time to chose the better and safer rules and regulations therefrom, with the hope that these shall be applied in the countries concerned. The sources from which information has been sought and on which this code is based are listed hereafter, according

to the degree of information and assistance they have offered;

1. NATIONAL BUILDING CODE (U.S.) (1949 ed.)
prepared by the National Board of Fire Underwriters.
2. UNIFORM BUILDING CODE (U.S.) (1949 ed.)
prepared by the Pacific Coast Building Officials Conference
3. Protection contre L'INCENDIE des batiments ou locaux recevant
du Public. (Ministère de l'intérieur) (1951 ed.) French Code
4. Supplement No. 3 to Palestine Gazette No. 1583 of 1947.
(hereafter called "PALESTINE CODE").
5. Reglement General D'Urbanisme pour la ville de Damas.
6. Bulletin de l'Association Libanaise des Ingenieurs et Architectes.
7. Stone & Cox Fire Insurance Year Book (1951). London.

Note: In the course of the literature, the author has purpose-ly reproduced , in the case of very few articles only, the regu-lations set forth in certain codes, either to bring out a contrast or a comparison or just for the sake of interest.

CHAPTER ONE

CLASSIFICATION OF BUILDINGS ACCORDING TO OCCUPANCY
AND USE.

ART.1 Class "A": Public Assembly Buildings:

A building in which people congregate for civic, political, educational, religious, social, recreational or any similar activities, including among others: Auditoriums, Motion picture projection theatres, lecture hall, libraries, dance halls, ballrooms, nightclubs, courts, city halls, churches etc... They are subdivided into:

Class A₁: Any assembly building with a stage and an occupant load of 1000 persons or more in the building

Class A₂: Any assembly building with a stage and an occupant load between 500 and 1000.

Class A₃: Any assembly building without a stage and having an occupant load of less than 500 persons.

ART.2 Class "B": Institutional Buildings:

A building that receives people for medical, charitable, educational, social, or other care or treatment; including among others: hospitals, sanitariums, clinics, homes for the aged, poor or blind, orphanages and nurseries

Subdivisions:

- a) Schools, colleges, or educational centers
- b) Units where the personal liberty of the inmates is restrained such as jails, reformatory schools, and to a lesser extent, lunatic asylums.

ART. 3 Class "C": Residential Buildings:

A building in which sleeping accommodations are provided for inmates, except as under class "B", including among others hotels, tourist houses, dormitories, boarding houses, convents, monasteries, multifamily apartment houses, etc...

ART. 4 Class "D". Business Buildings:

A building occupied for the transaction of business, for the rendering of professional services, for the display of goods or merchandise, or for the performance of work or labor or for the manufacture of non-inflammable and non-incombustible materials, including among others: office or administration buildings, department stores, laboratories, radio and telephone stations etc...

ART. 5 Class "E": Industrial Units:

Used primarily for the manufacture, fabrication or processing of products and materials, including among others: assembly plants, power and pumping plants, Ice manufacture plants, factories using non-explosive and not highly inflammable materials, bakeries, breweries and creameries; and storage rooms of the aforesaid.

ART. 6 Class "F": Hazardous Units:

Used for the manufacture or storage of highly inflammable and combustible materials, liquids and explosives, paints or other hazardous gases. To a lesser extent, public garages.

ART. 7: SPECIAL OCCUPANCY REQUIREMENTS.

1. No height limitation for any building of any occupancy if of fire proof construction (see Chapter on Type of Construction).
2. Buildings whose occupants are involuntarily detained or bedridden shall be constructed only of either fire proof or semi-fire proof construction.

HEIGHT LIMITATION

- 1) Class A buildings shall be of fire proof or semi-fire proof construction. Other constructions allowed under following reqms;
 - a) No theatre or motion picture auditorium shall be located or attached to a building of other occupancy unless it is seperated from such other occupancies by walls and floors of not less than 3-hrs. fire resistive rating construction.
 - b) If of semi-fire proof construction the height shall be 75ft. and shall be unlimited if less than 100 occupants are above 75 ft.
If of heavy timber construction shall not exceed 4 storeys nor 55ft. If of ordinary construction shall not exceed 2 storeys nor 35ft.
- 2) Class B Buildings if other than fire proof or semi-fire proof construction shall not exceed 2 storeys nor 35ft and shall have floors and partitions of not less than 1hr. fire resistance rating construction.

- a) If of semi fire proof construction they shall not exceed 6 storeys nor 75 ft.

- 3) Class C Buildings: Partitions, separating apartments, suites, or any private tenancy locations from one another or such locations from hallways or corridors, shall have a fire resistance rating of not less than 1hr, with openings protected by approved fire doors or by solid wooden (seasoned and treated lumber) doors.
 - a) No height limitation for such buildings of semi-fire proof construction.

- 4) Class D Buildings. No height limitation for such buildings of semi-fire proof construction.
 - a) If of heavy timber construction shall not exceed 6 storeys nor 75 ft. in height. If of ordinary construction shall not exceed 4 storeys nor 50ft.

- 5) Storage Buildings shall not exceed 50ft. in height if of semi-fire proof construction nor 35ft. if of heavy timber or of ordinary construction.

Such limitations shall be increased if buildings concerned have an approved fire extinguishing system.

CHAPTER TWO

CLASSIFICATION OF BUILDINGS ACCORDING TO CONSTRUCTION TYPE
WITH REGARDS FIRE RESISTANCE

ARTICLE 1: Type I Fireproof Construction

- a) The structural frame of such buildings shall be of any approved noncombustible construction such as fire protected structural steel or iron, or of reinforced concrete. All exterior walls shall be of not less than 4hrs. fire resistance rating constructed either of reinforced concrete, stone masonry or cement blocks.
- b) The floors and roofs shall be of fire resistive materials such as the above mentioned ones and shall be at least 4" thick; in any case not less than 3hr. fire resistive rating for extra hazardous occupancies and at least 2hrs. for all other buildings. Where wooden finish floors are used, the space between the concrete subfloor and the wooden sleepers shall be filled with incombustible material especially under and over partitions.
- c) Interior partitions: Shall be of not less than 2hrs fire resistance rating and shall rest on noncombustible materials. Temporary partitions dividing areas not exceeding 5000 sq.ft. and which are not particularly hazardous can have wood partitions for $\frac{3}{4}$ of the ht. of the room; if more than $\frac{3}{4}$ of the ht. is covered, the upper $\frac{1}{4}$ should be glazed with glass set in a noncombustible frame.
- (Note: For definition of "Combustible", noncombustible, fire rating, etc... see last Article at the end of this Chapter).

- d) Service Utilities: No pipes or service utilities shall be embedded in the required fireproofing of the structural member; except in reinforced concrete floors, electric installation conduits are permitted.
- e) Trusses and members which shall be constructed of noncombustible material and supporting roof loads or ceilings over floor areas where the clear height is 25' or more may be protected with a false ceiling of noncombustible materials and of not less than 1hr. fire resistive construction and shall be at least 6" distant from the lowest point of any member of such roof construction. Such a false ceiling shall have no openings except those required for ducts or exhaust ventilation.
- f) All spaces between the required fire proofing and the member itself shall be fire stopped at every floor level above and below partitions.
- g) There is no height limitation for buildings of such a construction type.

ARTICLE 2: Semifireproof Construction

- a) Exterior walls shall be of reinforced concrete, masonry, or cement block having a fire resistive rating of not less than 4hrs. and structural supporting members noncombustible not less than 3hrs. Floors and roofs at least 5" thick and shall be of not less than 2hrs. fire resisting rating. Partitions shall be of at least 1hr fire resistance rating and shall rest on noncombustible construction. Temporary partitions are allowable in any room or space and occupied by a single tenant.

No height limitation for such construction.

All other requirements and specifications in Article 1 apply herein.

ARTICLE 3: Heavy Timber Construction

- a) Exterior walls and bearing walls shall be of masonry or reinforced concrete of not less than 4hrs. fire resistive rating. b) Structural supporting members shall be of not less than 3hrs. fire resistive rating; wooden columns of fire treated and seasoned lumber and with no dimension less than 10" can be used. All such columns shall be superimposed. Wooden beams not less than 10" in any dimension are allowed and those supported by walls shall have not less than 8" thickness of masonry between their ends and the outside face of the wall.

Partitions: only noncombustible of at least 1hr. fire resistive rating shall be used and shall rest on noncombustible supporting members. Temporary partitions of wood or glass can be used for areas not exceeding 5000'.

Floor Construction: Tongued and grooved 3" well seasoned and treated lumber with 1" of top flooring laid crosswise or diagonally. In any case the floor system shall be of at least 1hr. fire resistive rating construction. A space of $\frac{1}{2}$ " shall be allowed between the floor and the adjacent wall or partition in order to allow for the expansion of such wall or partition due to wetting by water in case of fire extinguishing. Also a pitch of 1 in 20 shall be given to the top flooring to allow for drainage in case of fire circumstances.

ARTICLE 4: Ordinary Construction

a) Where the exterior and bearing walls are made of masonry or of reinforced concrete or of any fire resistive material ^{& where} skeleton structural framework of reinforced concrete, steel not fire protected, or of wood.

b) All spaces between different adjacent members shall be fire-stopped with approved noncombustible material.

c) Partitions, can be made of wood; if they are bearing ones they shall not support more than 2 stories and a roof. Temporary partition as specified in ART. 1 can be used. Floor construction may be of reinforced concrete, masonry, steel or wood.

A Building of such construction type which has a usable basement and whose first floor above grade is made of wood shall have an at least 1hr. fire resistive covering or ~~separation~~ operation between the soffit of such floor and the basement ceiling.

ARTICLE 5: Definitions

a) Combustible: The term combustible and its derivative shall be applied to materials only, and means a material which will ignite when heated to a temp. of or below 1200° F (648°.9 C) and continue to burn or glow.

b) Noncombustible: a material which will not ignite and give off inflammable vapours when heated to a temp above 1200° F.

c) Fire rating: means the time in hrs. that a unit or assembly of units can stand a prescribed fire test as determined by the A.S. T.M. (Standard methods of Fire tests of Building Construction and materials) (Also refer to Chap. on FIRE RESISTANCE RATINGS etc ART.9)

CHAPTER III. - LIGHT AND VENTILATION

Habitable rooms: Def: A room occupied by 1 or more persons for living, eating or sleeping and includes kitchens, serving apartments but does not include bathrooms, toilet compartments, laundries, serving or storage pantries, corridors, basements and other places that are not used frequently or during extended periods of time.

Art. 1 All habitable rooms shall be at least 7ft. wide and not less than 70sq.ft. in gross floor area. They shall have a clear height of 7ft.6" for at least 60sq.ft. of such floor area.

Every such room shall have natural light and ventilation by at least one window opening directly onto a street or on a court whose limitations are:

1. It shall be at least 6ft. wide or shall have a width at any level equal to at least $\frac{2}{3}$ the height of such court whichever is the greater.
2. The cross-sectional area of such court shall not be less than $1\frac{1}{2}$ times the square of its required least dimension.
3. They shall be accessible at their bottom and shall be connected with a street alley or yard by a passageway constructed of fire resistant construction.

Art. 2 Every room used as an auditorium or as a ^{/place of} public assembly, including dressing rooms, shall be provided with windows with an aggregate area of at least 10% of the total floor area.

These windows shall be directly connected to an outside street or court, and half their area should be openable.

Art. 3 If not provided with as in Art. 2, such rooms or spaces shall be provided with artificial light and an approved mechanical ventilating system which shall supply at least 30 cub. ft. of air

per person per minute, and shall be continuously in operation for as long as such space is in use by the public.

Art IV. All electric lights in all parts of the building (in public buildings) used by the public whether in corridors, exit courts and exit passageways shall be on a separate independent circuit and the bulbs shall be placed at a ht. of not less than 7 ft. above the floor and shall be protected by a wire cage.

Art.V. WINDOWS. All rooms shall be provided with windows whose aggregate area is at least 10% of the total floor area half of such area being openable for adequate ventilation. In any case such window area shall not be less than 12 sq. ft.

Art. VI. BATHROOMS AND TOILET COMPARTMENTS: They shall have an aggregate window area of at least 3 sq. ft half of which is openable directly to the outside or to a ventilating shaft which shall be directly connected to the outside air for its full height up till the top or shall be covered with a skylight ^a glazed with plain glass with adequate openings. Such shaft shall have an area of at least 6 sq. meters with no demension less than 2 meters.

No projections or any protrusions will be permitted in such shafts except for the piping and other utilities systems.

b) If the above requirements are not complied with, the compartment will be provided with a vent-tube whose sectional area is at least 72 sq in. which extends to and thru the roof. The duct should be constructed of noncombustible and corrosion resistant material and should be exclusively used for such purpose.

Art. VII. SPACES OR ROOMS HAVING SPECIAL HAZARDS AND ROOMS BELOW GRADE.
Every room which is habitable and placed below grade shall have at least the top $1\frac{1}{2}$ meters of its height above grade or above the road

or above the ground immediately adjoining the room, and shall be directly connected to the outside on the opposite side of the room to a well drained and tiled area at least 3 meters wide which is at a lower elevation than the floor of the room. (Pal Code)

Any other room which is not a habitable one but where people might congregate for some time, whose ceiling is below grade, shall be provided with an approved mechanical ventilation system and shall be artificially lighted by an appropriate electric lighting system.

Garages and all spaces where flammable liquids or materials are used, handled, manufactured or stored shall be equipped besides all other required openings, with mechanical exhaust system sufficient to change the air every fifteen minutes, with the exhaust intake located in the most effective location.

ART VIII. STAIRWAYS AND CORRIDORS; These shall be ventilated as the general requirements indicate or shall have a system of flues with a section at least 1 ft. by 1 ft. All public halls and vestibules mechanically ventilated shall be equipped with artificial lighting and shall be lighted at all times. If windows are used to provide such light and ventilation there shall be at least 1 window for at least 20 ft. of length.

* * * * *

CHAPTER FOUR

MEANS OF EGRESS AND HUMAN TRAFFIC FACILITIES

ART. 1 General:

a) Definition of Exit Way: means exit doorway or doorways, or such doorways together with connecting hallways or stairways either interior or exterior, or fire escapes, by means of which persons may proceed safely from a room or space to a street or to an open space which provides safe access to a street.

b) Two or more exit ways may use the same corridor or hallway provided that such corridor or hallway is enclosed by and separated from exit stairways and other parts of the building by partitions having a fire resistance rating of not less than 1 hour.

ART. 2 Occupant Load

The Occupant Load is the total number of persons actually occupying a building or part thereof at any time, or the total floor area divided by the number of sq.ft. allotted to each occupant (according to the following table) whichever is the greater:

<u>OCCUPANCY</u>	<u>GROSS AREA SQ.FT/PERSON</u>
Assembly area in places of assembly.....	7
Restaurants and dining areas.....	15
Dance Halls.....	15
Gymnasiums. Skating. Rinks.....	15

<u>OCCUPANCY</u>	<u>GROSS AREA SQ. FEET/PERSON</u>
Non Assembly areas.....	100
Classrooms.....	20
Children Homes, homes for the Aged.....	50
Hospitals, sanitariums, assylums.....	100
Factories, Storage warehouses, Hangars, Garages etc.....	100
Retails sales shops (Basement).....	20
" " " First floor.....	30
" " " Upper Floors.....	50
Residences.....	125
All others.....	100

ART. 3 NUMBER OF EXIT WAYS

a) Any room , space or area exceeding 1000 sq.ft. in area or occupied by more than 100 persons shall have at least 2 separate exitways.

b) Every story exceeding 2500 sq.ft. in areashall have at least 2 separate exitways. In multistory family apartment houses using a common exit way, every apartment that has no direct exit to a street or to a court opening on a street shall have access to at least one additional exit way separated from and independent from the interior stairway.

c) Unless it is sprinklered, every basement shall be provided with a stairway, window or other opening directly connected to the outside air so located and of such size as to permit its use by firemen at the time of fire.

- a) For Places of Assembly, see special Chapter on this class of occupancy.
- e) Every story in which persons are harbored to receive medical, charitable or other care or treatment or for correctional purposes, shall have at least two separate exit ways.

GENERAL REQUIREMENTS:

ART;4

- a.) Every exit way shall discharge into a public way or exit court which leads to a public way.
- b) The total width of exitways shall be divided more or less equally between doors or exits, and shall be placed at reasonable distance apart.
- c) No point in any floor area or space shall be more than 150 ft. distant from an exit doorway, measured along the line of travel

ART. 5 Corridors and Hallways:

- a)The unobstructed width of any corridor shall not be less than 4 ft. Exit doors when fully opened can project 6" into a corridor. In general the width shall be calculated at the rate of 12" for 100 persons accommodated.
- b) The total width of a hallway or corridor connecting a stairway to a public street or to a court shall not be less than the aggregate width of the stairways served by it.

c) The floor, walls, and ceiling of corridors of hallways shall be of not less than 1 hr. fire resistive construction. No decoration that is inflammable, and no object or material shall be placed in such places as to obstruct the passage of the public in any way.

ART. 6 Stairways

a) All stairways, whether interior or exterior shall be constructed of noncombustible material throughout, and shall have solid steps securely fastened in place.

b) Width: Stairways serving more than 50 people shall be not less than 4 ft. clear net width. Stairways serving 50 people or less can be 3 ft. wide. Those serving 10 or less persons shall be not less than 30" wide. Palestine Code:

"Stairways serving 200 people or less shall be not less than 1.30 m. net width. For an occupant load of more than 200 people the width shall be at least 1.60 m."

c) Rise and Tread: The rise shall be not more than 7½" and the tread not less than 10"; In any case their product in inches shall be between 70 and 75. Seven in. (7) and 11" for riser and tread is usually used. Palestine Code:

"The riser of a stairway shall not be more than 18 cm. high and the tread shall be determined by the following formula expressed in centimeters: $2 \times \text{ht. of riser} + \text{width of tread} = 62 - 64 \text{ cms.}$

According to the "TIME SAVER STANDARDS" specifications: "For the sake of practical classification a stairway can be defined as follows:

meters 2

"A stepped footway having a gradient not less than $31\frac{1}{4}\%$ or an angle of 17° - $21'$; and not greater than $112\frac{1}{2}\%$ or an angle of 48° - $22'$."

For allowable risers & treads of Stairs, ladders and ramps consult special chapter in "TIME SAVER STANDARDS".

d) Every intermediate landing shall have a width at least equal to the required width of the stairway, and no flight of stairs shall consist of more than 15 steps at a time.

e) Handrails: For stairways greater than 4 ft. wide, 2 handrails 1 on each side are required; for narrower stairways at least 1 handrail is required. (The usual height of handrail measured vertically from the line of the pitch of the stairs is taken 33" or 34"). Stairways that are greater than 8 ft. in width, can have an intermediate rail dividing the width of the stairway into portions not more than 6 ft. wide.

f) The space under the stairs shall be kept free and empty. Interior stairways in buildings connecting 2 or more stories shall be enclosed by fire partitions.

g) Exterior Stairways: Each story served by an exterior stairway shall have access to the stairway directly through an exit door which shall be an approved self closing fire door.

Handrails are not required for exterior monumental stairways. In every building more than 2 stories in height, at least 1 interior stairway shall lead to the roof.

h) Headroom: Every stairway shall have at least 7 ft. of headroom clearance measured vertically from the line of the pitch of the stairs to the nearest soffit.

h) Headroom (cont'D)

Palestine Code "The headroom above the tread of a stair or the floor of a landing, corridor or passageway shall be not less than 2.10 (meters.)"

"No window or part of a window shall be made or fixed to open inwards in such a manner as to project beyond the internal face of the wall on any stairway or lobby, landing corridor or passageway which forms part of, or gives access to, such stairway, at a height less than the height required for headroom." (X)

Cont'n of ART. 3

b) Palestine Code "A building containing a number of apartments shall be so designed and constructed that not more than forty rooms have access to any one staircase and not more than ten rooms have access to any one landing of a staircase." (X)

"Such stairway or stairways shall be so situated that no part of the floor of any storey is more than 25 (meters) distant from a stairway." ?

ART. 7 Ramps:

The slopes shall not exceed 1 in 8 and they shall have non-slippery floor surfaces French Code: Maximum allowable slope shall not exceed 10%.

All requirements for stairways and corridors apply herein.

ART. 8 Exit Outlets and Courts:

Every exit shall discharge into a public way or into a court which will lead directly to a public way and having an area of not less than 3 sq.ft. per occupant served by the exit. This court shall have at least 1 exit leading directly to a public street. The slope of such court shall not exceed 1 in 8. In case it is enclosed, it shall be of the same fire resistive rating construction as the building or space it serves.

ART. 9 Smokeproof Enclosure:

shall consist of a continuous stairway enclosed from the highest point to the lowest point by walls or partitions having a 2 hr. fire-resistive rating, with the supporting structural frame having at least a 4 hr. fire-resistive rating construction.

b) One of the required exits, in buildings having more than 1 stairway, shall be a smoke proof enclosure. Stairs in such an enclosure shall be of noncombustible construction such as all the walls, ceilings, slabs and structural supporting members. Every such enclosure shall lead to an exit into a public way or into a passageway leading into a public way whose construction (that of the passageway) is not less than 2 hrs. fire rating.

Art. 10 Exit Doors:

a) All exit doors shall swing to the outside in the direction of exit travel, shall be easily openable from the inside without any elaborate means, and shall not be provided with a lock or key.

b) The width of a door opening shall be not less than at the rate of 22" per 100 persons served by it. In any case no door shall be less than 4 ft. wide.

c) When fully opened they shall not obstruct the way for easy passage or decrease the width of the corridor; they can project 6" into a corridor when fully opened.

d) Revolving doors shall not be used as exits, except when ordinary doors of the required width are adjacent thereto.

e) Every door shall open into a public way or into a court with required dimensions leading to an exit way, or into a corridor of the adequate width, or into a stairway whose first step is at least 6" from the farthest point in the door when the latter is fully opened.

f) Palestine Code: "Where vestibules are provided the aggregate width of doorways leading therefrom to a public outside space shall be at least one third greater than the aggregate width of all doorways and passages leading into such vestibule.

g) No door leaf shall be wider than 4 ft.

SOME REQUIREMENTS FOR SOME SPECIAL OCCUPANCIES

ART. 11 Group A₁ Occupancies:

a) Every group of such occupancy shall be provided with a main exit which shall be of sufficient width to accommodate $\frac{1}{2}$ the total occupant load, without being less than the aggregate width of passages leading thereto. It shall connect to a stairway, horizontal exit or ramp which shall lead to a public way.

b) Every auditorium of Group A₁ occupancy shall be provided with at least one exit on each side of the main bank of seats other than the main exit. These shall be of sufficient width to accommodate $\frac{1}{2}$ of the total occupant load and shall open (in the direction of egress) directly onto an exit court or passageway of approved dimensions leading to an exit court.

Note: See also Chapter on "PLACES OF ASSEMBLY, AUDITORIUMS ETC."

ART. 12 Group B Occupancy:

a) In schools or colleges, the width of corridors shall be 2 ft. in excess to that specified under general requirements. In no case shall any corridor be less than 6 ft. wide.

b) There shall not be less than 2 stairways connecting floors to the main exit from the building. The required width of exit way shall be divided equally between such stairways; in no case shall the stair width be less than 5 ft. There shall not be any dead end in any corridor more than 25 ft. beyond the exit stairway or exit door.

c) Exit doors shall have the same width as corridors, hallways or stairways, but never less than 2 ft. less than the above. Any room which is below grade and is used by students shall shall have at least 1 exit leading directly to the exterior of the building and shall be in width not less than $\frac{1}{2}$ the total aggregate exit width required for that room.

d) Where bedridden patients are housed the corridors shall be not less than 6 ft. wide or shall at least accommodate a stretcher across besides 1 person.

Exterior doors shall not be lockable in such occupancies where bedridden patients are housed except in sanitariums for mental patients. In any case any exit door shall be not less than 4 ft. wide.

ART. 13 Fire Escapes:

Buildings requiring more than 1 exit stairway, and not conforming with the requirements of Art. 3 of this chapter shall have besides the main stairway in the building, an exterior stairway (fire escape) conforming to the following requirements:

a) Stairs shall be at least 22" wide between handrails, and shall have risers not more than 9" high and treads not less than 6" wide.

b) Ladders may be used from the uppermost landing to the roof; all doors leading from the fireescape to the building at each floor level shall be approved fire doors.

c) Unless the stair leading to the ground at the foot of the fire escape is permanently fixed, it shall be constructed with counterbalancing devices so that it can be easily and quickly released and placed in rigid position for use.

d) The stairs shall be designed as specified in Chapter entitled "DESIGN LIVELOADS".

e) Fire escapes shall be so placed that they can be easily reached by all the occupants of the building, and shall be leading directly to a street or to an open space leading to a public way or street.

f) All steps shall be solid, except for perforations not greater than $\frac{1}{2}$ " in diam. provided for drainage of the tread; Also they shall be guarded by 4 ft. high handrails on both sides.

g) Fire escapes may project beyond the building line not more than 6' but no part of such escape shall be less than 12' above the sidewalk level when not in use.

CHAPTER FIVE

PLACES OF ASSEMBLY, THEATRES, and CINEMAS

ARTICLE 1: Seating Arrangements

a) The width allotted to each person per seat shall not be less than 18".

b) Seats in rows shall not be less than 33" back to back nor less than 27" plus the sum of thicknesses of back plus inclination of back of seat.

c) When individual fixed seats are provided in rows no seat shall have more than 7 seats intervening between it and the nearest aisle; this limits the total number of seats in one row to 16.

d) The seats shall be separated by arms and firmly anchored to the floor except in loges or boxes where loose chairs can be permitted.

French Code: When no definite number of seats are allotted the width shall be 45 cms per person.

e) If the backs of the seats are movable the width of the passage between rows shall be 50 cms. at least, when the seat is up and the back vertical; and shall remain at least 40 cms. when the seat is down and back is inclined to a maximum. This automatic functioning of the seats shall always be in safe operation; and no infammable material shall be used for surface covering of either backing or seating of any seat.

Palestine Code: There shall be a space of not less than 300cms. in depth between the back of every seat and the front of the next seat behind when measured between perpendiculars. Seats shall be grouped together in groups of not less than 4 nor more than 12 with the centres of the seats not less than 50 cms. apart.

ARTICLE 2: Aisles

- a) Every aisle shall lead to an exit door or to a cross aisle (i.e. an aisle parallel to the rows of seats) leading to an exit door.
- b) The width of an aisle shall be at least 36"; such minimum width being measured at the end near the stage shall be increased by $\frac{1}{4}$ of an inch per foot of length along the travel towards the exits.
- c) Cross aisles shall not be in width less than the aggregate width of the tributary aisles measured at their point of junction with the cross aisle.
- d) All aisles shall be free and unobstructed at all times; in any case the line of travel to an exit door by an aisle shall not be more than 125ft.
- e) Steps shall not be allowed in aisles except in balconies and tiers which cannot be joined by a ramp of 10% or less grade. These steps shall be as wide as the aisles had there been any, and shall be illuminated during the performances, at every step; their tread and riser requirements shall be as specified for interior stairs in the Chapter dealing with "MEANS OF EGRESS."

French Code: Aisles shall be at least 1 metre wide at the point near the stage and shall increase in width towards the exit doors at the rate of 90 cms. per 100 persons accomodated.

No steps shall be placed in the aisles and any difference in elevation shall be straightened out by ramps not exceeding 10% grade.

ARTICLE 3: Exit Doors

a) Every gallery, balcony or hall having a capacity of not more than 500 persons shall have at least two exit doorways; where the capacity is between 500 and 1000 there shall be at least three exit doorways and where the occupant load is above 1000 persons there shall be at least 4 exit doorways. The aggregate clear width of doorways serving as exits shall be not less than at the rate of 22" per 100 persons accomodated; this width being divided among the required number of exits.

b) No doorway serving as an exit shall have a clear width of less than 4 feet.

c) All exit doorways shall swing open to the outside of the room where they are located and where the size of the exit doorway requires 2 doors in the same opening there shall not be a centre post in the opening for the doors to close against.

d) No exit doorway shall open immediately on a flight of stairs unless the width of the landing of such stairs shall be equal to at least 6" in excess of the width of the door leaf.

French Code: The minimum width of each door shall be at least 1.40 m.; in no case shall such door opening be less than at the rate of 80cms. per 100 people accomodated.

In all places of assembly having a capacity of not more than 500 persons shall have at least 2 exit doorways, where the capacity is between 500 and 1000 there shall be at least 3 exit doorways and where occupant load is above 1000 persons there shall be at least 4 exit doorways.

ARTICLE 4: Exit Signs and Illumination

Exits shall be illuminated at all times and shall be marked with an exit sign reading "EXIT" whose letters are 5" high. The signs shall be lighted by two separate lamps connected to two sperate circuits; one such circuit being independent from any other circuit in the building.

b) When exits are not visible from all locations in a public corridor, conspicuous directional signs shall be displayed in an adequate location to direct the public to the exits.

c) Doors visible to the public which are not used for exits shall have the words "NO EXIT" of the same height as above clearly written on them; also dead ends shall have the words "DEAD END" clearly written on them and shall be closed by doors which will open against the direction of egress.

d) All lighting fixtures shall not be at a height less than 7 ft above the floor and shall be protected by grilled globes.

e) All mirrors or such fixtures which might deceive the public on the direction of exits or stairways etc... shall be prohibited.

f) No revolving door shall be used as an exit from a balcony, tier or hall; and wherever such doors are allowed they shall meet the requirements in the Article concerning this subject in the Chapter MEANS OF EGRESS..

STAGE

ARTICLE 5: Construction

The stage shall be separated from all the parts of the building by walls or partitions having a fire resistance rating of not less than 4hrs.; such separation extending down from the foundation to at least 3 ft. above the roof except where such roof is of fire proof or semi fire proof construction, it shall be carried tightly to the underside of such roof slab.

b) All parts of the stage shall be of fire proof construction except any woodwork used as the stage floor which shall be hard wood rendered noninflammable.

c) All parts of the stage floor shall be designed to sustain a live load of at least 125 pounds per square foot.

d) If glass is used anywhere on the stage it shall be wire glass.

e) The roof over the stage shall be provided with a skylight of 1/10 of the stage area covered with wire glass panes capable of being opened by the lowering of the proscenium curtain automatically

or manually by the pulling of a rope or cord.

f) Stage Exits: At least 1 exit 3 feet wide shall be provided on each side of the stage to lead to an exit court or street directly or indirectly through a passageway of adequate dimensions.

g) Fire Places of Stoves shall not be allowed on the stage; the only system of heating allowed being one not having any flame.

ARTICLE 6: Proscenium

Each opening other than the proscenium opening in the wall which separates the stage from the auditorium shall be protected by a self closing fire door of at least $\frac{1}{4}$ " panel steel or wrought iron or any other approved fire door.

b) Proscenium Curtain: The proscenium opening shall be provided with a curtain of non combustible material so constructed and mounted as to prevent glow from a fire on the stage showing on the auditorium within a period of 5 minutes. The proscenium curtain shall be so arranged and maintained that it will be released automatically by a heat actuated device and will completely close the proscenium wall opening. It shall also be equipped with a separate and emergency device to permit the prompt and immediate closing of the curtain if the automatic mechanism for one reason or other accidentally goes out of order; such a device shall be placed in an easily accessible location. In any case the curtain shall be of such a fire resistive construction as to withstand a temperature of 1700^oF at the end of 15 minutes.

The curtain may be of the roll type, lift up type or overlapping close in type but in any case the closing of the curtain from the full open position shall be effected in less than 30 seconds, with the last remaining 5 ft. in not more than 5 seconds.

French Code

The stage shall be separated from all other spaces by fire proof construction.

The proscenium wall opening shall be equipped with a single piece curtain of metallic ^{construction} ~~curtain~~ or of non combustible material, which shall have to be completely closed in not more than 40seconds. It shall be closed either by a heat actuated device when the temperature reaches 85°C or with manual devices whose manipulation shall be capable of being made from two different positions: one at the inside of the stage enclosure, and the other from a location easily accessible in any circumstances.

There shall be at least 1 exit leading directly from the stage to a public open space this exit being exclusively used by persons behind the stage.

No artists' appertenant rooms or workshops shall open directly on the stage.

Article 7 Appurtenant Rooms:

a) These shall be separated from all other parts of the building ^{by fire partitions} and shall have roofs and floors of fireproof construction.

No such rooms shall be placed over or under the stage. They shall have independent exits leading to the exterior of the building and shall be lighted and ventilated at all times.

b) Appurtenant and dressing rooms shall have adequate air space for ventilation for every occupant and in no case shall they have a height of less than 8 ft. 6".

MOTION PICTURE PROJECTION ROOMS

ART. 8 Construction:

- a) The construction of such rooms shall be of fireproof construction with the enclosure walls, floor and ceiling of not less than 1 hr. fire resistive rating.
- b) The room shall be large enough to permit a free circulation of the operator on either side and back of the machine; a space of at least 1 meter unobstructed width being allotted on each 2 sides and on the back especially for this purpose. The room shall be not less than 3 meters along the axis of projection of the machine, not less than 3 meters wide, and not less than 2 meters high. The dimension perpendicular to the axis of projection shall be increased at the rate of 1.20 meters/machine.
- c) There shall be no door connection between the auditorium and the projection room; any doors allowable being from outside of the auditorium and opening onto a passage, corridor, or lobby. These doors shall be approved fire doors normally closed by a spring. There shall be at least 2 exit doors not less than 30" wide and shall open in the direction of egress.
- d) There shall not be any direct access between the projection booth or the rewind room and the auditorium except for the necessary projection or floodlighting ports.

Each machine shall have 2 ports, one for projection and the other for observation. The cross section of the opening shall not be more than 10"x10", that for the observation or spot lights can be as much as 12"x12". They shall be hermetically sealed permanently by not less than $\frac{1}{4}$ " glass pane and shall be protected by a steel, iron or $\frac{1}{4}$ " asbestos or any approved fire shutter which shall overlap the opening by at least 1" on all sides but close tightly on the opening. This device shall either close by gravity automatically by the unlatching of a fusible link actuated by heat, or manually from 2 different positions, one inside the cabin near the exit door, and the other from outside the cabin placed in an easily accessible location. Shutters or openings not in use shall be kept closed.

e) The rewind room shall be of the same rating as regards fire resistance as that of the projection booth itself. It shall be not less than 3 sq. meters in floor area and shall have at least 2 doors, one leading directly to the exterior of the building, and the other which shall be an approved fire door swinging into the projection booth.

f) Ventilation of these rooms shall be made by an approved mechanical ventilation system exhausting directly to the exterior air or thru noncombustible flue used exclusively for this purpose and independent from any other in the building.

Exhaust duct shall be of incombustible material and shall have a cross section of 1/20 of the total area it serves (i.e. rewind room + projection booth itself.)

The exhaust duct shall either be kept away from any incombustible material or shall be protected by 1" incombustible heat-insulating material covering.

g) Fire Extinguishing Apparatus:

All projection rooms shall be equipped with sprinkler extinguishing system with sprinkler heads particularly over machines and in the rewind room over film storage compartments.

In case the booth is not sprinklered, each projection machine shall have above it suspended from the ceiling a "shower" supplied at least from a reservoir of 4 M.C. capacity whose bottom is at least 6 m. above the ceiling of the booth. The shower shall be operated from at least 2 different positions; one inside the room placed near the exit door, and the other placed outside the room in an easily and quickly accessible location. The piping system in any case shall be fire resistant without having any soldered or welded joints; all joints shall be riveted.

In addition to the required fire extinguishing system the projection booth and the film rewind room shall each be provided with a 2½ gal. First Aid hand extinguisher ready for use at any time.

ART. 9 Fire Extinguishing Sprinkler System in Theatres:

Besides the specifications under the special Chapter "FIRE EXTINGUISHING APPRATUS" if such occupancies are not equipped with another approved fire extinguishing system they shall be provided with Sprinklers according to the

following requirements:

- a) On the stage side they are to be placed on the basis of 64 sq. ft. of floor area, not more than 8 ft apart and not more than 4 ft. from the walls; they shall be placed on the roof of the stage, under the stage, and in general in every portion behind the proscenium wll opening.
- b) For protection on the auditorium side, the sprinklers shall be located in the refreshment bars, in and under the gallery, and in the space between the ceiling of the auditorium and the roof, whether that space is used for the storage of properties or materials or not. These shall be spaced on the basis of one to each 100 sq. ft. of floor area, and not more than 5 ft. from the walls.
- c) The proscenium opening shall be provided with a line of water drenchers or open sprinklers, controlled with 2 water supply control valves placed in an accessible location, one on each side of the proscenium opening.

(Also refer to chapter "FIRE EXTINGUISHING APPARATUS").

Location with regards to Ground Elevation:

- a) Auditoriums, theatres, motion picture projection theatres, or any other place of assembly having an occupant load of not more than 250 people can be completely located below exterior ground level provided it is well lighted and ventilated and complying with the requirements of this code.
- b) If the occupant load is between 250 and 750 people, such places shall not have more than half their total interior height below grade.
- c) If the auditorium, theatre etc... has an occupant load of greater than 750 people it shall be completely situated above the exterior ground level, without in any case having the main ground floor level of the auditorium more than 6 meters above the highest exterior ground level.
- d) An adequate mechanical ventilation system shall be installed in all auditoriums to provide suitable temperature and humidity control in such a way as to change the air constantly thruout the room. The auditorium shall also be provided with a special exhaust system for the evacuation of smoke in case of a fire breaking out, and shall be manipulated by a switch placed outside the room.

(For "ventilation" also see Chapter dealing with this subject)

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CHAPTER SIX

ENCLOSURE OF VERTICAL OPENINGS.

ART. 1 General:

- a) Shaft holes and unenclosed vertical openings act as flues and will help a fire to extend its grip and also serve as waterways increasing the possible damage by water used in the extinguishment of a fire.
- b) Every series of vertical openings for whatsoever reason above one another and extending in 2 or more successive floors or floors and roof shall be protected to prevent fire in any story from communicating to any other story.

ART. 2 Enclosure:

The enclosing wall of vertical shafts or openings in all buildings shall be of noncombustible construction having a fire resistive rating of not less than 2 hours. All openings therein shall be protected with approved fire doors. A parapet wall or handrail at least 30" high above the roof shall be provided around all open shaft enclosures extending through the roof.

Shaft enclosures extending through the roof and which are not protected as aforesaid, shall be provided with a skylight of at least 10% of the cross-sectional area of the shaft opening and glazed with plain glass not thicker than $\frac{1}{8}$ ". Otherwise it shall be provided with a window of the same area as above and at least 10 ft. from any lot line, and whose height is at least 3 ft. above the roof.

A shaft not extending through the roof shall have a form of construction of its top, having a fire resistance rating equal to that of the enclosing walls of the shaft itself.

The floor construction of vertical shafts or openings shall be not less than 2 hr. fire resistive construction or at least of the same construction of the lowest floor to or through which it passes.

ART. 3

The enclosing walls in buildings of wood construction shall be of not less than 1 hr. fire resistive rating; chutes and dumbwaiters shafts with a small cross-sectional area may be lined with approved non-combustible material. All openings into such vertical enclosures shall be protected by approved fire doors.

ART. 4 Elevator Shafts:

- a) In elevator shafts there shall be at least one door in every 30 ft. of height of shaft which shall be protected with approved fire doors, fire shutters or windows.
- b) Enclosure walls of elevator shafts may consist of wire-glass set in metal frames on the entrance side only.
- c) Elevator shafts extending through more than 2 stories shall be equipped with an approved means of ventilation, either natural or mechanical.
- d) Elevator Machinery Compartments: These shall be separated from the elevator shafts by non combustible construction having

a fire resistive rating of not less than 2 hrs. Openings shall be provided with approved fire doors.

" Machinery compartment shall be located in places accessible only to specially qualified personnel. They shall not be placed under the elevator carriage; openings shall be provided with approved fire doors."

ART. 5 Elevator Cars:

- a) The safe carrying capacity shall be conspicuously posted in the car of every elevator.
- b) Every passenger elevator car shall be provided with a trap door in the top of adequate size to provide easy egress for passengers in case of accidents.
- c) All elevator cars or platforms shall be adequately lighted when in service.
- d) In buildings equipped with more than 1 elevator, not more than 3 elevators shall be placed in one shaft; at least 1 shall be kept in readiness at all times for fire department use.
- e) All elevator cars shall be provided with a metallic ladder permitting the passengers to reach the nearest floor in case the elevator accidentally stops along the way between floors; or shall be provided with some manual and mechanical means for the same purpose.

ART. 6 Protection around Conduits:

All openings around conduits, pipes or ducts shall be filled with approved noncombustible material or shall be closed off by close fitting noncombustible material at the ceiling and floor line or on each side of the wall.

ART. 7 Chimneys, Flues and Smokestacks:

1. Definitions:
- a) A Flue is a passageway for the purpose of removing products of combustion from solid, liquid or gas fuel.
 - b) A chimney is a vertical masonry or reinforced concrete shaft enclosing flues.
 - c) Smoke pipe is a pipe connecting a heating appliance to a flue.

Upon the completion of a building or the alteration of existing one the flues shall be cleaned and left smooth on the inside.

2. Chimneys: a) Shall extend at least 3' above the highest point where they pass through a roof of a building, and shall be capped properly with brick, terra cota, stone, cast iron, concrete or other noncombustible weather proof material. (X)

b) They shall be wholly supported on masonry or self supporting of noncombustible fireproof construction. (X)

c) Every inlet to any chimney shall enter the side thereof and shall be of not less than $\frac{1}{8}$ " thick metal.

d) Masonry chimneys shall be lined with fireclay lining to such a thickness that they shall have to withstand a temperature of not less than 2000° F. without softening or cracking.

In any case the thickness of the walls shall not be less than 4".

3. Metal Smokestacks: a) All smokestacks shall be painted or galvanized. Cleanout opening shall be provided at the base of such stacks.

b) They shall be constructed of not less than 1/8" thick metal and shall extend not less than 10' above the highest point within a radius of 25'.

- c) All metal smokestacks used in industry for high heat appliances shall be lined with $4\frac{1}{2}$ " fire brick or with fire clay extending not less than 25' above the smokepipe entrance.
- d) They shall extend not less than 25' above the highest point in the neighbouring district.

4. Interior Stacks: a) Such stacks extending through any story or roof shall be enclosed in a vertical shaft of 2 hr. fire resistive construction. The shaft shall provide at least 6" of clearance on all sides of the stacks. Any opening other than those required at top and bottom for ventilation shall be protected by self-closing fire shutters. of not less than 1 hr. fire resistance rating.

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CHAPTER SEVEN

DESIGN LIVELOADS

Art. 1 Minimum allowable Floor Live Loads:

All buildings shall be designed to sustain safely the live loads in the following table dependent upon the occupancy and use of such building and space.

<u>OCCUPANCY</u>	<u>LIVE LOAD POUNDS/ SQ. FT.</u>
<u>Public buildings.</u>	
Assembly halls, auditoriums, lecture halls, churches, etc.	
Fixed Seats	60
Movable Seats	100
Dance halls, restaurants, night clubs etc.	100
School and College Classrooms	40
Stairways, Corridors in any building	100
Theatre aisles and projection rooms	100
" Orchestra floor and balconies	60
" Stage floor	125
<u>Institutional Buildings:</u>	
Hospitals, assylums, sanitariums, etc.	
Operating rooms	60
Private rooms and wards	40
Laboratories and X-Ray rooms	100
Public Spaces	80

OCCUPANCY

LIVE LOAD POUNDS/SQ. FT.

Nurseries, homes for the aged &

Penal institutions (Non public spaces) 40

Business and Commercial units

Offices 60

Factories, Workshops (Light industry work) 125

Bakeries, and laundries 150

Stores (Light Merchandise) 100

Stores (Heavy ") 150

Storage Buildings

Garages 100

Storage Warehouses (Light Merchandise) 125

" " (Heavy ") 250

OTHER LIVE LOADS

Sidewalks: Either a uniformly distributed load of 250 lbs/sq. ft., or a concentrated load of 8000 lbs. on an area $2\frac{1}{2}$ ft. square placed in any position whichever will produce the greater stress.

Exterior balconies and fire escapes 100

Stairway and Balcony Railings shall be designed to resist a horizontal thrust of 50 lbs/linear ft. applied at the top of the railing.

Stairs: designed to support a uniformly distributed load of 100 lbs./sq; ft., or concentrated loads of 300 lbs. spaced 3 ft. c.t.c. each occupying an area 1 ft. wide by the depth of the tread, whichever will produce the greater stress.

OCCUPANCY

LIVE LOAD POUNDS/SQ FT.

Libraries

Reading rooms	60
Stacks rooms	125

Note: For a more complete information on allowable design live loads, consult "TIME SAVER STANDARDS" or "A. I. S. C. HANDBOOK" or any other approved book on building Construction

SPECIAL LOADS: Art 2.

Provision for Partitions.

Where the design live load is less than 80 lbs./sq.ft. provision should be made for partitions on plans where they are not definitely located or decided upon. This extra load shall be 20lbs/sq.ft. in excess to all other loads, and shall be uniformly distributed.

Roof Loads.

Ordinary roofs, unless used as a floor in which case it will be designed to support a live load as specified above, shall be designed to withstand a live load of 20 lbs./sq; ft. of horizontal projection besides any other load.

If the roof is used for promenade purposes, it shall be designed for 60 lbs./sq;ft.

Concentrated loads:

Every floor in an office , storage or business buildings where known or probable concentrations are expected shall be designed to sustain a live load of

3000 lbs. concentrated on an area $2\frac{1}{2}$ sq. ft. in area, wherever such load would produce stresses greater than those caused by the uniformly distributed live load for which the floor is designed.

ART. 3 REDUCTION IN LIVE LOADS

a) For live loads not exceeding 100 lbs. /sq. ft. the design live load on any member supporting a floor area of 150 sq. ft. or more, can be reduced at the rate of 0.08%/sq. ft. of total floor area supported by the member, except in places used for public assembly. The reduction shall be either "R" as determined by the following formula or 60%, whichever is the smaller.

"R" = $100 \left(\frac{D+L}{4.33L} \right)$ where R= reduction %
 D= dead load/sq. ft. of area supported by member
 L= design live load/sq. ft.

b) For determining the total live loads carried by columns the following reductions shall be permitted, the reductions being based on the assumed live loads applied to the entire tributary floor area:

No reductions shall be allowed for columns, in any building, carrying only the roof, or 1 storey and the roof.

Allowable reductions for Warehouses, Storage Buildings:

<u>Column carrying:</u>	<u>Reduction%</u>
2 floors and roof.....	5
3 " " "	10
4 " " "	15
5 or more floors and roof	20

Allowable reduction for Manufacturing Buildings, Stores and Garages

Allowable reduction for Manufacturing buildings, Stores and Garages

<u>Column carrying:</u>	<u>Reduction %</u>
2 floors and roof	10
3 " " "	20
4 or more floors and roof.....	30

Allowable reduction for All other Buildings:

<u>Column carrying:</u>	<u>Reduction %</u>
2 floors and roof	10
3 " " "	20
4 " " "	30
5 " " "	40
6 " " "	45
7 or more floors and roof	50

ART. 4 WIND PRESSURE

Except buildings and structures whose height does not exceed $1\frac{1}{2}$ times the least width, all buildings or structures shall be designed to withstand a horizontal wind pressure on all surfaces exposed to the wind (allowing for wind in any direction) in accordance with the following table:

<u>Maximum Height above Ground</u>	<u>Wind Pressure Lbs/sq.ft.</u>
Up to 50 feet	25
" " 75 "	35
More than 75 feet	45

b) Wind pressure on tanks or other similar structures shall be 50 lbs./sq.ft. on the gross area of the exposed surface, allowing for wind in any direction. For round tanks the pressure shall be assumed to act on 6/10 of the total projected exposed area.

In any case no allowance shall be made for the shielding effect of other adjacent buildings or structures.

c) Stresses: For members resisting wind loads besides any other loads, the allowable stresses may be increased by $33\frac{1}{3}\%$ without exceeding, in any case, 24000 lbs./sq.in as the allowable tensile stress in steel.

In no case shall the section thus found be less than that required if the wind forces were neglected.

d) Signs: All signs designed to withstand a horizontal wind pressure, according to the following, acting on the exposed area allowing for wind in any direction.

1. Signs in which the projected area exposed to wind exceeds 70% of the gross area (overall dimensions) are considered SOLID SIGNS and shall be designed to withstand a wind pressure of 50 lbs./sq. ft.

2. Signs in which the total aggregate area of the projected exposed letters, figures strips, etc., is less than 70% of the gross area (overall dimensions) are considered OPEN SIGNS and shall be designed to withstand a wind pressure of 35 lbs./sq.ft.

ART. 5 RESISTANCE TO EARTHQUAKES

- a) Masonry walls and interior partitions shall preferably be of a type that is reinforced; the steel in skeleton frame construction being carried around the vertical members.
- b) Foundations should be continuous under the whole structure or at least that all footings be interconnected.
- c) Buildings should preferably be as nearly square in plan as possible to avoid U-shaped or L-shaped outlines.
- d) All buildings and structures shall be designed to withstand besides all other loads horizontal forces produced by earthquakes in according with the following requirements:

The force shall be applied horizontally at each floor and roof level above the foundations and the force shall be assumed to act along the direction of the major axes of the building or at right angles to any elevation thereof.

The force to be resisted shall be = $F = C \times W$ where:

$W =$ Total Dead load + 25% Live load at and above the plane or elevation under consideration except in buildings 1 storey high and in warehouses where $W =$ Total Dead load + 50% live load.

C which is a numerical constant shall be according to the following table:

<u>Building or Structure or portion thereof</u>	<u>Value of "C"</u>	<u>Direction of wind</u>
The building as a whole	0.10	as specified above

<u>Building or Structure or portion thereof</u>	<u>Value of "C"</u>	<u>Direction of Wind</u>
Bearing and curtain wall, and fire partitions	0.20	Normal to surface of wall
Fire wall, parapet, and cantilever walls	1.00	-do-
Exterior and interior appendages decorations	1.00	Horizontal direction
Chimneys, smokestacks flagpoles	0.20	-do-
Tanks and towers supported directly on the ground and clear of buildings	0.10	as specified above
Same as next above but where located on buildings	0.20	-do-

Where the soil can not safely support the superimposed loads and necessitates the use of piles, or caissons, the value of "C" shall be increased by 25% in each case.

All parts of the building shall be so bonded and tied together that the entire assembly shall act in a unit as whole; Cornices, and facings, whether interior or exterior, shall be bonded to the main structure to form an integral part thereof.

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CHAPTER EIGHT

SAFEGUARDS DURING CONSTRUCTION.

Art. 1 Every scaffold the platform of which is 6 ft. or higher above the ground, other than ironworkers and carpenters scaffolds shall be provided with guard rails at least 36" high and with solid toeboards 6" high extending on both sides and along the platform. When objects are likely to fall on a scaffold from above an overhead protection shall be provided not more than 10 ft. above the scaffold platform. The planks used shall be not less than 2" seasoned lumber with not more than ten-foot lengths between supports.

Art 2. Whenever a building or structure within 10 ft. of a streetline is to be erected, raised or demolished, the person doing or causing this work to be done shall erect and maintain until the job is over, a shed of sufficient strength to sustain safely the weight of materials that may be placed on it or that may accidentally fall on it from above. If such shed is used for working on or for storage of materials it shall be provided with railings at least 3 ft high and toeboards at least 6 in. high. This shed shall be so constructed as to provide an unobstructed walkway for pedestrians not less than 8 ft. high projecting beyond the lot line not more than 6'.

Art. 3 Temporary fencing:

The owner shall provide a substantial fence ~~at least~~ 6 ft. high or less, that may extend through the street not more than 6 ft. It shall be built and closed for its full length along the side of the street except where doors which should open to the inside of the lot are located.

Art. 4 Hoists:

a) For interior hoists, all overhead machinery shall be safely protected from falling down, the car shall be substantially constructed and smoothly sliding on rigidly secured rails. The floor openings or other spaces through which these hoists operate shall be enclosed for their full height on all sides with barriers so spaced that heads, arms or legs of persons cannot be thrust through, or any material fall through them.

b) For exterior hoists, these shall be constructed on solid firm ground to avoid injurious settlement or distortion; the car and machinery having the same requirements as above.

Art. 5 Elevators:

When a building is to be equipped with more than one elevator, at least one such elevator shall be installed in a fireproof construction elevator shaft as soon as working conditions permit. Unless having a permit to do so these elevators shall not be allowed to carry passengers of any kind while the building is still under construction.

Art. 6 Flooring and Floor Openings:

In skeletonwork buildings or structures, all the working floor shall be planked over with the boards side by side and well fastened to the supports beneath, except where openings for raising or lowering materials or for chimneystacks, or similar purposes are located.

In case of concrete construction, all the permanent structural floor except for necessary temporary openings, shall be installed as the work progresses.

All floor openings, unless guarded by temporary enclosing structures for their full height and on all sides, shall be covered with substantial temporary flooring or guarded on all sides by railing 4 ft. high set at least 2 ft. from the opening on all sides, with toe boards at least 6" high.

Art. 7 Stair Facilities:

When a building is being constructed, one permanent stairway shall be installed as the work progresses or at least one temporary stairway shall be installed in each case until the highest point reached in the progress of the work.

Art. 8 Welding and Cutting:

When gas welding or cutting is done above combustible material or above a place where workers doing work or where people are likely to pass, noncombustible shield shall be interposed between the place where the welding is being done and the object or person concerned, to protect either, from sparks or from molten metal.

For the gas tanks supplying the fuel for such work, the caps of such tanks shall be well tightened in their place, and the tank shall be securely fastened to place, well shielded and preferably in an upright position.

Closed spaces shall be properly ventilated when welding or cutting is being done therein. Operators of welding and cutting equipment shall be protected from the rays of the arc flame by gloves, helmets, goggles equipped with proper filter lenses.

Art 9 Storage of material:

Any material placed in any place in a building shall be within the allowable load for which that space is designed. These materials shall not interfere with the progress of the work.

If materials are combustible and are stored within a building under construction, they should be protected by an adequate noncombustible covering.

Art 10 Hygiene and Sanitation:

Waste material, rubbish or garbage shall not be allowed to accumulate within the building nor in its immediate vicinity, but shall be removed and collected at least once a day. No material shall be disposed of by burning. Suitable temporary toilet facilities shall be provided for the workers in the vicinity of the work. An adequate potable water supply shall also be provided for the workers. A first aid cabinet shall also be provided.

Art. 11 Demolition :

In the demolishing of buildings one-storey at a time shall be torn down. No wall, chimney, or such similar structure shall be allowed to fall in mass over any floor above the groundfloor.

Art. 12 Warning Lights:

All excavation pits, fences, barriers, builders's equipment, building materials or rubbish (if any) found in any public space and likely to hinder the smooth passage of the public, shall have upon or by them illuminated globes in red, one light at each end and at intermediate points, to afford proper warning for persons during darkness.

Art. 13 Fire Protection:

In reinforced concrete building construction forms of wood shall be stripped off the concrete as soon as practicable and shall not be placed in any part inside the building

2. In buildings of steel frame construction, the columns shall be fireproofed up to the first 3 stories above grade, and no subsequent steel erection shall be carried up more than 3 stories in advance of the required fireproofing of the principal structural members.

3. Fire Extinguishing Equipment:

1. IN buildings equipped with standpipes, such standpipes shall be installed along with the progress of the work so that they can be used if necessary up to the topmost storey that has been constructed. They shall have at least one outlet in every floor with a firedepartment connection in the outside of the building at the sidewalk level.

2. All storage rooms, tool houses, dressing room for the workers or workshops shall be equipped with a portable hand fire extinguisher of the non-freezing type maintained in an easily accessible location. All fire hydrants, connections for standpipes or for sprinkler installations shall be free and unobstruced and easily accessible at all times.

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CHAPTER NINE

FIRE RESISTIVE STANDARDS AND DEVICES FOR FIRE PROTECTION

Article 1: Fire Partition

Definition: A wall constructed for the purpose of restricting the spread of fire; not necessarily continuous through all the storeys or extending through the roof.

Construction: They shall be constructed of approved noncombustible material having a fire resistive rating of at least two hours and shall be supported in each storey on construction having a fire resistance of at least two hours. In case they are load-bearing they shall be supported on construction having fire resistance of four hours. They shall be deemed continuous in successive storeys and the space where breaks occur along the height of the wall such as at floor or ceiling levels, shall be fire stopped.

Height: The maximum unsupported height of a fire partition shall not exceed eighteen times its total thickness unless suitably reinforced and anchored at floor and ceiling or secured to vertical supports at intervals of not over eighteen times the thickness.

Openings: Only required door or exit or duct openings shall be allowed and these shall be protected by an approved self closing fire door.



Article 2: Fire Wall

Definition: Is a wall constructed to subdivide or separate buildings or portions thereof to restrict the spread of fire; it starts at the foundation and extends continuously through all the storeys and above the roof for at least four feet, except in the case of fire proof construction such a wall may be carried to the underside of the roof slab.

Construction: Of reinforced concrete, solid masonry, or hollow masonry faced on each side with brick at least two inches thick.

Solid Masonry Walls: Shall be fourteen inches thick for the uppermost fifty feet and increase four inches in thickness for every additional thirty five feet measured along the height of the building downwards.

Hollow Masonry Walls: In any case shall have a total thickness including the two inch brick facing on each side, not less than four inches greater than as specified for Solid Walls above.

Reinforced Concrete Walls: Shall be ten inches thick for the uppermost fifty feet and increase two inches in thickness for each additional thirty five feet measured from the top of the building downwards.

Article 3: Fire Door

Definition: A door and its assembly so constructed and assembled in place as to give protection against the passage of fire.

Types:

- a) Single - one door on one face of the opening.
- b) Double - one on each face of the wall opening with at least seven inches air space or the full thickness of the wall.

Article 4: Specifications

Construction: Iron or Steel Doors

- a) Hinged type: Shall have sills and jams of incombustible material. The opening shall not be more than fifty six feet with not more than 7 feet wide and 9 ft. high. Raising of sill at least 2 in. is recommended to check flow of water. It shall be constructed of $\frac{1}{4}$ " steel or wrought iron plate set in at least $\frac{1}{4}$ in. frame riveted at the corners (no welding allowed) and fitted closely to the four sides of the opening with an overlap of 2 in. Where the opening is greater than 3 ft. 6in. wide 2 leaves should be provided each not greater than 3ft. 6in. wide in any case. No folding subdivisions of the leaf are allowed. Each door should have a bolt and latch at top and bottom so arranged that the door can be opened from either side of the opening.
- b) Sliding type: The door must be in one leaf overlapping the wall opening by at least 2in. on all sides when fully closed. It shall be hung from the top by wheels (frictionless) supported on steel rails securely anchored to the walls. Sliding doors should have automatic closing mechanism mounted on either an inclined track or a horizontal one. The inclined track generally consists of the attachment of a counterbalance weight suspended over a pulley so that the door will remain stationary in any position of its travel. At time of fire, the action of a heat actuated device or the melting of a fusible link disengages the counterbalance and the door rolls closing the opening by its own weight. The automatic devices shall be placed at the top of the opening and at the ceiling preferably on both sides of the wall opening and shall be so interconnected that the operation of anyone device

will, in case of double doors being installed, close both doors.

When sliding doors are mounted on a horizontal track weights must be provided to pull the door shut after the heat actuated device has disengaged the counterbalance.

Construction (continued) Metal Clad Doors

A door consisting essentially of a core made up of layers of grooved and tongued thoroughly seasoned and dried lumber at least 1-in. thick; the core being encased in tin or steel plates jointed together at their edges and nailed to the core. For openings less than 45 square feet the core should consist of at least three layers of boards. For openings greater than 45 square feet the core should consist of 4 layers. If the wood core is completely covered with asbestos sheeting or with steel or other incombustible material, one layer respectively can be reduced from the aforesaid specifications.

Openings in Fire Doors:

Vent holes shall be provided and they shall not exceed 4-in. in diameter. For smaller openings, the diameter shall not exceed 3-in. Where glazed openings are provided (the requirements and dimensions of such openings given in the next article) in any class fire door or window, the glass shall not be less than $\frac{1}{4}$ -in. thick wire glass with mesh openings not greater than 1-in. by 1-in.

Article 4 (Conti'd) Rolling Steel Door:

These are capable of being installed where space limitations prevent the installation of other types of doors. These shall be limited to fireproof construction where protected openings shall not exceed 80 sq. ft. in area or 12 ft. in any dimension.

ARTICLE 6: Places of Installation of Fire Doors.

Class A Situation: Shall be considered under such situation; openings in walls between separate buildings or sections of buildings. Openings in fire walls and partitions shall be considered to be of this class.

Class B Situation: Enclosures of vertical shafts and shoots, stairway enclosures, in walls and partitions within stage enclosures, in walls and partitions separating garages from other occupancies.

Class C Situation: Openings in corridors and room partitions.

Class D Situations: Doors or shutters for the protection of openings in exterior walls subject to severe fire exposure.

Class E Situation: Openings as above in D but for moderate fire exposure.

Class F Situation: Openings as above in D but for light fire exposure.

ARTICLE 7: Requirements for Each Class of Openings.

Class A Openings: Shall be protected by 2 interconnected automatic self closing class A fire doors, 1 door on each side of the opening. Each class A fire door shall have a fire resistance rating of at least 4 hours and shall not have any openings therein.

Class B Openings: Shall be protected by 2 class B fire doors automatic or self closing and having a fire resistance rating of $1\frac{1}{2}$ hours. Glass panels in class B fire doors shall be limited to one panel not exceeding 100 square inches in area with no dimension greater than 12 inches.

Class C Openings: Shall be protected by one self closing class C fire door which shall have a fire resistance rating of 1 hour.

Individual glass openings shall be limited to 1296 square inches.

Class D Openings: Shall be protected by self closing Class D fire doors having a fire resistance rating of not less than $1\frac{1}{2}$ hrs.

It shall have no openings at all.

Class E and F Openings: Shall be protected with class E or F fire doors which shall have a fire resistance rating of not less than 45 minutes. They may not necessarily be automatic or self closing. Glass lights shall be limited to 720 sq. ins.

ARTICLE 8: Automatic Closing Devices.

Automatic fire doors shall be designed to close automatically when the temperature of a heat actuated device or a fusible link reaches 50 degrees above maximum location temperature under normal conditions (generally this temperature is considered to be at 165°F).

Self closing doors shall be designed to act by gravity or by the action of an approved safe mechanical means with nothing to hinder it or prevent the safe operation of the closing device. The heat actuated devices shall be installed, 1 on each side of the wall at the top of the opening at ceiling height; in no case the distance between the device and the top of the opening being greater than 3 ft. Interconnected doors shall be so designed that the actuation of either device on either side of the opening shall close both doors.

ART. 9 FIRE RESISTANCE RATINGS:

a) Definition: This term is used to designate that property by virtue of which an element or part of a structure functions satisfactorily to a heat influence and load test.

Walls, partitions, ceilings, roofs and all supporting or non-supporting members are rated at so many hours of fire resistance rating depending upon the thickness of the member, the materials concerned in the construction of such a member, and upon the temperature of the fire resistance test.

The standard fire test carried out by American Society for Testing Materials is made on a sample wall 10 ft. square; and if it is rated at 4 hrs., for example, this means it has to stand up under the standard fire exposure (carrying its rated load in case it is a load-bearing member) for a period of 4 hours, without attaining a temperature on its unexposed face higher than 250°F. above the starting temperature. Besides this property for fire resistance a member should be of enough thickness to have stability against collapse or overturning. Ability to withstand the impact from collapsing floors or falling objects is also essential.

For a complete information about fire resistance ratings of walls, partitions, columns, beams and girders, floors and roof slabs, see tables in Appendix A in "NATIONAL BUILDING CODE" prepared by the National board of Fire Underwriters.

CHAPTER TEN

FIRE EXTINGUISHING APPARATUS

I. STANDPIPE AND HOZE SYSTEM

ART. 1. Where required:

In any building exceeding 50 ft. in height and on stages in theatres, auditoriums or in places of public assembly, one standpipe on each side of the stage shall be installed.

ART. 2 Number and Location:

The number of standpipes shall be such that all parts of every floor where they are installed shall be reached within 50 ft. of a nozzle connected to 100 ft. of hoze. They shall be located within stairway enclosures, as near a stairway as possible. French Code "Where standpipes are used they shall be placed preferably near staircase enclosures with the space between outlets not exceeding 40 meters."

ART. 3 Construction:

They shall be constructed of steel or wrought iron and shall have the required thickness to withstand a pressure of not less than 100 lbs/sq. in. in excess to the static head due to the height of the water in the standpipe.

They shall extend down from the lowest story upto the the highest story. Where more than one standpipe is required in any system, they shall be connected at their base by pipes of a size equal to that of the largest standpipe.

Standpipes shall be equipped with $2\frac{1}{2}$ in. connections for hoses in every story, with the valves not more than 5 ft. above the floor level. Where the water supply is furnished by a tank located in the building at or above the topmost outlet, a check valve shall be provided below the tank.

ART. 4. Hoze.

For $2\frac{1}{2}$ in. hoze the nozzle shall have a discharge outlet of not less than 1 in. They shall be kept on approved hoze racks or in approved hoze cabinets having a door with a glass panel so that the apparatus can be plainly seen from the outside and readily be accessible for use. French Code " Depending upon the fire hazard the standpipes shall be 40mm. diam with a discharge outlet 12mm.; or 20mm. with a discharge outlet of 7 mm. diameter. In any case the hoze shall be not less than 20 meters long; it shall be full of water at all times and shall be protected by a flexible metallic cover. "

ART. 5 Water Supply:

a) Standpipes shall be supplied from an adequate water supply system which shall deliver water automatically at opening a fire hoze outlet. Such water supply shall be furnished by a street main in which the pressure is sufficient to maintain a pressure of at least 15 lbs./sq. in at outlets in the topmost story of the building with a flow of 500 gal. per minute from a hydrant within 200 ft. of the building; or from a gravity tank of not less than 5000 gallons capacity and having

its bottom not less than 25 ft. above the outlets in the topmost story, or by approved automatic fire pumps having a capacity of not less 500 gal. per minute which shall be permanently connected to the standpipe system and which shall operate safely for at least one hour at the rated pump capacity. Such pumps shall be adequately protected from fire hazards and shall preferably be installed in a special compartment used exclusively by it and constructed of fire resistant materials.

b) When a tank which supplies a standpipe system is also used for domestic water supply and located at the required height (as stated above), the inlet of the pipe for the ordinary house supply shall be located at the height above the bottom of the tank equal to the height of water needed for fire extinguishing purposes.

ART. 6 Fire Department Connection:

a) Siamese Connection: is a connection usually placed at the exterior of a building connecting fire extinguishing apparatus system inside the building whereby the firemen of the fire department can boost up the water in the system from outside the building.

b) Siamese connections, having check valves in each inlet, shall be placed between 18" and 36" above sidewalk level, and built into the wall of the building, if possible, during construction. Each shall connect each standpipe riser with at least a 4" pipe. Where more than 4 risers are connected to a single system

a lesser number of such connections suitably distributed shall be allowed.

c) Such connection shall be provided with a cap, and it shall be threaded uniformly with that of the hose used by the fire department. Each such connection shall have on a plate affixed near to, the letters "STANDPIPE FIRE DEPARTMENT CONNECTION" clearly written.

d) An automatic ball drip shall always be placed at the lowest point in a horizontal position of the standpipe between the inside check valve and the outside Siamese Connection. This drip which closes against pressure (when water is flowing) will, when the pressure is released, automatically drain this portion of the pipe and prevent the connection from accumulating any water which might freeze. Such an instrument is indispensable in cold weather or freezing districts.

II. FIRST AID OR HAND EXTINGUISHERS

Advantages: These are convenient because they can be conveniently located and distributed which makes them readily available during the very first moments of a fire while an opportunity still remains of extinguishing the blaze in a manner that will cause the minimum amount of water and damage. They can be used where water is scarce and costly or where the domestic water supply is much less than the required absolute minimum.

a) Number and location; Where they are used, every 500 sq. ft.

offloor area shall be covered. (X)

b) It is essential that the device be portable and the best size is of a minimum of $2\frac{1}{2}$ gal. capacity, containing bicarbonate of soda and sulphuric acid, in a hermetically sealed glass bottle. By striking of a plunger or by just turning the extinguisher upside down the bottle is broken & the sulphuric acid mixes with the sodium carbonate solution and acts on it thus liberating carbon dioxide which jets out of the instrument carrying with it the liquid in a jet of about 35 ft. and thus extinguishing the fire. (X)

c) It is advisable that each standpipe-and-hoze cabinet be equipped with a $2\frac{1}{2}$ gal. fire extinguisher charged and ready for use; also a fireman's axe is also advisable, to be placed in such a cabinet. (X)

III. AUTOMATIC SPRINKLER SYSTEM

ART. 8 Where Required:

- a) In the basement or cellar of every building.
- b) In buildings used for the manufacture, sale, or storage of combustible and inflammable merchandise.
- c) In any building not of fireproof or semifireproof construction and having the floors or roofs combustible.
- d) In Class A occupancy buildings, at least in the storerooms, basements below grade, work shops, landries, and kitchens. They should extend to stairways and corridors if these are not equipped with any other suitable fire extinguisher. (X)

- d) In underground garages
- e) In laboratories where there are inflammable liquids or materials or where gases of hazardous nature are evolved. Laboratories shall also have special hoods for the exhaust of all liberated gases.

ART. 9 What they are and how they operate:

Sprinklers are sort of showers which are spaced along a water piping system (the branch lines) placed along the ceiling of the place where they are located and are operated by the opening of the sprinkler head due to a fusible link actuated by heat.

When a fire occurs in a certain location in any space in a building where they are located, the heat rises and causes the sprinkler head to open releasing water on the fire and thus quickly extinguishing it. Only the sprinklers in the immediate vicinity where the fire is started operate and flush water thus reducing water damage to an absolute minimum. Every sprinkler is spaced in such a way along the ceiling that it covers an area of from 80 to 100 ft. and in an ideal installation every single square foot should be covered. They usually have a discharge orifice of $\frac{1}{2}$ " depending upon the quantity of water available for disposition of, and upon the locality where they are installed, the latter fact of which (the construction) depending upon the spacing of the sprinklers; usually they are spaced along the branch lines from 8 to 12 ft. (X)

Simultaneously with the opening of a sprinkler an alarm is sounded both inside and outside the building to give warning of fire and so that as soon as the fire is out the water supply

may be cut off by a shut-off valve placed in any easily accessible location. When the fire is out only the heads which have operated need to be replaced. Depending upon the total number of sprinklers installed in the system, there shall be available at hand for emergency cases, from 6 to 24 sprinkler heads as spare ones. (x)

ART. 10 Advantages:

Sprinkler system is a combination of (a) fire detector, (b) fire Alarm, as has been previously said, and (c) fire extinguishers. Amongst the various qualities which it uniquely possesses are; its automatic operation, its continuous duty and speed of response, its restricted water damage and last by its Fire Insurance Discount allowances which go, as high as high as 50% reduction in premium. (x)

Its automatic operation does away with the need of any human element for its operation which can be started whether or not the building contains people, in contrast with any of the aforesaid fire extinguishing systems. (x)

Its continuous duty is derived from the fact that they stand ready for action at all times: within a few seconds after a fire breaks out the heat rises and the sprinkler head opens, and the operations of extinguishing the fire and sounding an Alarm automatically proceed simultaneously and without delay, thus extinguishing the fire while still in its early stages and with comparatively very small quantities of water.

ART. 11 Installation:

a) Before connecting branches from underground water mains to sprinkler systems they shall be flushed out thoroughly.

b) When ready for service sprinkler systems shall be designed to withstand a water pressure of not less than 200 psi. for two hours without any leakage at the joints.

c) Sprinkler systems shall have fire department connections as specified for standpipe systems.

d) When the branch lines fed from the mains and risers are not concealed in the installation, the sprinkler shall be installed with the deflector nearest to the ceiling; if the piping system is concealed (placed above a false ceiling for example) the sprinkler shall be installed in a pendent position with the deflector pointing to the floor. In any case, the sprinkler shall be placed in an upright position with the plane of the deflector parallel to the plane of the construction above it.

e) The piping and fittings shall preferably be galvanized or coated with red lead or any other corrosion resistant chemical. The sprinklers themselves shall never be painted or whitewashed. (X)

The ideal installation of crossmains and branch lines would be a center central feed (branch lines on either side of the cross mains with the same sprinkler head number, and with the riser in the middle of the crossmain).

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For a more complete information on this subject and on the Sprinklers System in general refer to "Installing Sprinkler Equipment" prepared by Factory Mutual Engineering Division.

ART. 12. Water Supply

The allowable water supplies are:

- a) Directly from town's street mains
- b) Elevated tank or reservoir placed in or on the roof of the building to be protected (Pressure due to Gravity). When no adequate and dependable water supply from the mains is available such an elevated tank whose capacity is not less than 15,000 gals and whose bottom is at least 25 ft. above the highest installed sprinkler shall be provided.
- c) Automatic fire pump (placed in a protected & accessible ^{location} drawing water from a rather unlimited source (100,000 gals available)
- d) Where the protection of large and valuable properties is concerned, supplies from at least 2 independent sources is required one of which should be automatic directly feeding the sprinklers without any operation of valves or manually starting pumps, giving a pressure at the level of the highest sprinkler at all times not less than 15 psi. at the point where cross mains connect with branch lines.
- e) In any case the use of sea-water or water having fibrous or other objectionable matter in suspension liable to cause accumulation and clog the pipes is forbidden. Also sea water due to its salt contents is objectionable due to its corrosive action.

(See also Water Supply for Standpipes)

TYPES OF SYSTEMS

ART. 13 Wet-Pipe Sprinkler System:

This system is installed in locations where temperatures remain above freezing. It consists of automatic sprinkler heads (actuated by the fusing of a fusible link at a temp of about 165°F) mounted at proper intervals on a system of overhead piping filled with water up to the sprinkler head and connected to the main water supply by valves, alarms and other devices so that constant water pressure is maintained at the closed sprinklers. This is the standard type of sprinkler system installation.

ART. 14 Dry-Pipe Sprinkler System:

Installed in building not artificially heated, in which there is any chance of the pipes freezing, in cold wather seasons. (X)

In this system, the piping is filled with air under moderate pressure which will escape by the opening of the sprinkler head thus releasing the pressure in the piping thus allowing the water to flow through the opened sprinkler head.

The covering of the branch lines with paper bags or linen with the idea of providing protection against such frost shall not be permitted. (X)

Dry-Pipe systems shall preferably be avoided in manufacturing areas of extra hazard occupancies especially in those involving flammable liquids because they operate more slowly than wet pipe systems. (X)

ART. 15 Deluge System:

ART. 15 Deluge System:

These are very effective in extra hazardous locations where in case a fire breaks out, the whole will in notime be set on fire such as in film storage rooms, warehouses for inflammable liquids or materials etc... In this system the pipes are not filled with water up to the sprinkler heads for these are unsealed and the water is held back by a check valve. The check valve operates by the actuation of a heat responsive device which opens the valve releasing water to the open head sprinklers and immediately deluging the whole area concerned. It also sounds an automatic alarm.

ART. 16 Window Sprinkler:

These are open head sprinkler usually with no automatic fusible link feature, designed to prevent outside exposing fires passing through the windows and start a fire inside the building. They are manually operated by a water control valve which starts the sprinklers thus wetting the entire surface of the glass and frame. All windows doors and opening shall be kept closed while operation.

One sprinkler shall be placed in the center of each window with the deflector on line with the top of the upper ^ssach and from 7 to 10 in. be _{re}fore the glass pane. Windows exceeding 6 ft. in width shall ^{have} need 2 sprinklers. (x)

Any considerable number of open ⁿwidow sprinklers requires a large volume of water and such sprinklers shall be installed only where an ample water supply is available at good working

pressure ϕ available at a relatively low cost. Open sprinklers are manually operated and the control valves shall be placed in an accessible location and shall be promptly turned when necessary.

Window sprinklers shall be installed in line along the top of the windows (as specified previously) and one line of sprinklers shall be used for every other story.

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