ENGINEERING STANDARD

FOR

FIRE PROTECTION IN BUILDINGS

ORIGINAL EDITION

NOV. 1993

This standard specification is reviewed and updated by the relevant technical committee on May 2000(1) and July 2012(2). The approved modifications are included in the present issue of IPS.

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FOREWORD

The Iranian Petroleum Standards (IPS) reflect the views of the Iranian Ministry of Petroleum and are intended for use in the oil and gas production facilities, oil refineries, chemical and petrochemical plants, gas handling and processing installations and other such facilities.

IPS are based on internationally acceptable standards and include selections from the items stipulated in the referenced standards. They are also supplemented by additional requirements and/or modifications based on the experience acquired by the Iranian Petroleum Industry and the local market availability. The options which are not specified in the text of the standards are itemized in data sheet/s, so that, the user can select his appropriate preferences therein.

The IPS standards are therefore expected to be sufficiently flexible so that the users can adapt these standards to their requirements. However, they may not cover every requirement of each project. For such cases, an addendum to IPS Standard shall be prepared by the user which elaborates the particular requirements of the user. This addendum together with the relevant IPS shall form the job specification for the specific project or work.

The IPS is reviewed and up-dated approximately every five years. Each standards are subject to amendment or withdrawal, if required, thus the latest edition of IPS shall be applicable

The users of IPS are therefore requested to send their views and comments, including any addendum prepared for particular cases to the following address. These comments and recommendations will be reviewed by the relevant technical committee and in case of approval will be incorporated in the next revision of the standard.

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GENERAL DEFINITIONS

Throughout this Standard the following definitions shall apply.

COMPANY :

Refers to one of the related and/or affiliated companies of the Iranian Ministry of Petroleum such as National Iranian Oil Company, National Iranian Gas Company, National Petrochemical Company and National Iranian Oil Refinery And Distribution Company.

PURCHASER :

Means the “Company" where this standard is a part of direct purchaser order by the “Company”, and the “Contractor” where this Standard is a part of contract document.

VENDOR AND SUPPLIER:

Refers to firm or person who will supply and/or fabricate the equipment or material.

CONTRACTOR:

Refers to the persons, firm or company whose tender has been accepted by the company.

EXECUTOR :

Executor is the party which carries out all or part of construction and/or commissioning for the project.

INSPECTOR :

The Inspector referred to in this Standard is a person/persons or a body appointed in writing by the company for the inspection of fabrication and installation work.

SHALL:

Is used where a provision is mandatory.

SHOULD:

Is used where a provision is advisory only.

WILL:

Is normally used in connection with the action by the “Company” rather than by a contractor, supplier or vendor.

MAY:

Is used where a provision is completely discretionary.

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1. SCOPE

This Standard specifies the minimum requirement for construction, protection, and occupancy features necessary to minimize danger to life from fire, smoke, fumes, or panic.

The standard identifies the minimum criteria for the design of egress facilities so as to permit prompt escape of occupants from buildings or, where desirable, into safe areas within the building.

When in fixed locations and occupied as buildings, vehicles, vessels, or other mobile structures shall be treated as buildings.

The standard does not attempt to address those general fire prevention or building construction features that are normally a function of fire prevention and building codes.

The prevention of accidental personal injuries during the course of normal occupancy of buildings, personal injuries incurred by an individual's own negligence, and the preservation of property from loss by fire have not been considered as the basis for any of the provisions of this Standard.

Note 1:

This standard specification is reviewed and updated by the relevant technical committee on May. 2000. The approved modifications by T.C. were sent to IPS users as amendment No. 1 by circular No. 108 on May. 2000. These modifications are included in the present issue of IPS.

Note 2:

This standard specification is reviewed and updated by the relevant technical committee on July 2012. The approved modifications by T.C. were sent to IPS users as amendment No. 2 by circular No. 351 on July 2012. These modifications are included in the present issue of IPS.

2. REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

NFPA (NATIONAL FIRE CODES)

NFPA 101	"Alternative Approaches to Life Safety"
NFPA 220	"Types of Building Construction"
NFPA 251	"Standard Method of Tests of Fire Resister of Building Construction and Materials"
NFPA A-1	"Fire Code"
NFPA A-13	"Standard for the Installation of Sprinkler Systems"

BSI (BRITISH STANDARD INSTITUTION)

BS 9999	"Code of Practice for Fire Safety in the Design Management and Use of Building"

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-GN-100 "Engineering Standard for Units"

IPS-E-SF-400 "Engineering Standard for Industrial Stairs, Ladders, Platforms, and Scaffolds"

3. DEFINITIONS AND TERMINOLOGY

Assembly

All buildings or portions of buildings used for gathering 50 or more persons.

Compartment

Every building shall be divided into compartments to limit the spread of fire and restrict the movement of smoke.

Court

An open, uncovered, unoccupied space, unobstructed to the sky, bounded on three or more sides by exterior building walls.

Dead End

An area from which escape is possible in one direction only.

Exit Access

That portion of a means of egress that leads to an exit.

Exit Discharge

That portion of a means of egress between the termination of an exit and a public way.

Fire Resistance

The ability of an element of building construction to satisfy for a stated period of time some or all of the criteria namely resistance to collapse, resistance to flame penetration and resistance to excessive temperature rise on the unexposed face.

Fire Resistance Rating

The time, in minutes or hours, that materials or assemblies have withstood a fire exposure as established in accordance with the test procedures. (see NFPA 251).

Hand Rail

A bar, pipe, or similar member designed to furnish persons with a handhold.

IPI

IPI As used in this standard, means Iranian Petroleum Industries.

Load Live

The weight superimposed by the use and occupancy of the building, not including the wind load, earthquake load, or dead load.

Means of Egress

Means of egress is a continuous and unobstructed way of travel from any point in a building or structure to a public way and consists of three separate and distinct parts: (a) the exit access, (b) the exit, and (c) the exit discharge.

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

Occupancy

The purpose for which a building or portion thereof is used or intended to be used.

Occupant Load

The total number of persons that might occupy a building or portion thereof at any one time.

Ramp

A walking surface that has a slope steeper than 1 in 20.

Travel Distance

The actual distance to be travelled by a person from any point within the floor area to the nearest storey exit, having regard to the layout of walls, partitions and fittings.

4. UNITS

This Standard is based on International System of Units (SI), as per IPS-E-GN-100 except where otherwise specified.

5. GENERAL REQUIREMENTS

This Standard applies to both new construction and existing buildings. In various sections, there are specific provisions for existing buildings that differ from those for new construction.

The authorities in IPI shall determine the adequacy of means of egress and other measures for safety of personnel from fire in accordance with the provision of this Standard.

The requirements for existing buildings can be modified if their application clearly would be impractical in the judgment of the IPI's relevant authorities, but only where it is clearly evident that a reasonable degree of safety is provided.

Where two or more classes of occupancy occur in the same building or structure, and are so intermingled that separate safeguards are impracticable, means of egress facilities, construction, protection, and other safeguards shall comply with the most restrictive requirements of the occupancies involved.

6. OCCUPANCY

6.1 No new construction or existing building shall be occupied in whole or in part in violation of the provisions of this Standard.

6.2 Existing buildings that are occupied at the time of adoption of this Standard shall remain in use provided:

a) The occupancy classification remains the same.

b) No serious life safety hazard exists that would constitute an imminent threat.

6.3 Buildings or portions of buildings can be occupied during construction, repair, alterations, or additions only if all means of egress and all fire protection features are in place and continuously maintained for the part occupied.

6.4 Changes of Occupancy

In any building or structure, whether necessitating a physical alteration or not, a change from one occupancy classification to another, or from one occupancy subclassification to another subclassification of the same occupancy can be made only if such building or structure conforms with the requirements of this Standard applying to new construction for the proposed new use.

6.5 Additions

Additions shall conform to the provisions for new construction.

6.6 Modernization or Renovation

Any alteration, or any installations of new equipment, shall be accomplished as nearly as practical in conformance with the requirements for new construction. Alterations shall not diminish the level of life safety below that which exists prior to the alteration. In no case shall the resulting life safety be less than that required for existing buildings. Life safety features that do not meet the requirements for new buildings but exceed the requirements for existing buildings shall not be further diminished. Life safety features in excess of those required for new construction are not required to be maintained.

6.7 Maintenance

Whenever or wherever any device, equipment, system, condition, arrangement, level of protection, or any other feature is required for compliance with the provisions of this Standard the above mentioned features shall thereafter be permanently maintained unless the Standard exempts such maintenance.

6.8 Provisions in Excess of Standard Requirements

Nothing in this Standard shall be considered to prohibit a better type of building construction, more exits, or otherwise safer conditions than the minimum requirements specified in this Standard.

7. CLASSIFICATION AND SEPARATION OF OCCUPANCY

7.1 A Building or Structure Shall be Classified as Follows:

7.1.1 Assembly

Assembly occupancies include, but are not limited to all buildings or portions of buildings used for gathering together 50 or more persons for such purposes as conference, entertainment, eating, amusement, exhibition and training.

Assembly occupancies include:

- assembly halls;
- mosques;
- auditoriums;
- bowling lanes;
- conference rooms;
- exhibition halls;
- libraries;
- motion picture theaters;
- recreation piers and sports;
- restaurants;
- theaters;
- training centers.

Occupancy of any room or space for assembly purposes by less than 50 persons in a building of other occupancy and incidental to such other occupancy shall be classed as part of the other occupancy and subject to the provisions applicable thereto.

7.1.2 Sub-classification of assembly occupancies

Each assembly occupancy shall be sub-classified according to its occupant load as follow:

- Class A, occupant load greater than 1000 persons.
- Class B, occupant load greater than 300 but not greater than 1000 persons.
- Class c, occupant load of 50 or more but not greater than 300 persons.

7.1.3 Educational

Educational occupancies include all buildings or portions of buildings used for educational purposes by six or more persons for four or more hours per day or more than 12 hours per week. Educational occupancies include:

Academies	Nursery schools
Kindergartens	Schools

Educational occupancies also include day-care facilities of any occupant load.

Other occupancies associated with educational institutions shall be in accordance with the appropriate parts of this Standard.

In cases where instruction is incidental to some other occupancy, the section of this Standard governing such other occupancy shall apply.

7.1.4 Health care

Health care occupancies are those used for purposes such as medical or other treatment or care of persons suffering from physical or mental illness, disease or infirmity; and for the care of infants, convalescents, or infirm aged persons. Health care occupancies provide sleeping facilities for four

or more occupants and are occupied by persons who are mostly incapable of self-preservation because of age, physical or mental disability, or because of security measures not under the occupants, control.

Health care occupancies include:

a) hospitals;

b) nursing homes;

c) limited care facilities.

Health care occupancies also include ambulatory health care centers.

7.1.5 Residential

Residential occupancies are those occupancies in which sleeping accommodations are provided for normal residential purposes and include all buildings designed to provide sleeping accommodations.

Residential occupancies are the following groups:

a) dormitories;

b) apartments;

c) guest houses;

d) board and care facilities;

e) one- and two-family dwellings.

7.1.6 Mercantile

Mercantile occupancies include stores, markets, and other rooms, buildings, or structures for the display and sale of merchandise. Mercantile occupancies include:

Department stores Drugstores

Supermarkets

Minor merchandising operations in buildings predominantly of other occupancies, such as a news-stand in an office building, shall be subject to the exit requirements of the predominant occupancy.

7.1.7 Business

Business occupancies are those used for the transaction of business (other than that covered under Mercantile), for the keeping of accounts and records, and similar purposes. Business occupancies include:

Dentists' offices

Doctors' offices

General offices

Laboratories for Basic or applied research not including hazardous chemicals

Outpatient clinics, ambulatory

Minor office occupancy incidental to operations in another occupancy shall be considered as a part of the predominating occupancy and shall be subject to the provisions of this Standard applying to the predominating occupancy.

7.1.8 Industrial

Industrial occupancies include factories making products of all kinds and properties devoted to

operations such as processing, assembling, mixing, packaging, finishing or decorating, and repairing. Industrial occupancies include:

Dry cleaning plants.	Laundries.
Factories of all kinds.	Power plants.
Gas plants.	Pumping stations.
Laboratories involving.	Refineries.
Hazardous chemicals.	Smokehouses.
Production units.	Gas compressor and injection plants.
Oil Booster Stations.	Oil loading terminals.
Distribution depots.	Gas compressor stations.
LPG bottling plants.	

7.1.9 Storage

Storage occupancies include all buildings or structures utilized primarily for the storage or sheltering of goods, merchandise, products, vehicles, or animals. Storage occupancies include:

Bulk oil storage	Hangars
Cold storage	Parking garages
Freight terminals	Truck and marine terminals
Warehouses	

Minor storage incidental to another occupancy shall be treated as part of the other occupancy.

7.1.10 Special structures

Special structures that house occupancies include the occupancies from the preceding groups that are in special structures or buildings including, among others, the following:

Open structures	Vehicles
Towers	Vessels
Underground	structures Water surrounded structures Windowless buildings

Such special buildings and structures shall conform to the requirements of the specific occupancy Chapters 8 through 29 NFPA Section 101 and modification as modified by Chapter 30.

7.2 Separated Occupancies

7.2.1 Where separated occupancies are provided, each part of the building comprising a distinct occupancy, as described in this chapter, shall be completely separated from other occupancies by fire-resistive assemblies, as specified in7.2.2, 7.2.3 and Appendix A unless separation is provided by approved existing separations. [NFPA 101: 6.1.14.4.3]

7.2.2 Occupancy separations shall be classified as 3-hour fire resistance–rated, 2-hour fire resistance-rated or 1-hour fire resistance-rated and shall meet the requirements of Chapter 8 of NFPA 101. [101: 6.1.14.4.2]

7.2.3 The fire resistance rating specified in Appendix A shall be permitted to be reduced by 1 hour, but in no case shall it be reduced to less than 1 hour, where the building is protected throughout by an approved automatic sprinkler system in accordance with NFPA 13 and supervised in accordance with 13.3.1.7, unless prohibited by the double-dagger footnote entries in the tables. [NFPA 101: 6.1.14.4.3]

7.2.4 Occupancy separations shall be vertical, horizontal, or both or, when necessary, of such other form as required to provide complete separation between occupancy divisions in the building. [NFPA 101: 6.1.14.4.4]

8. HAZARD OF CONTENTS

8.1 General

8.1.1 The hazard of contents, for the purpose of this Standard shall be the relative danger of the start and spread of fire, the danger of smoke or gases generated, and the danger of explosion or other occurrence potentially endangering the lives and safety of the occupants of the building or structure.

8.1.2 Hazard of contents shall be determined by the relevant authorities on the basis of the character of the contents and the processes or operations conducted in the building or structure.

8.1.3 Where different degrees of hazard of contents exist in different parts of a building or structure, the most hazardous shall govern the classification for the purpose of this standard.

8.2 Classification of Hazard of Contents

8.2.1 The hazard of contents of any building or structure shall be classified as low, ordinary, or high in accordance with the following clauses:

8.2.2 Low hazard

Low hazard contents shall be classified as those of such low combustibility that no self-propagating fire therein can occur, such as metal furniture in office buildings.

8.2.3 Ordinary hazard

Ordinary hazard contents shall be classified as those that are likely to burn with moderate rapidity or to give off a considerable volume of smoke, such as tire.

8.2.4 High hazard

High hazard contents shall be classified as those that are likely to burn with extreme rapidity or from which explosions are to be expected, such as gasolin (petrol) or petroleum gas.

8.3 Classification of Storage

8.3.1 Commodity classification

8.3.1.1 Class I commodity is defined as essentially noncombustible products on combustible pallets, in ordinary corrugated cartons with or without single-thickness dividers, or in ordinary paper wrappings with or without pallets.

8.3.1.2 Class II commodity is defined as Class I products in slatted wooden crates, solid wooden boxes, multiple thickness paperboard cartons or equivalent combustible packaging material with or without pallets.

8.3.1.3 Class III commodity is defined as wood, paper, natural fiber cloth, or Group C plastics or products thereof, with or without pallets. Products may contain a limited amount of Group A or B plastics. Metal bicycles with plastic handles, pedals, seats, and tires are an example of a commodity with a limited amount of plastic.

8.3.1.4 Class IV commodity is defined as Class I, II, or III products containing an appreciable amount of Group A plastics in ordinary corrugated cartons and Class I, II, and III products in corrugated cartons with Group A plastic packing, with or without pallets. Group B Plastics and free-flowing Group A plastics are also included in this class. An example of packing material is a metal typewriter in a foamed plastic cocoon in an ordinary corrugated carton.

8.4 Classification of Plastics, Elastomers, and Rubber

Note:

The following categories are based on unmodified plastic materials. The use of fire or flame-retarding modifiers or the physical form of the material may change the classification.

8.4.1 Group A

ABS (Acrylonitrile-Butadiene-Styrene Copolymer)

Acrylic (Polymethyl Methacrylate)

Acetal (Polyformaldehyde)

Butyl Rubber

EPDM (Ethylene-Propylene Rubber)

FRP (Fiberglass Reinforced Polyester)

Natural Rubber (if expanded)

Nitrile Rubber (Acrylonitrile-Butadiene Rubber)

PET (Thermoplastic Polyester)

Polybutadiene

Polycarbonate

Polyester Elastomer

Polyethylene

Polypropylene

Polystyrene

Polyurethane

PVC (Polyvinyl Chloride-highly plasticized, e.g., coated fabric, unsupported film)

SAN (Styrene Acrylonitrile)

SBR (Styrene-Butadiene Rubber)

8.4.2 Group B

Cellulosics (Cellulose Acetate, Cellulose Acetate Butyrate, Ethyl Cellulose)

Chloroprene Rubber

Fluoroplastics (ECTFE-Ethylene-Chlorotrifluoro-ethylene Copolymer;

ETFE-Ethylene-Tetrafluoroethylene Copolymer; FEP-Fluorinated Ethylene-Propylene Copolymer)

Natural Rubber (not expanded)

Nylon (Nylon 6, Nylon 6/6)

Silicone Rubber

8.4.3 Group C

Fluoroplastics (PCTFE-Polychlorotrifluoroethylene;

PTFE-Polytetrafluoroethylene)

Melamine (Melamine Formaldehyde)

Phenolic

PVC (Polyvinyl Chloride-rigid or lightly plasticized, e.g., pipe, pipe fittings)

PVDC (Polyvinylidene Chloride)

PVF (Polyvinyl Fluoride)

PVDF (Polyvinylidene Fluoride)

Urea (Urea Formaldehyde)

9. RAMPS

9.1 A ramp, either interior or exterior shall be used as a component in means of egress where it conforms to the general requirements of Section 5.1 of NFPA 101 and to the special requirements of this subsection.

9.2 Classification

A ramp shall be designated as Class A or Class B in accordance with the following table:

	Class A	Class B
Minimum width	112 cm	76 cm
Maximum slope	1 in 10	1 in 8
Maximum height between landings	3.7 m	3.7 m

a) Existing Class B ramps with slopes of 10 to 17 cm in 1 m are permitted subject to the approval of the authority concerned .

b) All existing Class A ramps and new ramps not exceeding slope of 1 in 15 need not be provided with landings.

10. TYPES OF BUILDING CONSTRUCTION

10.1 Guide to Classification of Types of Construction

The types of construction include five basic types designated by Roman numerals as Type I, Type II, Type III, Type IV, and Type V. This system of designating types of construction also includes a specific breakdown of construction type through the use of Arabic numbers. These numbers follow the Roman numeral notation when naming a type of construction, e.g., Type I-443, Type II-111, Type III-200, etc.

The Arabic numbers following each basic type (Type I, Type II, etc.) designate the fire resistance

rating requirements for certain structural elements as follows:

First Arabic Number-Exterior bearing walls.

Second Arabic Number-Structural frame or columns and girders, supporting loads for more than one floor.

Third Arabic Number-Floor Construction.

10.2 Types of Construction

10.2.1 Type I (442 or 332)

Type I construction is that type in which the structural members, including walls, columns, beams, floors, and roofs, are of approved noncombustible or limited-combustible materials and have fire resistance ratings not less than those set forth in Table 1.

10.2.2 Type II (222.111.000)

Type II construction is that type not qualifying as Type I construction in which the structural members including walls, columns, beams, floors, and roofs are of approved noncombustible or limited combustible materials and have fire resistance ratings not less than those set forth in Table 1.

10.2.3 Type III (211 or 200)

Type III construction is that type in which exterior walls and structural members which are portions of exterior walls are of approved noncombustible or limited combustible materials, and interior structural members, including walls, columns, beams, floors, and roofs, are wholly or partly of wood of smaller dimensions than required for Type IV construction or of approved noncombustible, limited combustible, or other approved combustible materials. In addition, structural members have fire resistance ratings not less than those set forth in Table 1.

10.2.4 Type IV (2HH).

Type IV construction is that type in which exterior and interior walls and structural members which are portions of such walls are of approved noncombustible or limited-combustible materials. Other interior structural members including columns, beams, arches, floors and roofs are of solid or laminated wood without concealed spaces and comply with the provisions of Clause 10.2.4.1 through 10.2.4.5.

In addition, structural members have fire resistance ratings not less than those set forth in Table 1.

Exceptions:

1) Interior columns, arches, beams, girders, and trusses of approved materials other than wood are permitted provided they are protected to provide a fire resistance rating of not less than 1 hour.

2) Certain concealed spaces are permitted by the Exception to 10.2.4.3.

10.2.4.1 Wooden columns supporting floor loads shall be not less than 203 mm in any dimension; wooden columns supporting roof loads only shall be not less than 152 mm in least dimension and not less than (203 mm) in depth.

10.2.4.2 Wooden beams and girders supporting floor loads shall be not less than 152 mm in width and not less than 254 mm in depth; wooden beams and girders and other roof framing, supporting roof loads only, shall be not less than 102 mm in width and not less than 152 mm in depth.

10.2.4.3 Framed or glued laminated arches which spring from grade or the floor line and timber trusses which support floor loads shall be not less than (203 mm) in width or depth. Framed or glued laminated arches for roof construction which spring from grade or the floor line and do not support floor loads shall have members not less than 152 mm in width and not less than 203 mm in depth for the lower half of the height and not less than 152 mm in depth for the upper half. Framed or glued laminated arches for roof construction which spring from the top of walls or wall abutments and timber trusses which do not support floor loads shall have members not less than 102 mm in width and not less than 152 mm in depth.

Exception:

Spaced members should be composed of two or more pieces not less than 76 mm in thickness when blocked solidly throughout their intervening spaces or when such spaces are lightly closed by a continuous wood cover plate not less than 51 mm in thickness, secured to the underside of the members.

Splice plates shall be not less than 76 mm in thickness.

10.2.4.4 Floors shall be constructed of splined or tongued and grooved plank not less than 76 mm in thickness covered with 25 mm tongue and groove flooring, laid crosswise or diagonally to the plank, or with 12.7 mm plywood, or of laminated planks not less than 102 mm in width, set on edge close together, spiked at intervals of 457 mm and covered with 25 mm tongue and groove flooring laid crosswise or diagonally to the plank or with 12.7 mm plywood.

10.2.4.5 Roof decks shall be of splined or tongued and grooved plank not less than 51 mm in thickness; or of laminated planks not less than 76 mm in width, set on edge close together, and laid as required for floors; or of 28.6 mm thick interior plywood (exterior glue); or of approved noncombustible or limited combustible materials of equal fire durability.

10.2.5 Type V (111 or 000)

Type V construction is that type in which exterior walls, bearing walls, and floors and roofs and their supports are wholly or partly of wood or other approved combustible material smaller than required for Type IV construction. In addition, structural members have fire resistance ratings not less than those set forth in Table 1.

TABLE 1 - FIRE RESISTANCE RATINGS (IN HOURS) FOR TYPE I THROUGH TYPE V CONSTRUCTION

	Type I		Type II			Type III		Type IV	Type V	
	442	332	222	111	000	211	200	2HH	111	000
Exterior Bearing Walls[a]										
Supporting more than one floor, columns, or other bearing walls	4	3	2	1	0[b]	2	2	2	1	0[b]
Supporting one floor only	4	3	2	1	0[b]	2	2	2	1	0[b]
Supporting a roof only	4	3	1	1	0[b]	2	2	2	1	0[b]
Interior Bearing Walls										
Supporting more than one floor, columns, or other bearing walls	4	3	2	1	0	1	0	2	1	0
Supporting one floor only	3	2	2	1	0	1	0	1	1	0
Supporting roofs only	3	2	1	1	0	1	0	1	1	0
Columns										
Supporting more than one floor, columns, or other bearing walls	4	3	2	1	0	1	0	H	1	0
Supporting one floor only	3	2	2	1	0	1	0	H	1	0
Supporting roofs only	3	2	1	1	0	1	0	H	1	0
Beams, Girders, Trusses, and Arches										
Supporting more than one floor, columns, or other bearing walls	4	3	2	1	0	1	0	H	1	0
Supporting one floor only	2	2	2	1	0	1	0	H	1	0
Supporting roofs only	2	2	1	1	0	1	0	H	1	0
Floor-Ceiling Assemblies	2	2	2	1	0	1	0	H	1	0
Roof-Ceiling Assemblies	2	1½	1	1	0	1	0	H	1	0
Interior Nonbearing Walls	0	0	0	0	0	0	0	0	0	0
Exterior Nonbearing Walls[c]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]

H: heavy timber members (see text for requirements).
[a]See NFPA 5000, 7.3.2.1.
[b]See NFPA 5000, Section 7.3.
[c]See 4.3.2.12, 4.4.2.3, and 4.5.6.8.

[5000: Table 7.2.1.1]

11. FIRE RESISTANCE

11.1 External Walls

11.1.1 General

Every external wall of a building other than that of the warehouse class shall comply with the requirements as to noncombustibility and fire resistance specified as appropriate thereto in Column (2) of the following Table according to the distance of the wall from the nearest boundary of the premises (Column (1)).

(1) Distance of wall in metres from nearest boundary of premises		(2) Appropriate requirements to non-combustibility & fire resistance
Not less than	Less than	Non-combustible through out & to have resistance to external fire of 1/2 hour.
1	---	Non-combustible throughout
1	1.5	Non-combustible externally
1.5	3	No special requirement
3	---	
Warehouse class used pre-dominantly for storage & consisting of one storey.		
6	12	Non-combustible externally & to have resistance to fire of one hour.
or a distance equivalent to half of the height of the building whichever is the greater.		
12		Non-combustible externally
or a distance the height of the building.		

11.1.2 Large storage buildings

Every external wall of a building of the warehouse class intended to be used wholly or predominantly for storage shall, if the capacity of the building exceeds 7000 m^3, or if its height exceeds 22 m, be noncombustible throughout and have a fire resistance of three hours.

12. MEANS OF EGRESS

12.1 General

In an emergency there have to be exit facilities sufficient to allow the public and staff to reach an area of relative safety without delay. The place of ultimate safety is of course beyond the final exit but it is not always practicable to evacuate the whole of the building immediately upon the incidence of fire in any part. Nevertheless, it is essential that the occupants are able to reach, without undue delay, areas of relative safety, e.g. protected routes and stairways within the building that lead ultimately to the open air.

The exit capacities tabulated in Table 2 have been based on an evacuation time of 2.5 min through a storey exit on the assumption that a unit width of exit of 500 mm permits the flow of 40 persons per minute. Stairway widths have been similarly calculated taking into account also the number of persons who could occupy a stairway.

TABLE 2 - CLEAR WIDTHS OF ESCAPE ROUTES WITHIN A STOREY AND OF ANY EXIT LEADING THEREFROM

MAXIMUM NUMBER OF PERSONS	WIDTH mm	MAXIMUM NUMBER OF PERSONS	WIDTH mm
50	826	280	1400
110	926	300	1500
220	1100	320	1600
240	1200	340	1700
260	1300	360	1800

Note:

Other values of width for a maximum number of persons greater than 220 shall be obtained by linear interpolation or extrapolation.

12.2 Application

12.2.1 Means of egress for both new and existing buildings shall comply with this Section.

12.2.2 Any alteration or addition that would reduce means of egress below the requirements of this Standard is prohibited.

12.2.3 Any change of occupancy that would result in means of egress below the requirements of this Standard is prohibited.

12.3 Separation of Means of Egress

12.3.1 Exits

Where an exit is required by this Standard to be protected by separation from other parts of the building, the separating construction shall meet the requirements of Section 6.2 NFPA code 101 Vol. 5 and the following requirements:

a) The separation shall have at least a 1 hour fire resistance rating where the exit connects three stories or less. This applies whether the stories connected are above or bellow the storey at which exit discharge begins.

b) The separation shall have at least a 2 hour fire resistance rating where the exit connects four or more stories, whether above or below the level of exit discharge. It shall be constructed of an assembly of noncombustible or limitedcombustible materials and shall be supported by construction having at least a 2 hour fire resistance rating.

c) Any opening therein shall be protected by a fire door assembly equipped with a door closer complying with 12.9.1.8.

d) Openings in exit enclosures shall be limited to those necessary for access to the enclosure from normally occupied spaces, from corridors, and for egress from the enclosure.

e) Penetrations into and openings through an exit enclosure assembly are prohibited except for required exit doors; duct work and equipment necessary for independent stairpressurization; sprinkler piping; standpipes; and electrical conduit serving the stairway.

There shall be no penetrations or communicating openings between adjacent exit enclosures.

12.3.2 Enclosing walls of exits shall be so arranged as to provide a continuous protected path of travel, including landings and passageways, to an exit discharge.

12.3.3 No exit enclosure shall be used for any purpose that would interfere with its use as an exit, such as for storage or similar purposes.

12.3.4 Width of exits and escape routes

12.3.4.1 Every exit should be wide enough to enable the quick passage of all the occupants who shall need to use it. In the case of small rooms or stories no calculation is necessary for 826 mm minimum wide door. For corridors, etc. the width should not be less than the door width to the stairway or the width of the final exit as appropriate.

Except where a single exit is acceptable, one of the exits should be assumed to be obstructed by fire. Therefore in the case of two exits, each should be capable of letting all the occupants pass. Where three or more exits are provided, each exit in turn should be discounted in assessing the aggregate widths of the others.

The number of occupants for whom provision should be made is known for certain areas, otherwise the numbers shall be calculated from the floor space per person given in table 3; in that case the number of occupants of a room or storey can be calculated from

area of room or storey (in m^2)

floor space per person (in m^2)

Whatever method is used for assessing the number of persons using a room or storey, the safety and fire authority shall need to be satisfied that adequate exits and widths of exits are provided for the number of persons actually using the premises when occupied.

The number of occupants of a building is the sum of the numbers of occupants of the stories in the building.

a) The widths or aggregate widths of exits and escape routes should be not less than those given in Table 2. If two or more exits or escape routes are required, the width or aggregate width should comply with Table 2 when in turn the width of each exit or escape route is discounted. For the purposes of Table 2, the width of a doorway is that of the leaf or leaves; of a passage between the sides at shoulder level; of a stairway, between the handrails.

b) If a story exit or a final exit is approached through a check-out point (e.g. in a supermarket) each check-out passage should not be less than 500 mm in clear width and the combined width of the check-out passageways should not be less than twice the required width of the storey exit at the final exit unless a further exit independent of the check-out points is provided.

12.3.5 Exit passageways

12.3.5.1 General

Any hallway, corridor, passage, tunnel, underfloor passageway, or overhead passageway shall be permitted as an exit passageway and as an exit or exit component where conforming to all other requirements of Clause 11.1 as modified by the provisions of this section.

12.3.5.2 Enclosure

An exit passageway shall be protected by separation from other parts of the building as specified in 12.3.1.

Fixed wired glass panels in steel frame should be installed in such a separation in a fully sprinklered building.

12.3.5.3 Width

The width of an exit passageway shall be adequate to accommodate the aggregate capacity of all exits discharging through it.

12.3.5.4 Floor

The floor shall be solid and without perforations.

TABLE 3 - FLOOR SPACE FACTORS

DESCRIPTION OF ROOM OR STOREY	FLOOR SPACE PER PERSON EXCLUDING STAIRWAY ENCLOSURES, LIFTS AND SANITARY ACCOMMODATION m^2
1 Shops and showrooms other than items 2 and 3	7.0
2 Supermarkets and bazaar type shops	2.0
3 Department stores: main sales areas	2.0
: Sparsely occupied Sales areas	7.0
4 Public restaurants and lounges	1.0 (1)
5 Staff coffee lounge, committee room, conference room, dining room, meeting room, restaurant, common room, lunge, reading room, staffroom, waiting room	1.0 (1)
6 Library, kitchens	7.0
7 Storage accommodation, car park (2)	30.0

Notes:

1) Or, where the occupants will normally be seated, the number of seats provided.

2) Alternatively two persons per parking space.

12.3.6 Exit access corridors

Corridors used as exit access and serving an area having an occupant load of more than 30 shall be separated from other parts of the building by construction having at least a 1 hour fire resistance rating. Openings in such separations shall be protected by an approved fire door assembly having a fire protection rating of at least 20 minutes. Such door shall be designed and installed to minimize smoke leakage.

12.3.7 Interior finish in exits

The flame spread of interior finish on walls and ceilings shall be limited to Class A or Class B in exit enclosures. Individual occupancies shall impose further limitations.

12.3.8 Headroom

Means of egress shall be so designed and maintained as to provide adequate headroom as provided in other sections of this Standard, but in no case shall the ceiling height be less than 229 cm nor shall any projection from the ceiling be less than 203 cm nominal height from the floor. Headroom on stairs is the vertical distance above a plane parallel to and tangent with the most forward projection of the stair tread.

12.3.9 Changes in level in means of egress

12.3.9.1 Changes in level in means of egress shall be by a ramp or a stair where the elevation difference is more than 53.3 cm.

12.3.9.2 Changes in level in means of egress not more than 53.3 cm shall be either by a ramp or by a stair complying with the requirements of IPS-E-SF-400. The minimum tread depth of such stair shall be 33.0 cm and the location of each step shall be readily apparent.

12.3.10 Evacuation

The assumption need not be made that the whole building necessarily has to be evacuated in a fire

emergency.

If adequate measures are taken in large offices department stores and buildings it should be practical and suitable to evacuate in stages. Where compartments are separated in such a manner as to prevent the spread of smoke in the early stages of a fire, or there is a system controlling the movement of smoke, the residents and staff should remain in a fire compartment not affected by the fire, provided that they are still free to leave the building by protected escape routes.

12.3.11 Disabled persons

The designer of a building when considering fire precautions for disabled persons have two questions in mind. The first is the inaudibility to deaf persons of fire alarm sounders. The second is egress for non-ambulant persons, particularly those confined to wheelchairs. Although, for good reasons, the normal practice is that escalators are disregarded as means of escape, the only practicable means of egress for a chairbound person in a multi-storey office and building is an escalator.

Provided that appropriate management arrangements can be made as precautions against undue hazard, a suitable escalator can be regarded as a means of escape for chair bound persons.

Although the proportion of disabled persons in shops and units is higher than, for example, in office buildings, when a shop is being planned it will not as a rule be possible to reliably predict its usage by disabled persons. It can be expected that some members of the public or staff will be persons with a disability of some kind. It is also expected that in the event of an emergency involving evacuation of the building, the majority of these disabled persons will be able to use the escape stairs. It will be a rare occurrence for resident in the building to be chairbound and incapable of being helped down the stairs; in the case of such a person it will be appropriate for special arrangements to be made in the event of evacuation; the responsibility for making these arrangements will be with the authorities in the emergency committee.

12.4 Number of Means of Egress

12.4.1 General

12.4.1.1 The minimum number of means of egress from any storey or portion thereof shall be two.

12.4.1.2 The minimum number of separate and remote means of egress from all floors or portions thereof shall be as follows:

Occupant load more than 500 but not more than 1,000: 3

Occupant load more than 1,000: 4

12.4.1.3 Where exits serve more than one storey, only the occupant load of each storey considered individually need be used in computing the number of exits at that storey, provided that the required number of exits shall not be decreased in the direction of exit travel.

12.5 Arrangement of Means of Egress

12.5.1 General

12.5.1.1 Exits shall be so located and exit access shall be so arranged that exits are readily accessible at all times.

12.5.1.2 Where exits are not immediately accessible from an open floor area, safe and continuous passageways, aisles, or corridors shall be maintained leading directly to every exit and shall be so arranged as to provide access for each occupant to at least two exits by separate ways of travel.

Note:

Where common paths of travel are permitted for an occupancy, such common path of travel shall be permitted but shall not exceed the limit specified.

12.5.1.3 Where more than one exit is required from a building or portion thereof, such exits shall be remote from each other and so arranged and constructed as to minimize any possibility that more than one may be blocked off by any one fire or other emergency condition.

12.5.1.4 In new construction, if two exits or exit access doors are required, they shall be placed a distance apart equal to not less than one-half the length of the maximum overall diagonal dimension of the building or area to be served, measured in a straight line between exits. Where exit enclosures are provided as the required exits and are interconnected by a corridor conforming to the requirements of 12.3.6, exit separation shall be permitted to be measured along the line of travel within the corridor.

In new construction where more than two exits or exit access doors are required, at least two of the required exits or exit access doors shall be so arranged to comply with the above. The other exits or exit access doors shall be so located that if one becomes blocked, the others will be available.

Note:

In buildings protected throughout by an approved automatic sprinkler system the minimum separation distance between two exits or exit access doors shall be not less than one-third the length of the maximum overall diagonal dimension of the building or area to be served, measured in a straight line between exits.

12.5.1.5 Interlocking or scissor stairs may be considered separate exits if enclosed in accordance with 12.3.1 and separated from each other by 2 hour fire resistance rated noncombustible construction. There shall be no penetrations or communicating openings, whether protected or not, between the stair enclosures.

12.5.1.6 Exit access shall be so arranged that there are no dead-end pockets, hallways, corridors, passageways, or courts.

12.5.1.7 Egress from rooms or spaces should open into adjoining or intervening rooms or areas, provided such adjoining rooms are accessory to the area served and provide a direct means of egress to an exit. Foyers, lobbies,and reception rooms constructed as required for corridors shall not be recognized as intervening rooms. Exit access shall be so arranged that it will not be necessary to pass through any area identified under protection from hazards.

12.5.2 Obstructions to egress

12.5.2.1 In no case shall access to an exit be through kitchens, storerooms, restrooms, workrooms, closets, bedrooms or similar spaces, or other rooms subject to locking.

12.5.2.2 Exit access and the doors to exits to which they lead shall be so designed and arranged as to be clearly recognizable. Hangings or draperies shall not be placed over exit doors or otherwise located so as to conceal or obscure any exit. Mirrors shall not be placed on exit doors. Mirrors shall not be placed in or adjacent to any exit in such a manner as to confuse the direction of exit.

12.5.3 Exterior ways of exit access

12.5.3.1 Exit access shall be by means of any exterior balcony, porch, gallery, or roof that conforms

to the requirements of this Standard.

12.5.3.2 Exterior exit access balconies shall be separated from the interior of the building by walls and opening protectives as required for corridors.

Note:

Where the exterior exit access balcony is served by at least two stairs and has no dead ends, or where dead ends occur, travel past an unprotected opening is not necessary to reach a stair.

12.5.3.3 A permanent, reasonably straight path of travel shall be maintained over the required exterior exit access.

12.5.3.4 There shall be no obstruction by railings, barriers, or gates that divide the open space into sections accessory to individual rooms, apartments, or other subdivisions.

12.5.3.5 An exterior exit access shall be so arranged that there are no dead ends in excess of 6.1 m.

12.5.3.6 Any gallery, balcony, bridge, porch, or other exterior exit access that projects beyond the outside wall of the building shall comply with the requirements of this Standard as to width and arrangement.

12.5.3.7 Exterior exit access shall have smooth, solid, substantially level floors and shall have guards on the unenclosed sides at least equivalent to those specified in IPS-E-SF-400.

12.5.3.8 Where accumulation of snow or ice is likely because of the climate, the exterior exit access shall be protected by a roof.

12.6 Measurement of Travel Distance to Exits

12.6.1 The maximum travel distance in any occupied space to at least one exit, measured in accordance with the following requirements, shall not exceed the limits specified in 12.6.5.

12.6.2 The travel distance to an exit shall be measured on the floor or other walking surface along the center line of the natural path of travel starting 30.5 cm from the most remote point, curving around any corners or obstructions with a 30.5 cm clearance therefrom, and ending at the center of the doorway or other point at which the exit begins. Where measurement includes stairs, the measurement shall be taken in the plane of the tread nosing.

Exception:

Travel distance measurement may terminate at a smoke barrier in existing detention and correctional occupancies as provided in Chapter 15 of NFPA 101.

12.6.3 Distance to exits shall be measured from the most remote point subject to occupancy.

12.6.4 Where open stairways or ramps are permitted as a path of travel to required exits, such as between galleries or balconies and the floor below, the distance shall include the travel on the stairway or ramp and the travel from the end of the stairway or ramp to reach an outside door or other exit in addition to the distance to reach the stairway or ramp.

12.6.5 Travel distance limitations

Travel distance to at least one exit shall not exceed 60 m in buildings not sprinklered or exceed 76 m in buildings protected throughout by an approved supervised sprinkler system.

Note:

Travel distance for areas having high hazard contents as specified in 12.6.7 is excepted.

12.6.6 Where any part of an exterior exit is within 3 m horizontal distance of any unprotected building opening, for outside stairs, the distance to the exit shall include the length of travel to ground level.

12.6.7 In all cases where the contents are classified as high hazard, exits shall be provided of such types and numbers and so arranged as to permit all occupants to escape from the building or structure or from the hazardous area thereof to the out-side or to a place of safety with a travel distance of not over 23 m, measured as specified in 12.6.2.

12.6.8 Capacity of means of egress provided in accordance with 11.6.7 shall be as specified in the applicable section of this Standard but not less than such as to provide 1.8 cm/person where exit is by inside or outside stairs or 1.0 cm/person where exit is by doors at grade level, by horizontal exits, or by Class A ramps.

12.6.9 At least two exits shall be provided from each building or hazardous area thereof.

12.6.10 Means of egress shall be so arranged that there are no dead-end pockets, hallways, corridors, passageways, or courts.

12.6.11 All exits shall terminate directly at a public way or at an exit discharge. Yards, courts, open spaces, or other portion of the exit discharge shall be of required width and size to provide all occupants with a safe access to a public way.

12.6.12 A maximum of 50 percent of the required exit capacity shall be permitted to discharge through areas on the level of discharge provided all of the following are met:

a) Such exits discharge to a free and unobstructed way to the exterior of the building, which way is readily visible and identifiable from the point of discharge from the exit.

b) The entire area on the level of discharge is separated from areas below by construction having a fire resistance rating not less than that for the exit enclosure.

c) The level of discharge is protected throughout by an approved automatic sprinkler system, and any other portion of the level of discharge with access to the discharge area is protected throughout by an approved automatic sprinkler system or separated from it in accordance with the requirements for the enclosure of exits. See 12.3.10.

Note:

to (c): The requirements of above clause is waived if the discharge area is a vestibule or foyer meeting all of the following:

1) The depth from the exterior of the building is not greater than 3 m and the length is not greater than 9.1 m.

2) The foyer is separated from the remainder of the level of discharge by construction providing protection at least the equivalent of wired glass in steel frames.

3) The foyer serves only for means of egress including exits directly to the outside.

12.6.13 The exit discharge shall be so arranged and marked as to make clear the direction of egress to a public way. Exit stairs that continue beyond the level of discharge shall be interrupted at the level of discharge by partitions, doors, or other physical barriers.

Note:

Exit stairs that continue one-half story beyond the level of exit discharge need not be interrupted by physical barriers where the exit discharge is clearly obvious.

12.6.14 Stairs, ramps, bridges, balconies, escalators, moving walks, and other components of an exit discharge shall comply with the detailed requirements of this Standard for such components.

12.6.15 Subject to the approval of the relevant authorities exits can be accepted where:

a) They discharge to the roof or other sections of the building or adjoining buildings, and

b) The roof has a fire resistance rating at least the equivalent of that required for the exit enclosure, and

c) There is a continuous and safe means of egress from the roof, and

d) All other reasonable requirements for life safety are maintained.

12.6.16 Escalators, lifts and moving walks

12.6.16.1 Escalators and moving walks shall not constitute a part of the required means of egress.

Previously approved escalators and moving walks in existing buildings, are excepted.

12.7 Illumination of Means of Egress

According to NFPA 101.

12.7.1 General

12.7.1.1 Illumination of means of egress shall be provided in accordance with this section for every building and structure where required. For the purposes of this requirement, exit access shall include only designated stairs, aisles, corridors, ramps, escalators, and passageways leading to an exit.

12.7.1.2 Illumination of means of egress shall be continuous during the time that the conditions of occupancy require that the means of egress be available for use. Artificial lighting shall be employed at such places and for such periods of time as required to maintain the illumination to the minimum Lux (lx) (foot candle) values herein specified.

12.7.1.3 The floors of means of egress shall be illuminated at all points including angles and intersections of corridors and passageways, stairways, landings of stairs, and exit doors to values of not less than 10 lx (1 foot candle) measured at the floor.

Note:

In assembly occupancies, the illumination of the floor of exit access should be reduced to values not less than 2 l × during periods of performances or projections involving directed light.

12.7.1.4 Any required illumination shall be so arranged that the failure of any single lighting unit, such as the burning out of an electric bulb, will not leave any area in darkness.

12.7.1.5 The equipment or units installed to meet the requirements of Section 5-10 of NFPA 101, shall be permitted also to serve the function of illumination of means of egress, provided that all applicable requirements of this section for such illumination are also met.

12.7.2 Sources of illumination

12.7.2.1 Illumination of means of egress shall be from a source of reasonably assured reliability, such as public utility electric service.

12.7.2.2 No battery-operated electric light nor any type of portable lamp or lantern shall be used for primary illumination of means of egress. Battery-operated electric lights shall be permitted to be used as an emergency source to the extent permitted under Clause 12.8 Emergency Lighting.

12.8 Emergency Lighting

12.8.1 General

12.8.1.1 Emergency lighting facilities for means of egress shall be provided in accordance with this section for every building or structure where required.

12.8.1.2 Where maintenance of illumination depends upon changing from one energy source to another, there shall be no appreciable interruption of illumination during the changeover. Where emergency lighting is provided by a prime mover-operated electric generator, a delay of not more than 10 seconds shall be permitted.

12.8.1.3 Emergency lighting facilities shall be arranged to maintain the specified degree of illumination throughout the means of egress, but not less than 10 lx, for a period of 1½ hours in the event of failure of the normal lighting. The illumination can decline to 6 lx at the end of the emergency lighting time duration.

12.8.1.4 Standard battery-operated emergency lights shall use only reliable types of rechargeable batteries provided with suitable facilities for maintaining them in properly charged condition.

12.8.1.5 The emergency lighting system shall be so arranged as to provide the required illumination automatically in the event of any interruption of normal lighting, such as any failure of public utility or other outside electrical power supply, opening of a circuit breaker or fuse, or any manual act(s), including accidental opening of a switch controlling facilities.

12.8.1.6 The emergency lighting system shall be either continuously in operation or capable of repeated automatic operation without manual intervention.

12.9 Means of Egress Components

12.9.1 Doors

12.9.1.1 General

a) A door assembly, including the doorway, frame, door, and necessary hardware, shall be used as a component in a means of egress where it conforms to the general requirements of clause 12.1 and to the special requirements of this section. As such, the assembly is designated as a door.

b) Every door and every principal entrance that is required to serve as an exit shall be so designed and constructed that the way of exit travel is obvious and direct. Windows that, because of their physical configuration or design and the materials used in their construction, could be mistaken for doors shall be made inaccessible to the occupants by barriers or railings conforming to the requirements of IPS-E-SF-400.

c) For the purpose of this Section a building is occupied at any time it is open to or accessible to the public or at any other time it is occupied by more than 10 persons.

12.9.1.2 Egress width

a) In determining the egress width for a doorway, only the clear width of the doorway when the door is in the full open position shall be measured. Clear width shall be the net, unobstructed width of the door opening without projections into such width.

Note:

In existing buildings, projections into the door opening by stops or by the hinge stile shall be permitted.

12.9.1.3 Width and floor level

a) No door opening in the means of egress shall be less than 81 cm in clear width. Where a pair of doors is provided, at least one of the doors shall provide a minimum 81 cm clear width opening.

Notes:

1) Exit access doors serving a room not greater than 6.5 m and not required to be accessible to the handicapped shall be not less than 61 cm wide.

2) In existing buildings the minimum door width shall be not less than 71 cm.

3) Interior doors within dwelling units shall be as provided in Chapter 22 of NFPA 101.

b) No single door in a doorway shall exceed 122 cm in width.

c) The floor on both sides of a doorway shall be substantially level and shall have the same elevation on both sides of the doorway, for a distance at least equal to the width of the widest leaf.

Note:

In one-and two-family dwellings and in existing buildings where the door discharges to the outside or to an exterior balcony, exterior exit, or exterior exit access, the floor level outside the door can be one step lower than the inside, but not more than 20.3 cm lower.

12.9.1.4 Swing and force to open

a) Any door in a means of egress shall be of the sidehinged or pivoted swinging type. The door shall be so designed and installed that it shall be capable of swinging from any position to the full use of the opening in which it is installed. Doors shall swing in the direction of exit travel:

- Where used in an exit enclosure, or
- Where serving a high hazard area, or
- Where serving a room or area with an occupant load of 50 or more.

Notes:

1) Smoke barrier door swing in existing health care occupancies as provided in Chapter 13, of NFPA 101, is excepted.

2) Where permitted by Chapters 8 through 30, of NFPA 101. The horizontal sliding or vertical rolling security grilles or doors that are a part of the required means of egress shall conform to the following:

-They must remain secured in the full open position during the period of occupancy by the general public.

- On or adjacent to the door. there shall be a readily visible, durable sign stating THIS DOOR TO REMAIN OPEN WHEN THE BUILDING IS OCCUPIED. The sign shall be in letters not less than 2.5 cm high on a contrasting background.

- Doors or grilles shall not be brought to the closed position when the space is occupied.

- Doors or grilles shall be openable from within the space without the use of any special knowledge or effort.

- Where two or more means of egress are required, not more than half of the means of egress shall be equipped with horizontal sliding or vertical rolling grilles or doors

3) An elevator lobby that is not a part of the exit access system for the remainder of the story may be provided with an approved self-closing or automatic-closing horizontal sliding door 12.9.1.13.

4) An elevator lobby shall be provided with a horizontal sliding door that conforms with the requirements of 12.9.1.13.

5) Where permitted by Chapters 8 through 30 of NFPA 101, any door in a means of egress serving an occupant load of less than 50 can be a horizontal sliding door that conforms to the requirements of 12.9.1.13.

6) Where permitted by Chapter 8 through 30 Of NFPA 101, horizontal exits or smoke barriers shall be provided with horizontal sliding doors that conform to the requirements of 12.9.1.13.

7) Doors to private garages and industrial and storage areas with an occupant load of not more than 10 need not be sidehinged swinging doors where such garages, industrial and storage areas contain low or ordinary hazard contents.

8) Revolving doors should comply with 12.9.1.10.

b) During its swing, any door in a means of egress shall leave unobstructed at least one-half of the required width of an aisle, corridor, passageway, or landing. When fully open, the door shall not project more than 17.8 cm into the required width of an aisle, corridor, passageway, or landing.

Note:

In existing buildings, a door giving access to a stair shall neither reduce the unobstructed width of a stair or landing to less than 55.9 nor ,when open, project more than 17.8 cm into the required width of a stair or landing.

c) The forces required to fully open any door manually in a means of egress shall not exceed a 67 N to release the latch, a 133 N to set the door in motion and a 67 N to open the door to the minimum required width. These forces shall be applied at the latch stile.

Notes:

1) The opening force for doors in existing buildings shall not exceed 222 N applied to the latch stile.

2) As otherwise provided in 12.9.1.9

d) Screen and Storm Doors

No screen door or storm door used in an exit shall swing against the direction of exit travel where doors are required to swing in the direction of exit travel (See clause 12.9.1.4.)

12.9.1.5 Locks, latches and alarm devices

a) Doors shall be arranged to be readily opened from the egress side whenever the building is occupied. Locks, if provided, shall not require the use of a key, tool, special knowledge or effort for operation from the inside of the building.

Notes:

1) In health care occupancies as provided in Chapters 12 and 13 of NFPA 101 are excepted.

2) Exterior doors should have key operated locks from the side provided:

- That on the egress side, on or adjacent to the door, there is a readily visible, durable sign stating THIS DOOR TO REMAIN UNLOCKED WHEN THE BUILDING IS OCCUPIED. The sign shall be in letters not less than 2.5 cm high on a contrasting background.

b) Every stairwell door shall allow reentry from the stairwell to the interior of the building, or an automatic release shall be provided to unlock all stairwell doors to allow reentry. Such automatic release shall be actuated with the initiation of the building fire alarm system.

Note:

1) Selected doors on stairwells can be equipped with hardware that prevents reentry into the interior of the building provided that:

- Such arrangement is specifically permitted.

- There are at least two levels where it is possible to leave the stairwell, and

- There shall be not more than four floors intervening between floors where it is possible to leave the stairwell, and

- Reentry is possible on the top or next to top floor permitting access to another exit, and

- Doors permitting reentry are identified as such on the stairwell side of the door.

2) In new health care occupancies as provided in Chapter 12, of NFPA 101

c) A latch or other fastening device on a door shall be provided with a knob ,handle ,panic bar ,or other simple type of releasing device having an obvious method of operation under all lighting conditions. Doors shall be open able with no more than one releasing operation.

Note:

Egress doors from individual living units and guest rooms of residential occupancies should be provided with devices that require not more than one additional releasing operation, such as a night latch, dead bolt, or security chain, provided such device is operable from the inside without the use of a key or tool and is mounted at a height not to exceed 122 cm above the finished floor. Existing security devices shall not exceed 152 cm in height above the finished floor and shall be permitted to have two additional releasing operations.

d) Where pairs of doors are required in a means of egress, each leaf of the pair shall be provided with its own releasing device. Devices that depend upon the releasing of one door before the other shall not be used.

Note:

Where exit doors are used in pairs and approved automatic flush bolts are used ,the door leaf having the automatic flush bolts shall have no doorknob or surface-mounted hardware. The unlatching of any leaf shall not require more than one operation.

e) No lock, padlock, hasp, bar ,chain ,or other device, or combination thereof ,shall be installed or maintained at any time on or in connection with any door on which panic hardware or fire exit hardware is required by this standard if such device prevents or is intended to prevent the free use of the door for purposes of egress.

12.9.1.6 Special locking arrangements

a) In buildings protected throughout by an approved supervised automatic fire detection system or approved supervised automatic sprinkler system and where permitted doors in low and ordinary hazard areas, shall be equipped with approved, listed, locking devices that shall:

- Unlock upon actuation of an approved supervised automatic sprinkler system or upon the actuation of any heat detector or not more than two smoke detectors of an approved supervised automatic fire detection system ,and

- Unlock upon loss of power controlling the lock or locking mechanism, and

- Initiate an irreversible process that will release the lock within 15 seconds whenever a force of not more than 67 N applied to the release device for a period of not more than three seconds. Relocking of such doors shall be by manual means only. Operation of the release device shall activate a signal in the vicinity of the door to assure those attempting to exit that the system is functional.

b) On the door adjacent to the release device, a sign shall be provided that reads:

PUSH UNTIL ALARM SOUNDS

DOOR CAN BE OPENED IN 15 SECONDS

Sign letters shall be at least (2.5 cm) high and 1/8 in.(0.3 cm) wide stroke.

c) Emergency lighting in accordance with Section 12.8 shall be provided at the door.

12.9.1.7 Panic hardware and fire exit hardware

a) Panic hardware and fire exit hardware consist of a door latching assembly incorporating a device that releases the latch upon the application of a force in the direction of exit travel. Fire exit hardware additionally provides fire protection where used as part of a fire door assembly.

b) Where a door is required to be equipped with panic hardware or fire exit hardware by some other provision such releasing device shall:

1) Consist of bars or panels, the actuating portion of which shall extend across not less than one-half of the width of the door leaf, not less than 76 cm nor more than 112 cm above the floor, and

2) Cause the door latch to release when a force not to exceed 67 N is applied.

c) Only approved panic hardware shall be used on doors that are not fire doors. Only approved fire exit hardware shall be used on fire doors.

d) Required panic hardware and fire exit hardware shall not be equipped with any locking device, set screw, or other arrangement that can be used to prevent the release of the latch

when pressure is applied to the bar. Devices that hold the latch in the retracted position are prohibited on fire exit hardware unless listed and approved for such use.

12.9.1.8 Self-closing devices

A door designed to normally be kept closed in a means of egress ,such as a door to a stair enclosure or horizontal exit, shall be a self closing door and shall not at any time be secured in the open position.

Note:

In any building of low or ordinary hazard contents, where permitted doors can be automatic closing where:

- Upon release of the hold-open mechanism, the door becomes self- closing ;and

- The release device is so designed that the door can be instantly released manually and upon release become self closing ,or the door should be closed by some simple or readily obvious operation; and

- The automatic releasing mechanism or medium is activated by (1) the operation of an approved automatic smoke detection system installed to protect the entire building ,so designed an installed as to provide for actuation of the system so promptly as to preclude the generation of heat or smoke sufficient to interfere with egress before the system operates, or (2) the operation of approved smoke detectors installed in such a way as to detect smoke on either side of the door opening and

- Any fire detection system or smoke detector is provided with such supervision and safeguards as are necessary to assure complete reliability of operation in case of fire :and

- Upon loss of power to the hold-open device, the hold-open mechanism is released and the door becomes self closing: and

- The release by smoke detection of one door in a stair enclosure results in closing all doors serving that stair.

12.9.1.9 Power-operated doors

Where required doors are operated by power ,such as doors with a photoelectric-actuated mechanism to open the door upon the approach of a person or doors with power-assisted manual operation, the design shall be such that in event of power failure the door shall be opened manually to permit exit travel or closed where necessary to safeguard means of egress. The forces required to open these doors manually shall not exceed those specified 12.9.1.4 (c) in except that the force to set the door in motion shall not exceed 222 N. The door shall be so designed and installed that when a force is applied to the door on the side from which egress is made, it shall be capable of swinging from any position to the full use of the required width of the opening in which it is installed (See 12.9.1.4)

Note:

1) Doors complying with 12.9.1.13 are excepted.

12.9.1.10 Revolving doors

a) All revolving doors shall comply with the following:

- Revolving doors shall be capable of being collapsed into a book-fold position.

- When in the book-fold position, the parallel egress paths formed shall provide an aggregate width of 910 mm.

- Revolving doors shall not be used within 3m of the foot of or top of stairs or escalators. Under all conditions there shall be a dispersal area acceptable to the I.P.I authority between the stairs or escalators and the revolving door.
- The revolutions per minute (RPM) of revolving doors shall not exceed the following:

Inside Diameter	Power Driven-type Speed Control (RPM)	Manual-type Speed Control (RPM)
1980 mm	11	12
2130 mm	10	11
2290 mm	9	11
2440 mm	9	10
2590 mm	8	9
2740 mm	8	9
2900 mm	7	8
3050 mm	7	8

- Each revolving door shall have a conforming side-hinged swinging door in the same wall as the revolving door and within 3 m.

Existing revolving doors where the number of revolving doors does not exceed the number of swing doors within 6.1 m are excepted.

b) Revolving doors shall be used as a component in a means of egress under the following conditions:

- Revolving doors shall not be given credit for more than 50 percent of the required exit capacity.
- Each revolving door shall be credited with no more than 50 persons capacity.
- Revolving doors shall be capable of being collapsed into a book-fold position when a force of not more than 578 N is applied to wings within 7.6 cm of the outer edge.

c) revolving doors not used as a component of a means of egress shall have a collapsing force of not more than 800 N. Revolving doors can have a collapsing force set in excess of 800 N if the collapsing force is reduced to not more than 578 N when:

- There is a power failure or power is removed to the device holding the wings in position.
- There is an actuation of the automatic sprinkler system where such system is provided.
- There is actuation of a smoke detection system that is installed to provide coverage in all areas within the building that are within 23 m of the revolving doors.
- There is the actuation of a manual control switch that reduces the holding force to below the 578 N level.

Such switch shall be in an approved location and shall be clearly identified.

12.9.1.11 Turnstiles

a) No turnstile or similar device to restrict travel to one direction shall be so placed as to obstruct any required means of egress.

Approved turnstiles not over 99 cm high that turn freely in the direction of exit travel can be used in any occupancy where revolving doors are permitted.

b) Turnstiles over 99 cm high shall be subject to the requirements for revolving doors.

c) Turnstiles in or furnishing access to required exits shall be of such design as to provide at least 41.9 cm clear width at and below a height of 99 cm and at least 55.9 cm clear width at heights above 99 cm.

12.9.1.12 Doors in folding partitions

Where permanently mounted folding or movable partitions are used to divide a room into smaller spaces, a swinging door or open doorway shall be provided as an exit access from each such space.

Under the following conditions the swinging door can be omitted and the partition can be used to enclose the space completely:

- The subdivided space shall not be used by more than 20 persons at any time.
- The use of the space shall be under adult supervision.

The partitions shall be so arranged that they do not extend across any aisle or corridor used as an exit access to the required exits from the floor.

- The partitions shall conform to the interior finish and other applicable requirements.
- The partitions shall be an approved type, shall have a simple method of release, and shall be capable of being opened quickly and easily by inexperienced persons in cases of emergency.
- Where a subdivided space is provided with at least two means of egress, the swinging door in the folding partition shall be omitted, and one such means of egress should be equipped with a horizontal sliding door complying with 12.9.1.13.

12.9.1.13 Horizontal sliding doors

a) Horizontal sliding doors shall comply with the following:

- The door shall be operable by a simple method from either side without special knowledge or effort, and
- The force required to operate the door shall not exceed 133 N to set the door in motion, and a 67 N to close the door or open it to the minimum required width, and
- The door shall be operable with a force not to exceed (222 N) when a force of (1,110 N) is applied perpendicularly to the door adjacent to the operating device, and
- The door assembly shall comply with the applicable fire protection rating and, when rated, shall be self-closing or automatic-closing by smoke detection in accordance with 12.9.1.8

APPENDICES

APPENDIX A

REQUIRED SEPARATION OF OCCUPANCIES (HOURS)†

TABLE 1A

Occupancy	Assembly ≤300	Assembly >300 to ≤1000	Assembly >1000	Educational	Day-Care >12 Clients	Day-Care Homes	Health Care	Ambulatory Health Care	Detention & Correctional	One- & Two-Family Dwellings	Lodging or Rooming Houses	Hotels & Dormitories
Assembly ≤300	—	0	0	2	2	1	2‡	2	2‡	2	2	2
Assembly >300 to ≤1000	0	—	0	2	2	2	2‡	2	2‡	2	2	2
Assembly >1000	0	0	—	2	2	2	2‡	2	2‡	2	2	2
Educational	2	2	2	—	2	2	2‡	2	2‡	2	2	2
Day-Care >12 Clients	2	2	2	2	—	1	2‡	2	2‡	2	2	2
Day-Care Homes	1	2	2	2	1	—	2‡	2	2‡	2	2	2
Health Care	2‡	2‡	2‡	2‡	2‡	2‡	—	2‡	2‡	2‡	2‡	2‡
Ambulatory Health Care	2	2	2	2	2	2	2‡	—	2‡	2	2	2
Detention & Correctional	2‡	2‡	2‡	2‡	2‡	2‡	2‡	2‡	—	2‡	2‡	2‡
One- & Two-Family Dwellings	2	2	2	2	2	2	2‡	2	2‡	—	1	1
Lodging or Rooming Houses	2	2	2	2	2	2	2‡	2	2‡	1	—	1
Hotels & Dormitories	2	2	2	2	2	2	2‡	2	2‡	1	1	—
Apartment Buildings	2	2	2	2	2	2	2‡	2	2‡	1	2	2
Board & Care, Small	2	2	2	2	2	2	2‡	2	2‡	2	2	2
Board & Care, Large	2	2	2	2	2	2	2‡	2	2‡	2	2	2
Mercantile	2	2	2	2	2	2	2‡	2	2‡	2	2	2
Mercantile, Mall	2	2	2	2	2	2	2‡	2	2‡	2	2	2
Mercantile, Bulk Retail	3	3	3	3	3	3	2‡	2‡	2‡	3	3	3
Business	1	2	2	2	2	2	2‡	1	2‡	2	2	2
Industrial, General Purpose	2	2	3	3	3	3	2‡	2	2‡	2	2	2
Industrial, Special-Purpose	2	2	2	3	3	3	2‡	2	2‡	2	2	2
Industrial, High Hazard	3	3	3	3	3	3	2‡	2‡	NP	3	3	3
Storage, Low & Ordinary Hazard	2	2	3	3	3	2	2‡	2	2‡	2	2	2
Storage, High Hazard	3	3	3	3	3	3	2‡	2‡	NP	3	3	3

NP: Not permitted.

†*Minimum Fire Resistance Rating.* The fire resistance rating is permitted to be reduced by 1 hour, but in no case to less than 1 hour, where the building is protected throughout by an approved automatic sprinkler system in accordance with NFPA 13 and supervised in accordance with 13.3.1.7.

‡The 1-hour reduction due to the presence of sprinklers in accordance with the single-dagger footnote is not permitted. [NFPA 101: Table 6.1.14.4.1 (a)]

(to be continued)

APPENDIX A
(Continue)

TABLE 2A

Occupancy	Apartment Buildings	Board & Care, Small	Board & Care, Large	Mercantile	Mercantile, Mall	Mercantile, Bulk Retail	Business	Industrial, General Purpose	Industrial, Special-Purpose	Industrial, High Hazard	Storage, Low & Ordinary Hazard	Storage, High Hazard
Assembly ≤300	2	2	2	2	2	3	1	2	2	3	2	3
Assembly >300 to ≤1000	2	2	2	2	2	3	2	2	2	3	2	3
Assembly >1000	2	2	2	2	2	3	2	3	2	3	3	3
Educational	2	2	2	2	2	3	2	3	3	3	3	3
Day-Care >12 Clients	2	2	2	2	2	3	2	3	3	3	3	3
Day-Care Homes	2	2	2	2	2	3	2	3	3	3	2	3
Health Care	2‡	2‡	2‡	2‡	2‡	2‡	2‡	2‡	2‡	2‡	2‡	2‡
Ambulatory Health Care	2	2	2	2	2	2‡	1	2	2	2‡	2	2‡
Detention & Correctional	2‡	2‡	2‡	2‡	2‡	2‡	2‡	2‡	2‡	NP	2‡	NP
One- & Two-Family Dwellings	1	1	2	2	2	3	2	2	2	3	2	3
Lodging or Rooming Houses	1	2	2	2	2	3	2	2	2	3	2	3
Hotels & Dormitories	1	2	2	2	2	3	2	2	2	3	2	3
Apartment Buildings	–	2	2	2	2	3	2	2	2	3	2	3
Board & Care, Small	2	–	1	2	2	3	2	3	3	3	3	3
Board & Care, Large	2	1	–	2	2	3	2	3	3	3	3	3
Mercantile	2	2	2	–	0	3	2	2	2	3	2	3
Mercantile, Mall	2	2	2	0	–	3	2	3	3	3	2	3
Mercantile, Bulk Retail	3	3	3	3	3	–	2	2	2	3	2	2
Business	2	2	2	2	2	2	–	2	2	2	2	2
Industrial, General Purpose	2	3	3	2	3	2	2	–	1	1	1	1
Industrial, Special-Purpose	2	3	3	2	3	2	2	1	–	1	1	1
Industrial, High Hazard	3	3	3	3	3	3	2	1	1	–	1	1
Storage, Low & Ordinary Hazard	2	3	3	2	2	2	2	1	1	1	–	1
Storage, High Hazard	3	3	3	3	3	2	2	1	1	1	1	–

NP: Not permitted.

‡The 1-hour reduction due to the presence of sprinklers in accordance with the single-dagger footnote is not permitted. [NFPA 101: Table 6.1.14.4.1 (b)]