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CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM

# QCVN 06:2022/BXD

# QUY CHUẨN KỸ THUẬT QUỐC GIA VỀ AN TOÀN CHÁY CHO NHÀ & CÔNG TRÌNH

***National Technical Regulation on Fire safety of Buildings and Constructions***

**HÀ NỘI – 2022**

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## Preface

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# QUY CHUẨN KỸ THUẬT QUỐC GIA VỀ AN TOÀN CHÁY CHO NHÀ & CÔNG TRÌNH

***National Technical Regulation on Fire safety of Buildings and Constructions***

## 1 GENERAL REGULATIONS

### 1.1 Scope

**1.1.1** This Code provides:

a) General requirements for fire safety of rooms, fire compartments, buildings and constructions (fire compartments, buildings and constructions hereinafter collectively referred to as “buildings”);

b) Fire-related technical classification for structural components, construction materials, building sections and buildings thereof.

**1.1.2** This Code applies to the following buildings and construction:

a) Residential building: apartment buildings and tenement buildings with a fire protection height of up to 150 m and no more than 3 basements; individual buildings with a height of 7 floors or more or with more than 1 basement to 3 basements; separate buildings in combination with manufacture and business with the occupation floor area for production and business over 30% of the total floor area;

NOTE: In case of conversion of separate building to other occupancy, the regulations of this code and relevant current laws shall be complied with.

b) Public buildings with fire protection height up to 150 m and no more than 3 basements (except for the constructions directly used as places of worship or belief; monuments); all types of outdoor sports fields with stands (stadium, training ground, sports competition and the like);

c) Manufacturers and warehouses with a fire protection height of up to 50 m and no more than 1 basement;

d) Technical infrastructure facilities and utilities buildings with a fire protection height up to 50 m and no more than 1 basement;

e) Traffic service buildings with a fire protection height up to 50 m and no more than 3 basements;

f) Buildings serving agriculture and rural development (except nurseries, green buildings and the like).

NOTE: Classification of buildings shall comply to relevant legal laws. Refer to table 6 for the specific buildings mentioned in 1.1.2.

**1.1.3** The buildings belonging to the occupancy fire hazard categories F1.2, F1.3, F4.2, F4.3 and the mixed-use buildings with a fire protection height greater than 150 m or having a fire protection basement

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of 4 floors or more, the buildings with specific characteristics of fire prevention and fighting different from the building hazard categories in Table 6, in addition to complying with this standard, it shall also provide the technical requirements and appropriate organizational and technical solutions in accordance to the specific fire prevention characteristics of those buildings, on the basis of the applicable standards.

NOTE: For buildings with basements of 4, 5 which are parking garages, in addition to the application of this Code, the application of additional regulations related to basement garages shall be applied.

**1.1.4** This code applied for the new buildings and structures mentioned in 1.1.2, or within the scope of the following alterations:

a) Renovation or repair that changes the function of the room, fire compartment or the building;

b) Renovation or repair that changes the escape solutions of the room, fire compartment or building;

c) Renovation or repair that increases the fire hazard of building materials, or reduce the fire resistance rates of structures and components;

d) Renovation or repair that changes the fire and explosion hazard classification of rooms, fire compartments and buildings in the direction of increasing fire risk;

e) Renovation or repair that raises the fire safety requirements for rooms, fire compartments and buildings;

f) Renovation or repair the fire protection systems of rooms, fire compartments and buildings;

g) Other renovation and repair cases under the guidance of the competent Fire Prevention and Rescue Police (Firefighting and Rescue Police).

**1.1.5** Sections 2, 3, 4, 5 and 6 shall not apply to buildings for special occupancy (buildings and constructions in the technological chain of energy facilities: hydroelectric power plants, thermal power plants, nuclear power plants; wind power, solar power, geothermal power, tidal power, garbage power, bioelectricity; biogas power; cogeneration; airport traffic control tower; manufacture or warehouses of explosives and substances; storage facilities for petroleum and petroleum products, natural gas, combustible gases , as well as flammable substances; petrol, flammable liquid, gas trading shops; toxic chemical manufacturers or warehouses; defense and security buildings; underground sections of subway works; mining works; and buildings of similar characteristics).

**1.1.6** Section 5 also shall not apply to:

a) Facilities and buildings for preserving and processing cereal;

b) Steam generating facilities for producing heat and power grids;

c) Fire suppression system for suppressing fire caused by metal or strong chemically-active substances and materials which when contacts with water will result in explosions, create extreme heat, e.g. compounds of aluminum-organic matters, alkali metals, compounds of lithium-organic matters, azure lead, hydrides of aluminum, zinc, magnesium, sulfuric acid, titanium chloride and thermite.

**1.1.7** The requirements for fire safety and protection of standard documents for construction shall be developed based on the regulations of this Code.

In addition to comply with the Code, other requirements for fire safety shall be complied with, particularly requirements in other documents prescribing standards applied to specific buildings and constructions. In case documents prescribing specific standards developed based on the Code are not available, specific regulations in applicable standards shall be permitted for use until said standards are reexamined, foreign applicable standards that fulfill the Code, regulations and law of Vietnam on fire safety and application of foreign standards in construction in Vietnam shall be permitted to use.

In case of any discrepancy between applicable documents prescribing standards for fire safety of buildings and constructions and the Code, the Code shall prevail.

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**1.1.8** Design dossiers of fire safety and technical documents of buildings, parts, structural components and construction materials shall specify all fire-related technical properties thereof according to the Code.

**1.1.9** When designing and constructing buildings and constructions, in addition to the Code, other compulsory regulations and technical requirements shall be complied with according to applicable regulations and law, namely: planning, structure, water supply and drainage system, electrical system, electric equipment, lightning arresters, fuel supply system, energy efficiency, ventilation systems, air conditioning, mechanical affairs, glass safety, falling and collision prevention.

**1.1.10** In specific cases, Ministry of Construction may only allow specific constructions to replace certain regulations of the Code if written application is submitted to Ministry of Construction specifying additional and substitutional solutions or basis of calculations for guarantee fire safety for such specific construction. The written presentation shall be approved by the Police Departments of Fire Prevention and Fighting and Rescue in prior to submit to Ministry of Construction.

### 1.2 Subjects of application

The Code is applied to organizations and individuals related to investment for construction in Vietnam territory.

### 1.3 References

Following reference documents are vital for application of the Code. In case following reference documents are amended or replaced, the new version shall prevail.

QCVN 17:2018/BXD, *National technical regulations on the construction and installation of outdoor advertising facilities.*

TCVN 3890, *Fire prevention and suppression equipment for buildings and constructions. Equipment, placement and maintenance*.

TCVN 5738, *Fire protection – Automatic fire alarm system – Technical requirements*.

TCVN 7336, *Fire protection – Water, foam automatic fire-extinguishing systems – Design and installation requirements.*

TCVN 9310-4, *Fire prevention and suppression – Terminology – Part 4: Firefighting equipment*.

TCVN 9310-8, *Fire prevention and suppression – Terminology – Part 8: Terminology for fire suppression, rescue and handling of dangerous materials*.

TCVN 9311-1, *Fire resistance test – Structural components of buildings – Part 1: General requirements*.

TCVN 9311-3, *Fire resistance test of structural components of buildings – Part 3: Guidelines on testing methods and application of test figures*.

TCVN 9311-4, *Fire resistance test of structural components of buildings – Part 4: Separate requirements of separate bearings to take vertical load.*

TCVN 9311-5, *Fire resistance test of structural components of buildings – Part 5: Separate requirements of separate bearings to take horizontal load*.

TCVN 9311-6, *Fire resistance test of structural components of buildings – Part 6: Separate requirements for beams.*

TCVN 9311-7, *Fire resistance test of structural components of buildings – Part 7: Separate requirements for pillars*.

TCVN 9311-8, *Fire resistance test of structural components of buildings – Part 8: Separate requirements for vertical separate non-bearing structures*.

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TCVN 9383, *Fire resistance test – Doors and fire rated doors*.

TCVN 12695, *Reaction to fire tests for products — Non-combustibility test.*

TCVN 13456, *Fire protection – Emergency lighting and Exit sign – Design, installation requirements*.

## 1.4 Glossary

In this Code, the following terms shall be interpreted as follows:

### 1.4.1

**Fire safety for buildings and constructions (buildings sections))**

The compliance of the requirements regarding material properties and construction structures, architectural and planning solutions, appropriate technical and technology solutions suitable to the usage of the constructions to prevent fire (fire prevention), limit the spread and extinguish the fire (fire suppression), prevent the factors that are hazardous to humans, minimize damage to assets in case of fire.

### 1.4.2

**Fire engine accessway (fire staging area)**

Road sections with finished surface capable of bearing calculated load, that are distributed along the circumference or part of the circumference of the buildings which allow firefighting vehicles to deploy firefighting activities.

NOTE: Compared to driveway for fire engines, fire engine accessway are designed to bear a greater load with wider dimension to enable deployment of firefighting vehicles.

### 1.4.3

**Fire protection**

A combination of organization solution and technical measures to prevent fire from affecting human and limiting material damage to assets and properties due to the fire.

### 1.4.4

**Fire resistance grade of buildings, constructions, fire compartments**

Graded characteristics of the buildings, constructions, fire compartments, determined by the fire resistance rates of the structures/components used to build such buildings, constructions, fire compartments.

### 1.4.5

**Fire barrier**

Used to prevent fire and combustion products from spreading from a fire compartment or from a room that the fire occurs to other rooms. Including fire-stopping wall, fire-stopping partition and fire-stopping floor.

### 1.4.6

**Smoke barrier**

Devices for diverting, trapping and (or) preventing spread of smoke (gaseous product of fire).

### 1.4.7

**Fire hazard levels of structural components (fire risk level)**

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A characteristic of structural components which is determined based on different levels of experiment results of combusting materials of structural components according to regulations and standards.

**1.4.8**

**Structural fire hazard levels of buildings (fire risk level)**

Levelling characteristics of buildings, constructions and fire compartments, determined by the rate of participation of the building structure in the development of fire and the formation of fire hazard factors.

**1.4.9**

**Fire protection Height (FLS height)**

The fire protection height of the building (excluding the top technical floor) shall be determined as follows:

− By the maximum distance from the fire engine driveway surface to approach to the lower edge of the door opening (window) opening on the outer wall of the top floor;

− Half of the total distance from the fire engine driveway surface to approach the floor and the ceiling of the top floor – when there are no openings (windows).

NOTE 1: When the roof is utilized, the fire protection height of the building is determined by the maximum distance from the fire engine driveway surface to the upper edge of the roof parapet..

NOTE 2: When determining the fire protection height, the roof is not considered as being occupied if there is not oftenly have representation of the occupant on the roof.

NOTE 3: When there is a balcony (loggia) or window covering structure (railing), the fire protection height is calculated as the maximum distance from the road surface for the fire engine driveway to the upper edge of the enclosed covering structure (railing).

**1.4.10**

**Solid stream height**

Equals 0.8 times the height of a stream introduced vertically.

**1.4.11**

**Smoke trap door (sky or shutter door)**

The device (equipment) are automatically controlled remotely, cover the openings in the outer wall of the building, covering the room protected by a smoke exhaust system based on natural mechanism.

**1.4.12**

**Elevator shaft door**

The entry door is designed to be installed in the lift shaft at the stops to allow entry and exit of the lift car.

**1.4.13**

**Smoke extraction air grill**

An opening in a channel (duct) of a smoke extraction system, which is fitted with a mesh, screen, or smoke hood or normally closed fire damper.

**1.4.14**

**Accessible floor area**

Floor area of all covered spaces in a building or part of a building, including area of service ducts,

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elevator shafts, toilets, staircases areas occupied by fixed or movable furniture, equipment, facilities and any outdoor habitable areas above or below the first storey of the building.

**1.4.15**

**Fire engine driveways**

Driveways within a facility premises to enable fire engine to arrive and drive to perform firefighting, evacuation and rescue activities.

**1.4.16**

**Egress route**

The travel path of the occupant, leading directly out or leading into the safe area, the refuge floor, the refuge room and comply with the requirements for safe egress of the occupant in the case of a fire.

**1.4.17**

**Independent egress route**

The egress route is used exclusively for a part of the building (other parts of the building shall not open an emergency exit leading to this egress route).

**1.4.18**

**Fire resistance rate**

Duration (in hours or minutes) from the start of fire resistance tests with standard heat until any of the limit states of structure and components appear.

**1.4.19**

**Refugee room**

An area located in refuge floors for temporary evacuation in case of fire.

**1.4.20**

**Technical rooms**

Refer to rooms for storing technical equipment and devices of the buildings or stories. Technical rooms can be situated on the whole or part of technical floors.

**1.4.21**

**Rooms**

Indoor space with specified occupancy and limited by the structure component

**1.4.22**

**Occupied room**

Room in which the occupant are present for not less than 2 hours continuously or present for a total of 6 hours in a day and night.

**1.4.23**

**Side corridors**

Refer to corridors which have one side is natural ventilated, uninterrupted, along the length of the corridors, with clearance height from the highest point of the walls along the corridors going upwards not

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less than 1.2 m.

**1.4.24**

**Fire protection systems**

The fire protection system includes: Smoke control systems, indoor fire hydrant systems, outdoor hydrant booster systems, automatic fire suppression systems, fire alarm and public audio systems, emergency lighting and instruction systems, fire lifts, evacuation and rescue equipment, Means of egress solutions, smoke control measures and fire spread prevention measures.

**1.4.25**

**Air supply smoke control system**

The system is automatically remote controlled, in order to prevent the smoke pollution when there is a fire for the rooms in the safe zone, the stairwells, the elevator shafts, the fire-stopping vestibules by supplying air from outside and create residual pressure in the above areas, as well as prevent the spread of combustion products and supply air to compensate for the volume of combustion products that have been purged out.

**1.4.26**

**Smoke exhaust system (Smoke extract system)**

The system is automatically remote controlled, in order to extract the smoke and combustion product through the smoke air grill to outdoor space.

**1.4.27**

**Fire Hydrants**

A combination of pre-installed specialized equipment including valves and nozzles ready to deliver water to extinguish fire.

**1.4.28**

**Fire protection distance**

Regulated distance between the buildings and constructions for the fire spreading prevention purpose.

**1.4.29**

**Fire Compartment**

A part of a building, separated by fire barrier walls and (or) fire-blocking floors or fire-blocking roofs; the fire-resistance rates of the dividing structures ensure that the fire does not spread outside the fire compartment during the fire.

**1.4.30**

**Buffer chamber (Vestibule)**

A transitional space between two doors to prevent smoke and other gases from entering the buildings, staircases or other rooms of the buildings.

**1.4.31**

**Fire-blocking vestibule**

Buffer space protecting openings on fire barriers, covered by fire-blocking floors and fire-blocking partitions, with two consecutive openings come with fire-blocking seal; or more than two openings come

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with the fire-blocking seal when forced supply of sufficient outside air into the buffer space so that the buffer is free from contaminated with smoke in the event of a fire.

**1.4.32**

**Smoke**

Particles in air generated by partially burnt materials which are in liquid form and (or) solid form.

**1.4.33**

**Means of Egress (emergency exit, exit door)**

The exit or door leading to the egress route, leading to external directly or leading to safe zone, refugee floor, refugee room.

**1.4.34**

**Independent means of egress**

Mean of egress that leading to the egress route without crossing any other building section (room) of different occupancy.

**1.4.35**

**Private means of egress**

The means of egress from part of the building (room) leading to an independent egress route, either discharge directly to external, or leading to safe zone, refugee floor, refugee room.

**1.4.36**

**Protective concrete coatings, Thickness of protective concrete coatings**

- Refers to the concrete coatings from the edge of the structure to the nearest surface of steel reinforcement.

- Thickness of the protective concrete coatings shall be calculated from the edge of the structure to the nearest surface of the steel reinforcement.

**1.4.37**

**Occupied roof**

The roof normally have presence of the occupant (not less than 2 building continuously or total time in 1 day and night is not less than 6 hours).

**1.4.38**

**Flame**

Burning zone in air phase within the visible spectrum.

**1.4.39**

**Building**

A construction whose primary functions is to protect and shelter human or interior contents; usually covered partially or totally and constructed fixed in place.

**1.4.40**

**Apartment Building.**

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Refers to a building with 2 stories or higher, with multiple flats, shared corridors and staircases, private sections, shared sections and infrastructure systems mutually shared by all households, individuals and organizations, including apartment buildings constructed for residential purposes, mixed purposes and business purposes (also known as mix-used apartment building).

**1.4.41**

**Multi-purposes building**

A building for multiple purposes (e.g. a building designed for office, commercial service, public activity purposes and may have residential rooms).

NOTE: Multi-purposes building shall comply to the regulations on fire safety for multi-purpose building when the construction floor area used for any function does not exceed 70% of the total building floor area of the building (excluding other floor areas for technical systems, fire protection system, refugee and parking area).

**1.4.42**

**Manufacture building**

Building with industrial manufacture activities and ensure the necessary conditions for workers and equipment operations.

**1.4.43**

**Occupancy fire hazard category of the buildings, constructions, fire compartments and rooms**

Category characteristics of the buildings, constructions, fire compartments and rooms, based on the occupancy and specific usage function of such buildings, constructions, fire compartments and rooms, including feature of technology production chain in such buildings, constructions, fire compartments and rooms.

**1.4.44**

**Fire hazard levels of construction materials**

Group characteristics of construction materials, based on different levels of fire test results of materials according to the applicable standards.

**1.4.45**

**Fire compartmentation**

Part of the fire compartment which separated by fire barrier and (or) area without fire load.

**1.4.46**

**Fire prevention**

A combination of organizational and technical measures in order to ensure safety for human, prevents fire incidents, limits fire spread and facilitates effective fire extinguishing.

**1.4.47**

**Compartment volume**

Volume of a space within a building or a fire compartment. This volume does not include walls of protected elevators, exit staircases and other spaces (e.g. sanitation areas and storage units) covered by walls with fire resistance rate not less than 60 minutes and corridors passing through walls are protected by class 2 fire-blocking doors installed with automatic door closing mechanisms. Compartment volume shall be calculated based on following dimensions:

a) Plan area is based on distance between inner finished area of surrounding walls, or in case of all

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surfaces without surrounding walls, calculated from a vertical surface to the topmost outer edge of the floor;

b) Height is based on distance from the upper surface of the lower floor to the bottom surface of above floor;

c) In case of a building or fire compartment that extends to the ceiling, calculate up to the bottom surface of the ceiling or bottom surface of the ceiling of the highest level in a fire compartment, including spaces occupied by unprotected walls, vertical shafts, service ducts, or structure within the calculated space.

**1.4.48**

**Smoke stop vestibule**

A vestibule located outside of entrance to an exit staircases. Design of such lobby shall be able to prevent or minimize infiltration of smoke into staircases.

**1.4.49**

**Lift lobby**

The empty space in front of elevator entrance.

**1.4.50**

**Number of Stories**

Number of stories of a building including all levels above ground (including technical floors and attic floor), basements and semi-basements, not including garret.

NOTE: An attic floor shall not be taken into account for total number of storey of a building if its primary function is to cover staircases/elevator shafts and technical equipment of the building (if any) with ceiling not exceeding 30 % of roof deck area.

**1.4.51**

**Fire incident**

Uncontrolled fire leading to damages in terms of human and/or assets.

**1.4.52**

**Fire**

A rapid oxidation that generating heat of a material accompanied by any of the 3 factors: flame, light and smoke.

**1.4.53**

**Standard document**

Including documents such as standards, technical specifications, codes of practice and technical regulations indigenous and abroad approved by the authorities having jurisdiction.

**1.4.54**

**Fire load**

Refers to total heat generated by burning of flammable materials within a building space.

**1.4.55**

**Garret**

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The level contained within the sloped roof whose entire or part of vertical surface is formed by pitched roof or gable roof; in which surrounding walls (if any) shall not be more than 1.5 m from the floor.

**1.4.56**

**Recall stop (elevator)**

Floor with main entrance of the building (normally floor 1).

**1.4.57**

**Basement**

A floor with more than half of its height situated below ground according to approved planning grade plane.

NOTE: When considering fire safety requirements for buildings surrounded with multiple ground levels, stories below ground storey according to approved grade plane shall not be considered as basements if egress direction from that storey are not upwards.

**1.4.58**

**Refuge floor**

Refers to a floor for temporary evacuation situated in buildings higher than 100 m. A refuge floor may have one or many refuge areas.

**1.4.59**

**Semi-basement**

Refers to a storey with half of its height at or above grade plane on which the building is constructed according to approved planning.

**1.4.60**

**Technical floor**

A storey or part of a storey where technical rooms and technical equipment of the building are provided. Technical floors can be basements, semi-basements, garrets, topmost storey or any storey in-between the building.

**1.4.61**

**Above-ground storey**

A storey which floor is at or higher that grade plane on which the building is constructed according to approved planning.

**1.4.62**

**Fire access elevator (fire lift)**

Refers to an elevator primarily installed to carry passengers, equipped with protection control and communication systems and marked with signs dictating that the elevator shall be used under direct operation of fire department to provide access to stories of a building in case of fire.

**1.4.63**

**Smoke exhaust ventilation**

The controlled air exchange process, which takes place inside the building when there is a fire in one of the rooms of the building, has the effect of preventing the harmful effects of combustion products

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(increasing the concentration of toxic substances, increase in temperature and change in optical density of the air) to people and property.

**1.4.64**

**Fire hazard of building materials and substances**

State of matter and material and characterized by its ability to give rise to a fire or explosion of a substance or material.

**1.4.65**

**Fire hazard of the protected object**

The state of the protected object and is characterized by its ability to generate and develop a fire, as well as the impact of fire hazard factors on people and property.

**1.4.66**

**Fire resistance**

Properties against the effects of the fire and against the spread of dangerous elements of the fire.

**1.4.67**

**Smoke Dampers**

Fire damper that are normally closed, require only fire resistance rates E, and are installed directly on the openings of smoke extraction shafts in smoke-protected corridors, concourses and halls (hereinafter referred to as corridors).

**1.4.68**

**Fire damper**

The device is automatically controlled remotely, used to shield ventilation channels or openings on the building's enclosure structure, with fire resistance rating assessed according to EI criteria. Fire dampers include the following types:

- Fire damper normally open (closed in case of fire);

- Fire damper normally closed (opens when there is a fire or after a fire);

- Dual fire damper (closed in case of fire and opened after fire).

**1.4.69**

**Safe zone**

A zone in which people are protected from the effects of fire hazards, or in which there are no fire hazards, or where fire hazard factors that not exceed allowable value.

**1.4.70**

**Smoke zone**

An area in a building that is limited or surrounded with smoke barrier or structural components to prevent the spread of smoke in case of fire.

**1.4.71**

**Structural fire protection measure**

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Refers to impregnation, coating or covering of protective coatings on structural components to enhance fire resistance and/or reduce fire risks of such structural components.

**1.4.72**

**Fire hazard factors**

Fire elements whose effects could result in injury, poisoning, or danger to life and/or property damage.

NOTE: Fire hazard factors: 1) open flames and sparks; 2) heat flow; 3) the ambient temperature rises; 4) elevated toxic concentrations of products of combustion and thermal decay; 5) low oxygen concentration; 6) Visibility reduced in smoke.

## 1.5 General regulations

**1.5.1** While designing a building, it is required to have structure measure, layout - space management and technical method to ensure following requirements in case of fire:

- The building shall be able to maintain overall structural integrity and stablization in a specific period of time determined by fire resistance grade of the building;

- Every individual in the building (regardless of age and health conditions) may evacuate outside to safe areas (hereinafter referred to as “exterior”) before emergence of life and health hazard situations due to hazard factors of the fire;

- Have ability to rescue human;

- Fire department and fire vehicles can access the fire and adopt measures to extinguish the fire, rescue people and assets;

- Prevent fire spreading to adjacent and nearby buildings, including the collapse of the burning building;

- Direct and indirect losses regarding assets, including the building and interior properties shall be minimized, taking into account financial relationship between the damage and expenditure on fire safety measures and equipment.

**1.5.2** During construction process, satisfy following requirements:

- Adoption of fire safety measures approved as per the law conforming to applicable regulations and standards;

- Adoption of fire prevention measures for buildings under construction and auxiliary constructions and regulations on fire prevention in construction according to applicable regulations and law on fire prevention;

- Availability and readiness of firefighting equipment according to regulations and law;

- Capability to ensure safe evacuation, human rescue and asset protection in case of fire on construction sites and buildings under construction.

**1.5.3** During utilization and operation process, satisfy following requirements:

- Ensure the building components and the performance of the fire protection systems in accordance with their design requirements and technical documents;

- Implementation of applicable regulations and law on fire prevention;

- Restriction from changing structure or clearance - space distribution and structure technical solutions without having approved design as per the law;

- Upon repair, restriction from using components and materials unsatisfactory to applicable regulations and standards.

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- In case of buildings licensed with limited fire loading or number of people in buildings, place notice on such limitations in visible spots, managers of the buildings shall develop separate solutions for fire prevention and evacuation in case of fire.

**1.5.4** While analyzing fire hazards of buildings, may take into account situations calculated based on correlation between: development and spread of hazard elements in a fire, human evacuation and fire fighting organization.

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# 2 FIRE-RELATED TECHNICAL CLASSIFICATION

## 2.1 Construction materials classification according to fire hazard

### 2.1.1 Classification target

**2.1.1.1** Fire-related technical classification of building material and substances is to establish requirements for fire safety in the presence of substances and materials, use, storage and transportation, processing and disposal.

**2.1.1.2** To establish fire safety requirements for building structures, buildings and fire protection systems, building materials are classified according to fire hazard.

### 2.1.2 Classification criteria

Fire risk of construction material is determined based on the fire technical specification:

- Flammable;

- Combustible;

- Surface fire spreading;

- Smoke production;

- Toxicity.

### 2.1.3 Classification according to flammability

**2.1.3.1** According to flammability, building materials are classified into non-combustible materials and combustible materials.

**2.1.3.2** Non-flammable building materials are materials with flammability criteria (temperature rise, mass loss of test specimen, duration of steady flame) when tested as in B.1.1, Appendix B.

Non-flammable building materials are not specified in terms of fire hazard and other criteria are not determined (see B.1.1, Appendix B).

**2.1.3.3** Flammable materials shall be divided into 4 categories:

- Ch1 (mildly flammable);

- Ch2 (moderately flammable);

- Ch3 (flammable);

- Ch4 (highly flammable).

Flammability and groups of construction materials classified according to flammability shall conform to Appendix B, Section B.1.2.

### 2.1.4 Classification according to combustibility

With respect to combustibility, flammable construction materials shall be classified into 3 categories:

- BC1 (limited-combustible);

- BC2 (moderately combustible);

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- BC3 (combustible).

Groups of construction materials classified according to combustibility shall conform to Appendix B, Section B.1.3.

### 2.1.5 Classification according to fire spreading

With respect to surface fire spread, flammable construction materials shall be classified into 4 categories:

- LT1 (no spreading);

- LT2 (limited spreading);

- LT3 (moderate spreading);

- LT4 (fast spreading).

Groups of construction materials classified according to ability to spread the fire on surfaces are applied to surface materials of roofs, floors and flooring materials according to Appendix B, Section B.1.4.

With respect to other construction materials, classifying in terms of ability to spread fire on surfaces is not required.

### 2.1.6 Classification according to smoke production

With respect to ability to produce smoke, flammable construction materials shall be classified into 3 categories:

- SK1 (low smoke production);

- SK2 (moderate smoke production);

- SK3 (high smoke production).

Groups of construction materials classified according to ability to produce smoke shall conform to Appendix B, Section B.1.5.

### 2.1.7 Classification according to toxicity

With respect to toxicity of combustion products, flammable construction materials shall be classified into 4 categories:

- DT1 (low toxicity);

- DT2 (moderate toxicity);

- DT3 (high toxicity);

- DT4 (extra high toxicity).

Groups of construction materials classified according to toxicity of combustion products shall conform to Appendix B, Section B.1.6.

### 2.1.8 Classification according to fire hazard

**2.1.8.1** According to fire hazard, construction materials are classified into fire risk levels increasing from CV0, CV1, CV2, CV3, CV4 to CV5.

NOTE: The fire risk level of building materials is the aggregate index of the fire hazard classification of the materials mentioned in 2.1.2.

**2.1.8.2** Fire risk level of building materials is determined according to B.1.7, Appendix B.

## 2.2 Construction components

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### 2.2.1 Classification target

**2.2.1.1** Construction components shall be classified by fire resistance and fire risk.

**2.2.1.2** Building components are classified according to their fire resistance to determine their usage ability in the buildings, constructions and fire compartments with certain fire resistance grades or to determine fire resistance grades of buildings, constructions and fire compartments.

**2.2.1.3** Building components are classified according to fire risk to determine their degree of involvement in fire development and the possibility of forming fire risk elements.

### 2.2.2 Classification according to fire resistance

**2.2.2.1** Building components of buildings and constructions, depending on their ability to resist the impacts of fire and the propagation of fire hazard factors under standard test conditions, are classified into construction components with fire resistance rates as follows:

- Not specified

- Not less than 15 min;

- Not less than 30 min;

- Not less than 45 min;

- Not less than 60 min;

- Not less than 90 min;

- Not less than 120 min;

- Not less than 150 min;

- Not less than 180 min;

- Not less than 240 min.

**2.2.2.2** Fire resistance rates of construction components are determined under standard test conditions. The time to reach the fire resistance rates of the load-bearing members and the enclosure under standard test conditions or according to the calculation results is determined by the duration to reach one or several consecutive signs of the limit states:

- Loss of load-bearing capacity (assigned with the letter “R”);

- Loss of integrity (assigned with the letter “E”);

- Loss of thermal insulation (assigned with the letter “I”) due to the temperature of the unheated surface increasing to the limit value;

- Loss of ability to limit thermal radiation (assigned with the letter “W”) due the heat flux at a specified distance from the unheated surface of the member/structure reaches the limit value.

NOTE 1: Fire resistance rate of construction materials shall be determined by fire resistance test according to TCVN 9311-1 to TCVN 9311-8 or equivalent standards or by calculation according to applicable fire resistance design standards.

Fire resistance rate of smoke and air ducts shall conform to ISO 6944 or equivalent standards.

NOTE 2: Required Fire resistance rate of specific construction components are mentioned in the Code and technical regulations applied to each type of construction. Fire resistance rate of construction components are represented with REI, REW, EI, EW, EIW, RE or R accompanied by number dictating duration of burning in minute. E.g. A component with Fire resistance rate of REI 120 means the component shall be able to retain all 3 capacities: load-bearing, integrity and thermal insulation under impact of fire for 120 minutes; a component with Fire resistance rate of R 60 means the component shall be able to retain load-bearing capacity for 60 minutes regardless of integrity and thermal insulation.

NOTE 3: Some construction components are considered as satisfactory to fire resistance rate if any of following conditions is satisfied:

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a) The components share technical properties with samples of fire resistance test and samples display Fire resistance rate no lower than the required fire resistance rate of such components.

b) The components share technical properties with components specified in Appendix F and corresponding Fire resistance rate under Appendix F is no lower than required fire resistance rate of such components.

c) Fire resistance rate of components determined by calculation according to standard fire resistance design shall be no lower than required Fire resistance rate of such components.

### 2.2.3 Classification according to fire risk

**2.2.3.1** With respect to fire risks, construction components shall be classified into 4 categories:

- K0 (no fire risk);

- K1 (mild fire risk);

- K2 (moderate fire risk);

- K3 (fire risk);

**2.2.3.2** The value of criteria for classifying a building element into a certain fire risk category is determined in accordance with the methods stated in the national standards (or equivalent) on fire safety testing.

NOTE 1: It shall be permitted to determine fire hazard levels of components without testing as follows:

a) K0 - if they are made solely from non-flammable material.

b) K1 - if outer surfaces of the components are made from materials with fire-related technical criteria no higher than Ch1, BC1 and SK1;

c) K2 - if outer surfaces of the components are made from materials with fire-related technical criteria no higher than Ch2, BC2 and SK2;

d) K3 - if outer surfaces of the components are made from materials with any of the fire-related technical criteria is Ch3, BC3 and SK3.

NOTE 2: A façade is considered a member with fire risk class K0, if its elements (including parts associated with the building) are made of non-combustible materials. It is permissible to ignore the sealing circuits and the surface coating with a thickness of less than 0.3 mm (if any).

## 2.3 Fire barrier

### 2.3.1 Classification target

Fire barriers are classified according to measures to prevent the spread of fire-hazardous elements, as well as according to fire-resistance to select construction structures and parts that seal the openings of fire barrier with fire resistance rates required and fire hazard level.

### 2.3.2 Fire barrier classification

**2.3.2.1** Fire barriers include fire-blocking walls, fire-blocking partitions and fire-blocking floor, classified in table 1.

NOTE: In addition to those fire barriers, to prevent the spread of fire, there are other measures: fire curtain; fire prevention water curtain; fire distance; space without fire load.

**2.3.2.2** Members that seal the opening of a fire barrier (fire door, trapdoor, fire damper, window, fire curtain) depending on the fire resistance rate of corresponding partition are classified into types in Table 2.

NOTE: The fire resistance rate of fire dampers of the air distribution systems is determined according to ISO 10294 or equivalent standards. The fire resistance rate of doors, windows and blocking doors is determined according to TCVN 9383 or equivalent standards.

**2.3.2.3** Fire-blocking vestibule located in the opening of the fire barrier, depending on the type of components that form the fire-blocking vestibule, are classified into type 1 and type 2 fire-blocking

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vestibule.

### 2.3.3 Requirements for fire barrier

**2.3.3.1** Fire barriers are used to prevent fire and combustion products from spreading from a fire compartment or from a room that the fire occurs to other rooms.

**2.3.3.2** Fire barriers are characterized by fire resistance and fire risks.

The fire resistance of a fire barrier is determined by the fire resistance of its constituent members, including:

- Separating components (Partitions, wall panels, floor panels and similar);

- Stabilizing components for the separators (frames, braces and similar);

- Supporting components of the separators (support beams, support flanks, supporting walls and similar);

- Connecting components in-between.

Fire resistance rate based on load-bearing (R) capacity of stabilizing sections and connecting components shall not be lower than required Fire resistance rate of the separating sections.

Fire risks of Fire barriers shall be determined by fire risks of separating sections, stabilizing sections and connection components thereof.

**2.3.3.3** Fire resistance rates and types of building components performing the fire barrier function, types of corresponding sealing members and fire-blocking vestibule are specified in Table 1.

**2.3.3.4** Class 1 Fire barrier shall have K0 fire hazard level. In special cases, it shall be permitted to utilize K1 fire hazard level in Class 2 to Class 4 Fire barriers.

**2.3.3.5** The fire resistance rates for the respective types of opening sealing members of the fire barriers is specified in Table 2.

**Table 1 – Fire resistance rates and types of building components performing as fire barriers, types of corresponding sealing members and fire-blocking vestibule**

| Fire barrier | Class of Fire barrier | Fire resistance rate of Fire barrier | Type of sealing member of Fire barrier resistance rate | Type of fire-blocking vestibules |
|---|---|---|---|---|
| 1. Fire Barrier Wall | 1 | REI 150 | 1 | 1 |
| | 2 | REI 45 | 2 | 2 |
| 2. Fire partitions | 1 | EI 45 | 2 | 1 |
| | 2 | EI 15 | 3 | 2 |
| 3. Fire partition with a glazing area greater than 25% of the partition area | 1 | EIW 45 1) | 2 | 1 |
| | 2 | EIW 15 1) | 3 | 2 |
| 4. Fire-stop floor | 1 | REI 150 | 1 | 1 |
| | 2 | REI 60 | 2 | 1 |
| | 3 | REI 45 | 2 | 1 |
| | 4 | REI 15 | 3 | 2 |

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1) For the part of materials other than glass that applied the EI criterion, for the glass part shall apply EW criterion. Fire-blocking partitions that have been tested to meet EI criteria for both glass shall be considered to have met EW criterion.

**Table 2 - Fire resistance rate of sealing members in fire barrier**

| Sealing members of the openings on the Fire barriers | Type of sealing members in Fire barrier | Fire Resistance Rating |
|---|---|---|
| 1. Door (except: door with glazing area > 25% the door area; smoke proof doors), lid doors, fire damper[1)], fire curtains | 1 | EI 60 |
| | 2 | EI 30 |
| | 3 | EI 15 |
| 2. Door with glazing area > 25% the door area | 1 | EIW 60 [2)] |
| | 2 | EIW 30 [2)] |
| | 3 | EIW 15 [2)] |
| 3. Door of elevator shaft (when fire resistance rates required) | 2 | E 30 |
| 4. Window | 1 | E 60 |
| | 2 | E 30 |
| | 3 | E 15 |

1) Fire resistance rate of fire dampers shall be solely based on integrity (E) if such dampers are installed in service ducts, shafts and pipes in a manner that meets required fire resistance, applicable to both integrity (E) and thermal insulation (I).

2) For the part of materials other than glass that applied the EI criterion, for the glass part shall apply EW criterion. Fire-blocking partitions that have been tested to meet EI criteria for both glass shall be considered to have met EW criterion.

**2.3.3.6** Requirements for members of all type of fire-blocking vestibule are specified in Table 3.

NOTE: When there are doors, trapdoors, dampers, windows, screens in the fire barrier, or when such doors position is on a fire-blocking vestibule, then the selected fire damper, doors, and vestibule shall be capable of preventing fire in accordance with the type of the fire barrier as specified in Table 1 .

**Table 3 – Requirements of components of vestibules**

| Type of fire blocking vestibule | Type of parts of the fire blocking vestibule | | |
|---|---|---|---|
| | Partition | Floor | Sealing component |
| 1 | 1 | 3 | 2 |
| 2 | 2 | 4 | 3 |

## 2.4 Stairs and staircases

### 2.4.1 Classification target

Stairs and staircases are classified for the purpose of defining requirements for them in terms of spatial and structural solutions, as well as for establishing requirements for their use in accordance to the occupant egress route.

### 2.4.2 Stair classification

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**2.4.2.1** Stairs and staircases for evacuation from buildings and constructions in case of fire shall be classified into following types:

- Type 1 – indoor stairs, positioned inside stair shaft.

- Type 2 – indoor stairs, exposed.

- Type 3 – outdoor stairs, exposed.

NOTE 1: "Exposed" means not positioned inside a stair shaft.

NOTE 2: Under Appendix I are illustrations of staircases.

**2.4.2.2** Transport methods serving fire fighting and rescue shall be classified into 2 following types:

- P1 – vertical ladder;

- P2 – stairs with tread slope not greater than 6:1 (no more than 80°).

### 2.4.3 Staircase classification

**2.4.3.1** Exit stairs are classified into the following types depending on the degree of protection against smoke contamination in the event of a fire:

- Regular staircase;

- Smoke-stop staircase.

NOTE: Under Appendix I are illustrations of staircases

**2.4.3.2** Regular types of staircases:

- L1 – naturally lit through door openings (open or glazed) in the outer wall on each floor; or not naturally lit only in case of egressing from rooms in the semi-basement;

- L2 – receiving natural lighting via roof skylight (with or without glasses installed).

**2.4.3.3** Smoke-stop staircases are classified into the following types, depending on the measure of protection against smoke contamination in the case of fire:

- N1 – A staircase granting access to each storey through a smoke proof buffer through the open intervention paths (see section 3 for cases of staircase type N1);

NOTE: It shall be permitted to replace N1 staircases with staircases granting access to each storey through a vestibule. Both vestibule and stair enclosure shall have positive pressure in case of fire. Air supply for vestibule and staircase shall be separate from each other.

- N2 – positive pressure (air pressure inside the staircase shall be higher than air pressure outside the staircase) in case of fire;

- N3 – Staircase with the entrance to the stair shaft from each floor through the fire-blocking vestibule always has positive air pressure (positive air pressure in the fire-blocking vestibule is frequent or when there is a fire).

## 2.5 Buildings, constructions, fire compartments

### 2.5.1 Classification target

The technical fire classification for the buildings, constructions and fire compartments in order to establish fire safety requirements for fire protection systems for the buildings, constructions depending on their occupancy (usage purposes) and their fire hazard.

### 2.5.2 Classification criteria

The technical fire classification for the buildings, constructions and fire compartments shall consider the

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following criteria:

- Fire resistance grade;

- Structural fire hazard level;

- Occupancy fire hazard category.

### 2.5.3 Fire resistance grade of buildings, constructions, fire compartments

**2.5.3.1** Buildings, constructions, fire compartments shall be classified to 5 fire resistance grade in to grade I, II, III, IV, V.

**2.5.3.2** Establish fire resistance grade of buildings, constructions, fire compartments

The fire resistance grade of a building, construction, or fire compartment is established depending on the number of floors (or the fire protection height of the building), the fire hazard category according to occupancy, the area of the fire compartment (see Appendix H) and the fire hazard of technological processes taking place in such building, construction, and fire compartment.

**2.5.3.3** The required fire resistance rates of the construction components shall be selected in accordance with the selected fire resistance grade of the building, construction and fire compartment. Except for the cases specified in this Code, the conformity between the fire resistance grade of the building, construction, and fire compartment with the fire resistance rates of their construction components are specified in Table 4.

**Table 4 - Conformity between fire resistance grades of buildings, constructions and fire compartments with fire resistance rates of construction components of buildings, constructions and fire compartments**

| Fire resistance grade of buildings, construction and fire compartment | Fire resistance rate of building component, not lower than | | | | | | |
|---|---|---|---|---|---|---|---|
| | Load-bearing components, columns, walls | Outer non-load bearing walls | Floors (including floors of garrets and over basements) | Roof sections without garret | | Staircase structures | |
| | | | | Roofing (including thermal insulated) | Truss, beams, purlins | Interior walls | Treads and landings |
| I | R 120 | E 30 | REI 60 | RE 30 | R 30 | REI 120 | R 60 |
| II | R 90 | E 15 | REI 45 | RE 15 | R 15 | REI 90 | R 60 |
| III | R 45 | E 15 | REI 45 | RE 15 | R 15 | REI 60 | R 45 |
| IV | R 15 | E 15 | REI 15 | RE 15 | R 15 | REI 45 | R 15 |
| V | Not specified | | | | | | |

NOTE 1: In buildings with Fire resistance grade I, II and III, floors and ceilings of basements and semi-basements shall be made of non-flammable materials and have fire resistance rate of at least REI 90. Floors of 1st storey and the topmost storey shall be made from materials with flammability no lower than Ch1. In buildings with Fire resistance grade IV and V, floors of basements or semi-basements shall be made from materials with flammability not lower than Ch1 and Fire resistance rate not lower than REI 45.

NOTE 2: The fire resistance rates of roofing sheets (including roofing sheets with insulation) and purlins supporting roofing sheets shall not be required (except for buildings, fire compartments, rooms belonging to the fire hazard category of occupancy F3.1, F3.2, manufacturers, warehouses of F5 and other buildings, rooms and fire compartments of classes A, B, C) when comply all the following condition:

− The underside of the purlins is located at a minimum distance of 6.1 m from the floor immediately below them;

− Roofing sheets and purlins are made from non-combustible or weakly combustible materials (Ch1). NOTE 3: In buildings with 2 or 3 basements (buildings under category F1.3 and multi-purpose buildings), load-bearing structures and components in basements shall have a minimum fire resistance rate of R 120.

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NOTE 4: In rooms for manufacturing or preserving flammable liquid, the floors shall be made of non-flammable materials.

NOTE 5: A non-load-bearing exterior wall shall not required fire protection with an area determined according to E.3, Appendix E.

NOTE 6: Do not stipulate the fire resistance rate of non-load-bearing external walls for the sides of the building and satisfy the following conditions:

- The building is protected throughout with automatic sprinkler fire fighting system according to TCVN 7336;

- Ensure the minimum fire distance corresponding to 100% of the area of the outer wall that not required to be fire protection at E.3, Appendix E;

- Non-load-bearing outer walls of buildings shall have fire hazard level K0. Exterior wall finishing materials (if any) are non-combustible materials or have flammability not less than Ch1 and fire propagation not less than LT1.

Load-bearing walls, columns, bracing systems, rigid walls, trusses, parts of floors between floors and of roofs without garret (beams, trusses, beams, floor slabs, roofing sheets) are considered as load-bearing components of the building if they ensure the overall durability and spatial stability of the buildings in case of fire.

Such load-bearing components shall be instructed by design departments in technical documents of the buildings.

No regulations on fire resistance rate and fire hazard level of roof structural members with garret in buildings regardless fire resistance grades. The fire-resistance rates shall not be required for the garret gable structure, in this case, the garret gable shall have a fire hazard level equivalent to the fire hazard level of the building's enclosing wall. Components and structures of roofs with garret floors shall be instructed by design departments in technical documents of the buildings.

No regulations on fire resistance rate for members sealing openings (doors, windows, trapdoors), roof skylights and roof panel for skylight, except sealing members in the fire barriers and special cases to be specified.

If minimum required Fire resistance rate of components are R 15 (RE 15, REI 15), it shall be permitted to use steel structure without using protective coatings if their fire resistance rate are calculated or tested not less than R 8, or cross section factor Am/V not more than 250 $m^{-1}$.

NOTE: The cross-sectional factor Am/V is determined according to ISO 834-10 or equivalent standards.

In smoke proof stair enclosure type N1, it shall be permitted to use treads and landings with R 15 fire resistance rate and K0 fire hazard level.

Fire compartments are divided by fire-blocking walls of class 1 and (or) fire-blocking floors of class 1. It is permissible to divide the fire compartment vertically by technical floors separated from adjacent floors by fire-blocking floors of type 2, if the fire-blocking walls of class 1 do not deviate from the main axis. It is permissible to divide the fire compartment in buildings with fire resistance grades IV and V by type 2 fire-blocking walls.

### 2.5.4 Classification of structural fire hazards of buildings, constructions and fire compartments

**2.5.4.1** Buildings, constructions and fire compartments are classified into 4 levels of structural fire hazard S0, S1, S2 and S3 according to the fire risk of the building components.

**2.5.4.2** Establishment of structural fire hazard levels of buildings, constructions and fire compartments

The structural fire hazard level of the building, constructions and fire compartments is established depending on the number of floors, the occupancy fire hazard category, the area of the fire compartment and the fire risk of the technological processes taking place in such building, construction and fire compartment.

**2.5.4.3** Conformity between the structural fire hazard level of the building and the fire hazard level of structure components

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The fire hazard level of structure components shall be consistent with the structural fire hazard level of the building, construction and fire compartment. The conformity between the structural fire hazard level of the building, construction and fire compartment with the selected fire hazard level of their structure components is specified in Table 5.

**2.5.4.4** No regulation on fire hazard level for members sealing openings on the building's enclosure structure (doors, windows, trapdoors), skylights on the roof, except for the opening sealing members in the fire barrier.

NOTE: In actual construction of structures or structural systems where it is not possible to determine their fire resistance rates or fire hazard level on the basis of standard fire resistance tests or calculations, It is necessary to conduct fire resistance test on the members of such structure or structural system in accordance to the selected standard document.

**Table 5 − Conformity between structural fire hazard level of building, construction and fire compartment with fire hazard level of construction component**

| Structural fire hazard levels | Fire hazard levels of construction components | | | | |
|---|---|---|---|---|---|
| | Load-bearing structures in form of bars (pillars, beams, etc.) | Outside of outer walls | Walls, partitions, floors and roofs without garret | Walls of staircases and fire barriers | Treads and landings in staircases |
| S0 | K0 | K0 | K0 | K0 | K0 |
| S1 | K1 | K2 | K1 | K0 | K0 |
| S2 | K3 | K3 | K2 | K1 | K1 |
| S3 | Not specified | | | K1 | K3 |

**2.5.5 Classification of occupancy fire hazards for buildings, constructions, fire compartments and rooms**

**2.5.5.1** Buildings and sections thereof (rooms with functions related to one another) shall be classified into fire hazard category depending on their use purpose and threat to human safety in case of fire taking into account: age, physical attributes, possibility of sleeping people, groups of people utilizing primary functions and number of said groups. Occupancy fire hazard categories are specified under Table 6.

**2.5.5.2** Rooms for manufacturing and storing, including laboratories and warehouses with more than 50 $m^2$ in area, rooms for preparing food with more than 10 KW with cooking equipment in buildings under categories F1, F2, F3 and F4 shall be placed under category F5.

**2.5.5.3** With respect to buildings with defined occupancy fire hazard categories, in general cases, it shall be permitted to allocate rooms having other fire hazard categories while complying with regulations under design standards for specific buildings and technical equipment in addition to the Code.

**Table 6 - Classification of buildings [1)] in accordance to occupancy fire hazard categories**

| Categor | Usage purpose | Characteristic of |
|---|---|---|
| **F1** | **Buildings for temporary or permanent residential purposes (including day and night residence)** | Rooms in such buildings are regularly used day and night. People inhabiting the buildings may vary in ages and physical attributes. One of the features of said buildings are presence |
| F1 | Nursery, kindergarten, preschool; hospitals (excluding field hospitals), inpatient treatment blocks of epidemic prevention and control establishments, general and specialized clinics, maternity homes; specialized buildings for the elderly and disabled (not apartment buildings), nursing homes; sleeping blocks of boarding schools and of children's facilities, and buildings of similar use. | |

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| | | |
|---|---|---|
| F1.2 | Hotels, guest suites, motels, inns; dormitories, hostels; sleeping blocks of nursing, convalescence, rehabilitation and orthopedic facilities; and other residential facilities with similar usage characteristics. | of bedrooms. |
| F1.3 | Apartment, and other building with similar usage characteristics. | |
| F1.4 | Residential dwelling unit, and other building with similar usage characteristics. | |
| **F2** | **Cultural and sports facilities** | Room in such buildings are characterized by large amount of customers inhabiting in certain period of time. |
| F2.1 | Theatres, cinemas, circuses, concert halls; clubs, nightclubs, discos, bars, karaoke and other similar establishments in closed rooms; sports buildings with stands, indoor sports halls, arena; library; conference center, event organization excluding food service; and other buildings with similar usage characteristics with calculated number of seats for people in closed rooms. | |
| F2.2 | Museums and exhibitions; dance halls; blocks of amusement facilities, aquariums and buildings with similar use characteristics. | |
| F2.3 | Facilities mentioned in F2.1 but open to the outdoors, amusement parks; buildings with similar usage characteristics. | |
| F2.4 | Facilities mentioned in F2.2 but open to the outdoors. | |
| **F3** | **Commercial, business and residential service facilities** | Rooms of such buildings are characterized by quantity of customers exceeding quantity of servers. |
| F3.1 | Retail, shop, showrooms for products and goods, fair buildings, commercial centers, electronics centers, supermarkets, department stores, convenience stores; bookstore; motorcycle and moped shops; and buildings with similar usage characteristics. | |
| F3.2 | Restaurants, food and beverage shops, rest stops; conference center, event organization including food services; and buildings with similar usage characteristics. | |
| F3.3 | Railway station, airport terminal; waiting buildings for cable cars to transport people, ferry terminals, bus stations; and buildings with similar usage characteristics. | |
| F3.4 | General, specialist and emergency medical (outpatient) clinics; blocks of outpatient treatment of other medical facilities such as medical stations, orthopedic, beauty salons, rehabilitation; building with massage service business; and buildings with similar usage characteristics. | |
| F3.5 | Guest rooms of businesses, life and public service establishments with an uncounted number of seats (post offices, savings funds, ticket offices, law offices, notary offices, stores, laundromats, tailors, shoe and clothing repair shops, barber shops); funeral service establishments, religious and belief establishments, communal buildings, pagodas, churches, chapels, cathedrals, holy buildings, Buddhist recitation halls, building of cult, ancestral center; and similar facilities. | |
| F3.6 | Physical training complexes and sports training and competition areas without stands; service rooms; stadiums, race courses, shooting grounds; and buildings with similar usage characteristics. | |

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| | | |
|---|---|---|
| **F4** | **Educational and training facilities, offices, scientific organizations, research and design organizations, management agencies** | Rooms in such buildings are used for specific period of time in a day, regularly occupied by identified groups of people who are used to current conditions with specific age and physical attributes. |
| F4.1 | Primary schools, secondary schools, general training institutions with multiple levels of education (excluding pre-schools and kindergartens), high schools, professional high schools, college department; schools for training people specializing in religious activities at a teen age; and buildings with similar usage characteristics. | |
| F4.2 | Universities, colleges, academies, professional intermediate schools, schools for fostering professional improvement, schools for technical workers; schools for training people specializing in religious activities not in group F4.1; and buildings with similar usage characteristics. | |
| F4.3 | Facilities of management agencies, Nation agencies at all levels, working offices of office workers in enterprises; headquarters of political organizations, socio-political organizations; offices of socio-professional organizations, non-business units, social and political organizations; headquarters of religions; design organization, scientific research organization, seismic research station, hydro-meteorological station, space research facility; information organizations and publishers; radio, television, telecommunications facilities, information equipment buildings; banks, agencies, offices; and buildings with similar usage characteristics. | |
| F4.4 | Fire fighting and rescue, evacuation stations (departments). | |
| **F5** | **Buildings, structures and rooms for manufacturing or storing.** | Such rooms are characterized by presence of groups people working regularly, including day and night |
| F5.1 | Manufacturing buildings, production and testing rooms, workshops, repair and maintenance shops for automobiles, motorcycles and mopes; and buildings with similar usage characteristics. | |
| F5.2 | Buildings and structures for storing; automobile, motorcycle and bicycle parking lots without technical and repair services; bookstores, archives, specialized database centers, storage rooms; warehouses of flammable goods and materials or non-combustible goods and materials in flammable packages; and buildings with similar usage characteristics. | |
| F5.3 | Buildings serving agriculture and rural development. | |
| 1) This table applies to buildings, constructions, fire compartments, rooms or groups of rooms with related occupancies. | | |

### 2.5.6 Classification of manufacture and warehouse buildings, constructions and based on fire and explosion hazards

**2.5.6.1** Classification target

The target of classification of buildings, constructions and rooms with manufacture and warehouse functions according to fire and explosion hazards is to establishing fire safety requirements towards preventing the possibility of ignition and ensure fire protection for the occupants and properties in case of fire in the building, construction and rooms.

**2.5.6.2** Room classification

**2.5.6.2.1** According to the fire and explosion hazard, production and warehouses rooms are classified into classes:

- High fire and explosion hazard (A);

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- Fire and explosion hazard (B);

- Fire hazard (C1, C2, C3 and C4);

- Moderate fire hazard (D);

- Low fire hazard (E).

Classes of production and warehouse rooms are specified in Appendix C.

**2.5.6.2.2** Other occupancies buildings, constructions and rooms shall not be classified according to fire and explosion hazards.

**2.5.6.2.3** Class of rooms according to fire and explosion hazards is determined based on the type of substances and combustible materials present in the room, their quantity and nature of fire danger, as well as the room spatial and the characteristics of the technological processes taking place in the room.

**2.5.6.2.4** The determination of the room class is carried out by checking the greater hazard room (A) to less hazard (E) in accordance to Table C.1, Appendix C.

**2.5.6.3** Classification of buildings, constructions

**2.5.6.3.1** According to fire and explosion hazards, buildings, constructions are classified into classes A, B, C, D and E.

**2.5.6.3.2** Class of buildings and constructions according to fire and explosion hazard is determined based on the proportion and total area of rooms of this class or another class in such buildings and constructions.

**2.5.6.3.3** The classification of buildings and constructions is specified in Appendix C.

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# 3 ENSURING HUMAN SAFETY

## 3.1 General regulations

**3.1.1** Requirements of this section are to ensure:

- Timely and unobstructed egress for the occupants;

- Rescue of people under influence of dangerous elements of the fire;

- Protection of the occupant during evacuation away from dangerous elements of the fire.

**3.1.2** Evacuation refers to organized self movement of humans from rooms where dangerous elements of the fire may affect them to outside. Evacuation also refers to involuntary movement of people having limited movement capabilities with assistance of servers. Evacuation is done via means of egress.

**3.1.3** Rescue refers to forced movement of people towards the exterior who are under influence of dangerous elements of the fire or in case of direct presence of said influences. Rescue shall be performed voluntarily with assistance of fire department or professionally trained force, including use of rescue equipment, via means of egress and means of escape.

**3.1.4** Protection of humans on egress route shall be guaranteed by combination solutions of plan – space, furnishing, structures and technical properties of buildings and organizations.

Egress routes within the rooms shall guarantee safe egress towards means of egress from such rooms without taking into account smoke protection and fire suppression in the rooms.

Egress protection outside of the rooms shall taking into account of occupancy fire hazard category of rooms on the egress routes, number of people evacuating; fire resistance grade and structural fire hazard levels of buildings, number of means of egress on one storey and from the entire buildings.

Construction material fire hazard levels of rooms and egress routes outside of rooms shall be limited on surface layers (finishing layers and cladding) depending on occupancy fire hazard category of the rooms and buildings, taking into account other solutions regarding protecting egress routes.

**3.1.5** When design means of egress of rooms and buildings, do not take into account of rescue measures and devices and exits that fail to meet exit requirements under 3.2.1.

**3.1.6** It is not permitted to allocate rooms under category F5 class A or class B below rooms simultaneously occupied by 50 people; do not situate F5 rooms in basements and semi-basements.

It is not permitted to allocate F1.1, F1.2 and F1.3 rooms in basements and semi-basements.

**3.1.7** In buildings with 2 to 3 basement stories, it shall only be permitted to situate smoking rooms, supermarkets, commercial centers, diners, drinks store and other public spaces below the first basement stories if additional fire safety measures are developed and approved by Police Departments of Fire Prevention and Fighting and Rescue in accordance to 1.1.10.

Regarding hospitals and schools, the major occupancies are only permissible to be allocated in semi-basement or basement 1 (in the absence of a semi-basement) and above. Basement 1 is the top basement or adjacent to the semi-basement.

At least 1 entry leading to exit staircases via smoke stop lobbies separated with surrounding spaces with class 2 fire-blocking walls shall be provided on each basement storey. Doors shall be installed with automatic-closing mechanism.

**3.1.8** To ensure safe exit, the fire shall be detected and alarmed in time.

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**3.1.9** To protect building inhabitants during evacuation, it is required to prevent smoke from infiltrating egress routes of buildings and sections thereof.

Basic requirements regarding smoke protection of buildings are specified under Appendix D.

**3.1.10** The electrical equipment of the fire protection system of the building shall be supplied with priority electricity from two independent sources (a mains power source and a alternate generator source).

NOTE: For electrical equipment with their own backup power (e.g. diesel pumps, fire cabinets with backup batteries), only one mains power supply is required, but this separate backup source shall ensure normal operation in the event of a fire.

**3.1.11** Effectiveness of methods ensuring safety for humans in case of fire can be assessed by calculation.

### 3.2 Means of egress and means of escape

**3.2.1** An exit is considered to be a means of egress if:

a) It leads rooms on the 1st storey towards outside in any of following manners:

- Discharge to external directly;

- Via corridors;

- Via lobbies (or lounges);

- Via staircases;

- Via corridors and foyers (or lounges);

- Via corridors and staircases.

b) It leads rooms on any stories other than the 1st storey to:

- Staircases or type 3 staircases directly;

- Corridors lead directly to staircases or type 3 staircases;

- Commonly shared rooms (or lounges) with direct exits leading to staircases or type 3 staircases

- Side corridors of buildings under 28 m lead directly to type 2 staircases;

- Discharge to the occupied roof, or to a separate area of the roof leading to the type 3 staircase.

c) It leads to adjacent rooms (other than rooms under category F5 class A or B) on the same storey with exits specified in 3.2.1 a) and b). Exits leading to class A or B rooms shall be considered means of egress if they lead from technical rooms without frequent worker and are used to serve class A or B rooms above.

d) Means of egress that meet the provisions of 3.2.2 and other exits specified in this Code.

NOTE: In the case of using a type 3 staircase to escape, there should be an egress calculation in accordance with Appendix G.

**3.2.2** Exits from basements and semi-basements are, in principle, means of egress if they lead directly outside separately from common staircases of the buildings (illustration in Figure I.1, Appendix I).

Exits are considered means of egress if they:

a) Exits from basement through common staircases with separate exits leading outside isolated from remaining parts of staircases by class 1 solid fire-rated partitions (illustration in Figure I.2, Appendix I);

b) Exits from basements and semi-basements where class C1 to C4, D, E, entering rooms of class C1 to C4, D, E and to foyers on the 1st storey of category F5 buildings;

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c) Exits from lounge, luggage rooms, smoking rooms and bathrooms in basements and semi-basements of category F2, F3 and F4 buildings to lobbies of 1st storey via separate type 2 staircases.

In this case, the following requirements shall be met:

- The foyer shall be separated from adjacent corridors and rooms by fire partitions not less than type 1;

- The rooms on the 1st floor and the upper floors shall have an egress route that does not pass through this foyer (except for rooms located in the foyer);

- Finishing materials for waiting rooms, locker rooms, smoking rooms and restrooms in basements or semi-basements shall satisfy the requirements for common rooms according to Appendix B;

- The locker room shall have an exit number that satisfies the requirements of this Code, excluding the emergency exit to the type 2 staircase mentioned above.

d) Hinged swing doors on entrance door intended for rail or road transport vehicles.

It is permissible to arrange a buffer chamber at the exit that directly discharging from the building, from the basement and semi-basement.

**3.2.3** An exit shall not be considered as an means of egress if sliding, folding, rolling or revolving doors are situated on the exit.

Exits with swing door (hinged door) situated within doors or gates above shall be considered as means of egress if designed conforming to the requirements.

**3.2.4** Quantity and width of means of egress from rooms, stories and buildings are defined based on the largest amount of people possible travelling through and permissible maximum distance from places potentially occupied by occupants to the nearest means of egress.

NOTE 1: The largest amount of people to evacuate from different spaces of buildings or sections of the building is determined according to Appendix G, Section G.3.

NOTE 2: Apart from general requirements specified under the Code, specific requirements regarding quantity and width of means of egress are specified in standard document on each type of construction. Appendix G prescribes specific requirements for commonly seen types of buildings.

Sections of buildings with different occupancies and separated by fire barriers shall have independent mean of egress, except for the cases specified in this Code.

Sections of buildings with different occupancies and separated by fire barriers into multifunctional indoor fire compartments shall have separate means of egress from each floor.

No more than 50% of the means of egress leads into the adjacent fire compartment permissible (except for the means of egress leading into the F5 fire compartment).

Particularly, the F5 category building shall have its own means of egress.

**3.2.5** Following rooms shall have minimum 2 means of egress:

a) F1.1 rooms simultaneously occupied by more than 15 people;

b) Rooms in basements and semi-basements simultaneously occupied by more than 15 people; and rooms in basements and semi-basements simultaneously occupied by 6 to 15 people may have 1 of 2 exits conforming to 3.2.13 d);

c) Rooms simultaneously occupied by more than 50 people;

d) Rooms (except group F5 rooms) with a concurrent presence of less than 50 people (including an elevated audience floor or auditorium balcony) with a distance along the aisle from the farthest person to the exit exceeding 25 m. When there are means of egress through the room under consideration from the adjacent rooms with the occupant load of more than 5 people in each adjacent room, the mentioned distance shall include the length of the emergency route for the occupant from the adjacent rooms;

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e) Rooms with a total occupant loads in them and in adjacent rooms with means of egress that only enter the consideration room of 50 or more;

f) Rooms under category F5 class A or B with more than 5 people working in a shift, class C with more than 25 people working in a shift or larger than 1 000 $m^2$;

g) Exposed working platforms or floors for people operating and maintaining equipment in category F5 rooms larger than 100 $m^2$ – with respect to rooms under class A or B or larger than 400 $m^2$ – for rooms under other classes

If the room required to have 2 or more exits, it is permissible to arrange no more than 50% of the number of the means of egress of that room passing through an adjacent room, provided that the adjacent room shall also have means of egress in compliance with the provisions of this Code and the corresponding standard documents for such room.

**3.2.6** Number of exits by floor

**3.2.6.1** Stories of following shall have not less than 2 means of egress:

a) The floors of the building belong to categories F1.1; F1.2; F2.1; F2.2; F3; F4;

b) Floors with a occupant load of 50 or more;

c) The floors of F1.3 when total area of flats on a storey exceeds 500 m2 (for dwelling unit, calculate area of one storey of such unit). In case the total area of apartments on one floor is less than or equal to 500 m2 and there is only 1 means of egress from each storey, each flat situated a height taller than 15 m shall have an means of escape according to 3.2.13 in addition to the means of egress;

d) Floors of category F5, class A or B if at most more than 5 people simultaneously working in a shift, class C if at most more than 25 people simultaneously working in a shift;

e) Basements and semi-basements shall have no less than 2 means of egress if they are larger than 300 m2 or simultaneously occupied by 15 people.

**3.2.6.2** It shall be permitted to provide 1 means of egress in the following cases (except for buildings with fire resistance grade V):

a) From each floor (or from a part of the floor separated from other parts of the floor by fire barriers) with a occupancy fire hazard categories F1.2, F1.4, F2 (except nightclubs, discos, bars, theaters, karaoke buildings; and similar service providers), F3, F4.2, F4.3 and F4.4, when the following conditions are simultaneously satisfied:

- With respect to buildings with fire protection height not greater than 15 m, area of each storey shall not exceed 300 $m^2$. With respect to buildings with fire protection height from 15 m to 21 m, area of each storey shall not exceed 200 $m^2$;

- The entire buildings shall be protected throughout by automatic sprinkler system;

- The largest occupant loads on each floor does not exceed 20 people;

- For buildings over 3 floors or with a fire protection height greater than 9 m: provided with type 2 fire doors on the means of egress from each floor to the exit staircase.

- For buildings with 3 floors or less or with a fire protection height of 9 m or less type 2 stairs is permissible to replace the mentioned staircase, provided that people in the building can escape to an open balcony or open terrace in case of fire (except villas, resort facilities according to the separate regulations below).

NOTE: An open balcony or open terrace means that it is open to the outdoors and the cover (if any) shall ensure easy egress and rescue when the fire fighter approaches.

For villas and resort facilities not greater than 3 floors under category F1.2, it is permissible to replace the mentioned staircases with stairs of type 2, when ensuring all the following conditions:

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- The area of each floor is not more than 200 m2, the fire protection height is not more than 9 m and the occupant load is not more than 15 people;

- The building has at least one direct exit discharge to external or to a type 3 staircase;

- To egress by type 2 stairs, provided that egress up or down to not more than 1 floor. In case of going down 2 floors to egress, each room that can be used for sleeping shall have no less than one window located at a height of not more than 1 m above the floor and have a direct exit to the corridor or to common room with door opening to balcony. In case of going down 2 floors to egress, each room that can be used for sleeping shall have no less than one window located at a height of not more than 1 m above the floor and have a direct exit to the corridor or to common room with door opening to balcony. In case these windows and balconies are located at a height of more than 7 m to a maximum of 9 m, each window and balcony shall be equipped with means of escape to ensure the safe escape of people from high level (e.g. metal ladders, rope ladder);

b) From technical floors or areas of technical equipment with an area of not more than 300 $m^2$. In case the floor has a technical area as above, for every remaining 2,000 $m^2$, no less than one means of egress shall be provided (in case the remaining area is less than 2,000 $m^2$, it shall also be arranged no less than one mean of egress). If the technical floor or technical area is located in the basement, the means of egress shall be separate from other exits of the building and discharge directly to external. If the technical floor or technical area is located on the above-ground floors, it is permissible to provide exits through the common staircases, while for buildings with N1 staircases – travel through the vestibule of N1 staircase;

c) From the floors of buildings F1.3 with the total area of apartments on such floor (for buildings with residential units, calculate the floor area in the unit) from over 500 $m^2$ to 550 $m^2$ and:

- When the level of the top floor is not more than 28 m – the exit from the considered floor to the regular staircase, provided that each apartment is equipped with an addressable fire detector;

- When the level of the top floor is greater than 28 m – the exit from the considered floor into an N1 staircase provided that all rooms in the apartment (except toilets, bathrooms and annexes) are equipped with addressable fire alarms or automatic fire extinguishing equipment.

For F1.3 buildings with a fire protection height of over 28 m to 50 m and a total area of apartments on each floor to 500 m2, it is permissible to replace the N1 staircase with the N2 staircase, when all the following conditions are met: 1) Entrance to the staircase from all floors, including the passage between the staircase and the foyer, shall have a fire-stop vestibule with positive pressure in case of fire; 2) One of the elevators in the building is intended for the firefighters transportation; 3) All rooms in the apartment (except toilets, bathrooms and annexes) are equipped with addressable fire alarms or automatic fire extinguishing systems; 4) The building is equipped with a audible fire alarm system (provided in common corridors between apartments is permissible).

NOTE: The area of the apartment includes both the area of the balcony and (or) loggia.

d) From floors (or parts of floors separated from other parts by fire barrier) under occupancy fire hazard category F4.1, provided that all following conditions are satisfied:

- The fire protection height of the building is not more than 9 m, the consideration floor area is not more than 300 $m^2$;

- The floor under consideration has a side corridor leading to a type 2 open staircase or staircase, group rooms F4.1 have doors to this side corridor.

**3.2.7** Number of means of egress from any storey shall not be less than 2 if such storey including room(s) that requires 2 or more means of egress.

Number of means of egress from a building shall not be less than the number of means of egress on any given storey of such building.

**3.2.8** In case of at least 2 means of egress, they shall be provided separately and when calculate egress capacity of the exit, it is required to take into account that the fire might prevent people from

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using any of the exits. The remaining exits shall be able to ensure safe egress capacity for all people in the rooms, on the stories or in the buildings (illustration in Figure I.3).

If a room, section or storey of a building requires minimum 2 means of egress, at least 2 of such exits shall be separated from another and the distance between any 2 exits shall equal or greater than half of the longest diagonal line across the room, section or storey of the building. Distance between 2 means of egress shall be measured by the straight lines connecting their 2 nearest sides (illustration in Figure I.4 a), b) and c)).

If buildings are protected through out by automatic sprinkler fire fighting systems, the distance may be reduced to 1/3 of the longest diagonal line of room layouts mentioned above (illustration in Figure I.4 d)).

If 2 exit staircases are connected by a interior corridor, the distance between 2 means of egress (2 entrance doors of the exit staircases) shall be measured along the corridor (Figure I.5). The corridor shall be protected according to 3.3.5.

**3.2.9** Clearance height of means of egress shall not be less than 1.9 m, clearance width shall not be less than:

- 1.2 m – from rooms under category F1.1 when number of people evacuating exceeds 15 people, from rooms and buildings with other fire hazard categories with more than 50 people evacuating, except for category F1.3;

- 0.8 m – in all other cases.

Width of doors leading to external from staircases and from staircases to lobbies shall not be less than calculated value or width of stair flight under 3.4.1.

In all cases, when determining width of a means of egress, shall take into account geometric shapes of means of egress via door opening or doors in order to not obstruct transportation of medical stretches carrying injured persons.

If a two-wing door is used on the means of egress, the width of the exit is only taken as the width of the passage through the side of the open wing, which is not allowed to count the closed wing or fixed wing. The two-wing doors shall be fitted with a self-closing mechanism for the wings are closed in turn.

In buildings with a fire protection height greater than 28 m (except for F1.3 and F1.4), the egress doors from common corridors on each floor, from the common hall, waiting room, foyer, staircase (except for doors that discharge direct to external), shall be fire rated doors with a fire resistance rate not less than EI 30.

**3.2.10** Doors of means of egress and other doors along Egress route shall be opened outwards.

No regulations on opening direction for doors of:

- Rooms under categories F1.3 and F1.4;

- Rooms simultaneously occupied by not more than 15 people, other than class A or B rooms;

- Storage not larger than 200 $m^2$ and does not have place for regularly occupying by workers;

- Bathrooms, toilet;

- Exits leading to landings of type 3 staircases.

**3.2.11** Doors of means of egress from corridors on stories, commonly shared spaces, waiting rooms, lobbies and staircases shall not have locks so as to be opened from inside without keys. With respect to buildings higher than 15 m, doors mentioned above shall be solid doors or doors with tempered glass.

Doors of means of egress from rooms or lobbies that are forced smoke proofed shall be solid doors equipped with automatic-closing mechanism and jambs shall be tightly wedged. If said doors need to be opened during use, they shall be equipped with mechanism that automatically closes the doors in case of fire.

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With respect to staircases, doors shall be equipped with automatic-closing mechanism and jambs shall be tightly wedged. Doors of staircases that are opened directly outside might not be equipped with automatic-closing mechanism and jambs might not be tightly wedged. Except for cases otherwise specified, doors of staircases shall be class 1 fire-rated doors in grade I or II fire-resistance buildings; class 2 in grade III or IV buildings; and class 3 in grade V buildings.

Apart from specific regulations, doors of means of egress from storey corridor leading to staircases in a building with minimum 4 stories (except for detention and correctional building) shall ensure:

a) All electric locks installed on doors shall be automatically unlocked as soon as fire alarm systems are activated. Said electric locks shall also be automatically unlocked in case of power loss;

b) People using staircases can go back into the buildings via the doors that they leave or other doors which allow re-entry to the buildings;

c) Allocate points of re-entry following the principles that doors may only prevent re-entry if all requirements below are satisfied:

- No more than 2 stories may leave a staircase to get to another means of egress;

- No more than 4 stories situated in-between stories that grant access to another Egress route via staircases;

- Building re-entry may be done at the top storey or the storey immediately below the top storey granted access to by the same staircases if said stories allow access to another means of egress;

- Doors allowing re-entry shall be marked on the inside with “CỬA CÓ THỂ ĐI &O TRONG NHÀ” (Doors allowing entry) with each letter is at least 50 mm tall and placed at a height of not lower than 1.2 m and not higher than 1.8 m;

- Doors those do not allow re-entry shall have notice posted on the inside in order to distinguish locations of doors allowing re-entry or the nearest exits for each direction of movement.

NOTE: With respect to door that do not allow re-entry, place warning signs on the corridors inside the buildings (outside of the staircases) dictating that people cannot re-entry the buildings once they go through the door.

**3.2.12** Exits that do not satisfy requirements for means of egress could be considered as means of escape to raise safety level for the occupant in case of fire. Means of escape specified in 3.2.13 shall not be accounted in egress calculation in case of fire.

**3.2.13** Apart from cases specified in 3.2.12, means of escape also include:

a) Exits leading to balconies or loggias with solid walls not narrower than 1.2 m from edges of balconies (or loggias) to windows (or doors with glass) or not narrower than 1.6 m between glass windows opening towards the balconies (or loggias). The balcony or loggia shall be not less than 0.6 m wide, ensure natural ventilation and be separated from the room by partitions (with door openings) from floor to ceiling. It is permissible to replace the mentioned solid wall with a fire rated glazing not less than EI 30 or EI 15 depending on the fire resistance rate of the exterior wall;

b) The exit leads to an external open transition passage (bridge), whose width is not less than 0.6 m, leading to an adjacent fire compartment or to an adjacent fire compartment. No covering structures/component allowed that impede the movement of people;

c) Balcony or loggia exits with a width not less than 0.6 m, which are equipped with external stairs connecting balconies or loggias on each floor, or have lid doors on the floor of the balcony or loggia, with a minimum size of 0.6 x 0.8 m, which can be opened to the balcony or loggia downstairs;

d) Direct exits from rooms having finished floor elevation not lower than negative 4.5 m and not higher than 5.0 m through windows having dimensions not less than 0.75 m x 1.5 m or via trapdoors no smaller than 0.6 m x 0.8 m; such exits shall be equipped with ladders; no regulations on steepness of the ladders;

e) Roof discharges of buildings under fire-resistance grade I, II and III under classes S0 and S1 through

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windows, doorways or trapdoors with dimensions and ladders specified in d) of this clause.

**3.2.14** In technical floor shall be permitted to provide means of egress with a height no less than 1.8 m.

In technical floors for placement of technical networks (ducts, lines, etc.), it shall be permitted to provide means of egress through doorways not smaller than 0.75 m x 1.5 m or via trapdoors not smaller than 0.6 m x 0.8 m without providing any means of egress.

In underground technical floors, these exits shall be separated from other exits of the buildings and leading directly outside.

### 3.3 Egress route

**3.3.1** Egress routes shall be illuminated and guided in accordance with the requirements of TCVN 3890.

**3.3.2** Maximum permissible distance from the furthest position of the rooms or from the furthest workplaces to the nearest means of egress is measured along the egress routes shall be limited depending on:

- Occupancy fire hazard categories and fire risk classes (consult Appendix C) of rooms and buildings;

- Number of occupant evacuating;

- Geometric calculations of rooms and egress routes;

- Fire hazard level and fire resistance grade of the building.

Length of egress routes along type 2 staircase shall equal 3 times the height of such stair.

NOTE: Specific requirements regarding maximum permissible distance from the furthest point to the nearest means of egress are specified on a case-by-case basis. Appendix G specifies specific regulations applied to commonly seen building types.

**3.3.3** When allocating and designing egress routes, it is required to base on requirements under 3.2.1. Egress routes shall not include elevators, escalators and passages below:

- Passages through interior corridors with exits from elevator shafts, through elevator lobbies and vestibules in front of elevators if structures covering elevator shafts, including elevator doors, fail to meet requirements applied to fire barriers;

- Passages going through staircases when paths cutting across landings of staircases are parts of interior corridors or cutting across rooms where type 2 staircases are situated and said stairs are not for evacuation;

- Passages going along roofs, except for roofs under utilization or parts of roofs which provided only for evacuation;

- Passages going along type 2 staircases, connecting minimum 3 stories, or starting from basements/semi-basements, except for cases specified in 3.2.1, 3.2.2, 3.2.6 egress through type 2 staircases.

**3.3.4** Finishing materials, wall and ceiling decoration (including suspended ceiling panels if any), tiling materials, floor covering materials on the egress route shall comply with the requirements in Table B.8, Appendix B.

**3.3.5** In the corridors on the exit exit mentioned in 3.2.1, except in specific cases in the Code, it is not permissible to provide: projection of device from flat wall surfaces at a height less than 2 m; pipes carrying flammable gas and liquid, wall cabinets, except for communication panels and cabinets containing fire hydrants.

Corridors, halls, foyers, concourses and common rooms on the egress route shall be covered with fire barrier in accordance with the standards for each type of construction. Fire barriers enclose egress route of building fire resistance grade I shall be made from materials with fire resistance rate not lower than EI

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30, and of fire resistance grade II, III and IV buildings shall be made from non-flammable materials or materials with Ch1 flammability with fire resistance rate no lower than EI 15 With respect to buildings with fire resistance grade II of fire hazard class D or E (see Appendix C), may enclose corridors by glass walls. Doors leading to the corridors shall be fire-blocking doors with fire resistance rate not lower than fire resistance rate of the fire barriers.

Corridors that are longer than 60 m shall be divided by class 2 fire-blocking partitions into sections with length defined in Appendix D according to smoke protection requirements but not greater than 60 m. Doors in the fire-blocking partitions shall comply to 3.2.11.

When doors of rooms are opened outward to corridors, width of egress routes along the corridors shall equal clearance width of the corridors subtract:

- Half the width of protruding sections of the doors (calculate whichever doors protruding the most) – when doors are placed on one side of the corridors.

- The entire protruding width of the doors (calculate whichever doors protruding the most) – when doors are placed on both sides of the corridors. These requirements do not apply to lobbies of stories (common lobbies) situated between doors of dwelling unit and doors leading to staircases in blocks of category F1.3 buildings.

**3.3.6** Clearance height of horizontal sections of egress routes shall not be less than 2 m, clearance width of horizontal sections of egress routes and slope sections shall not be less than:

- 1.2 m – for commonly used lobbies for evacuation for more than 15 occupants from category F1 rooms, more than 50 occupants – from rooms under other fire hazard categories.

- 0.7 m – for passages leading to individual working spaces.

- 1.0 m – for all remaining cases.

In any case, egress routes shall be wide enough, taking into account of geometry shapes thereof in order to not obstruct transportation of medical stretches carrying injured persons.

**3.3.7** On floors of egress routes shall not have elevated flooring with difference in height less than 45 cm or raised edges, except for doorsteps. At raised elevated flooring sections, it is required to provide steps with not less than 3 steps or slopes with steepness not more than 1:6 (height difference shall not exceed 10 cm over length of 60 cm or angle created by slopes with flat surfaces shall not be more than 9.5$^{o}$).

When constructing steps for places with more than 45 cm of differences in height, install guardrails.

Except for specific cases under 3.4.4, shall not install spiral staircases, totally or partially curved stairs in terms of overall area and in any stair tread and a staircase shall not have steps with different height and tread depth along egress routes. Do not provide mirror on egress routes in order to avoid any confusion regarding egress routes.

### 3.4 Stairs and staircases on the egress routes

**3.4.1** Tread depth of stairs for occupant evacuation, including stair flight in staircases, shall not be smaller than calculated value or width of any means of egress (door) within the staircases and shall not smaller than:

- 1.35 m – for buildings under category F1.1;

- 1.2 m – for buildings with any storey, other than the 1st storey, simultaneously occupied by more than 200 people;

- 0.7 m – for stairs leading to individual working spaces;

- 0.9 m – for all remaining cases.

**3.4.2** Slope (angle) of stairs along egress routes shall not be greater than 1:1 (45$^{o}$); depth of tread shall

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not be less than 25 cm except for outdoor stair, and riser of tread shall not be greater than 22 cm and not less than 5 cm.

Slope (angle) of exposed staircases leading to individual workplaces may be increased up to 2:1 (63.5$^{o}$).

It shall be permitted to reduce tread depth of starting curved stairs (usually situated in lobbies of storey 1) in the inner curve down to 22 cm; it shall be permitted to reduce tread depth down to 12 cm for stairs leading to technical floors, garret, unoccupied roof, as well as rooms simultaneously occupied by not more than 5 people (other than category F5 class A or B rooms).

Type 3 staircases shall be made of non-flammable materials (except for buildings with fire resistance grade V) and placed adjacent to solid sections (without windows or skylights) of walls having fire hazard category no lower than K1 and fire resistance rate not lower than REI 30 or EI 30 (no fire resistance rater required of the solid part this of the wall for buildings with fire resistance grade V). These staircases shall have landings situated at the same elevation as means of egress with guardrails situated at a height of 1.2 m and not less than 1.0 m away from the nearest windows. It is permissible to replace solid sections of the wall with glazing walls with a fire resistance rate not less than EI 30. No fire resistance rate required for the door openings leading from the corridor to the stair landing, nor from the rooms that this type 3 staircase is only used to egress for those rooms.

Type 2 staircases shall satisfy requirements applied to treads and landings in staircases.

**3.4.3** Width of staircase landings shall not be less than the width of stair way. Width of landings in front of entrance to elevators (landings acting as elevator lobbies) of elevators having hinged doors opening outwards shall not be less than total width of stair flight and half the width of elevator door and not be less than 1.6 m.

Length of intermediate landings in straight staircases shall be no less than 1.0 m.

Doors that are opened to staircases shall not reduce calculated width of landings and stair flight when they are opened.

**3.4.4** Buildings under fire hazard category F4 might be installed with curved staircases on egress routes when all following conditions are met:

- Stair height shall not exceed 9.0 m;

- Width of stairway shall conform to requirements under the Code;

- Smallest curve radius shall not be less than twice the width of stairway;

- Riser height shall range from 150 mm to 190 mm;

- Width of inner treads (270 mm away from the small ends of the treads) shall not be less than 220 mm;

- Width at the middle of the treads shall not be less than 250 mm;

- Width of outer treads (270 mm away from the big ends of the treads) shall not be more than 450 mm;

- Sum of 2 times the riser and width of inner treads shall not be less than 480 mm and in case of width of outer treads, not greater than 800 mm.

**3.4.5** In staircases and vestibules (if any), do not place:

- Pipes carrying flammable gas and liquid;

- Wall cabinets, other than communication panels and cabinets containing fire hydrant;

- Exposed cables and power lines (except for power lines for low voltage electric devices) including for lighting corridors and staircases;

- Exits from cargo elevators and cargo lifting devices;

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- Exits leading of storage or technical rooms;

- Equipment protruding from wall surfaces at a height less than 2.2 m from surfaces of treads and landings.

In the space of exit staircases and fire-stop buffer chamber with positive air pressure in case of fire, no functional room is permissible to be provided.

**3.4.6** In spaces of staircases, other than smoke proof enclosures, may situate no more than 2 passenger elevators capable of descending to the 1st storey with structures sheltering elevator shafts made from non-flammable materials.

For outdoor elevator shafts, use structural components made from non-flammable materials as sheltering structures.

**3.4.7** Staircases, except for the cases specified separately in this Code, shall have a direct exit to the premises adjacent to the building or through the lobby separated from the corridors and rooms adjoining by class 1 fire partitions with doors with self-closing mechanisms, and door gaps shall be sealed.

When provide means of egress from 2 staircases through common lobby, one of the means of egress shall lead directly to external apart from leading to the lobby. In case there is only one staircase discharging into the lobby, this staircase shall have an exit discharging directly to external.

It shall be permitted to provide means of egress from 2 staircases through common lobby with respect to buildings with fire protection height under 28 m, area of each storey does not exceed 300 $m^2$, with the largest occupant loads on each floor according to the approved design, when the design does not specify this value then the largest occupant loads shall be calculated equal to the ratio between the floor area of the room or floor or building divided by the floor space coefficient (m2/person) specified in Table G.9, does not exceed 50 people and the entire building is protected by automatic fire fighting systems in accordance with current applicable regulations.

For passenger terminals and large halls with similar usage characteristics, 50% number of exits from the staircases (or from corridors) into the common passenger hall with a direct exit discharge, discharge to the open outdoor overpass, or to the platform - can be considered as means of egress.

N1 type staircases shall have exits that discharge directly.

**3.4.8** The staircases shall be provided with natural or artificial lighting.

a) In case of natural lighting:

Except for L2 staircases, lighting can be performed by skylights with less than 1.2 $m^2$ in area on outer walls of each storey.

L2 staircases shall have skylights on the roofs with not less than 4 $m^2$ in area and the gaps between stair flights not less than 0.7 m or skylights along the height of staircases with cross-section area not less than 2 $m^2$.

It shall be permitted to provide not more than 50% of staircases without skylights for evacuation purposes in following cases:

- Category F2, F3 and F4 buildings: for N2 or N3 staircases with positive pressure in case of fire;

- F5 class C buildings with fire protection height up to 28 m, and regardless of fire protection height in case of class D and E buildings: for N3 staircases with positive pressure in case of fire.

b) In case of artificial lighting:

In case it is infeasible to provide the openings as prescribed in a) of 3.4.8, the exit staircases shall be smoke-free staircases and provided with artificial lighting, powered as noted in 3.4.13 to ensure the principle of continuous maintenance of the power supply for the lighting system for stable operation in case of fire, and the light should be sufficient so that the evacuate occupant following these staircases can see the egress route clearly and not be dazzled.

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**3.4.9** Implementation of smoke proof of N2 and N3 staircases shall comply with Appendix D. If necessary, N2 staircases shall be divided into compartments at different height with class 1 fire-blocking solid partitions with respect to passages between compartments outside the staircases.

Window in N2 staircase shall not be opened.

Vestibule of N3 staircase shall not less than 3.0 $m^2$ and not less than 6.0 $m^2$ if such vestibule also act as lobby of fire lift.

**3.4.10** Smoke proof feature of smoke stop vestibule leading to N1 smoke proof stair enclosure shall ensure natural ventilation with appropriate structural and surface planning solutions. Cases considered to be appropriate are:

NOTE: Appendix I (I.3.2) illustrates methods of situating smoke stop vestibule to allow access to N1 staircase.

a) Smoke stop vestibules shall be open and connected to the external and not usually provided in inner corners of buildings, it is required to satisfy following requirements at the same time (Figure I.7):

- When parts of outer walls of the buildings are connected with other walls with an angle of less than 135$^o$, the horizontal distance from the nearest doorways in one vestibule to the vertex of adjoining angle shall not be less than 4m; such distance might reduce to equal the protruding value of outer walls; the requirement does not apply to passage situated in adjoining corners exceeding 135$^o$ and to protruding sections of outer walls that are not less than 1.2 m;

- Width of walls between doorways of smoke stop lobbies and the nearest doorways of the rooms shall not be less than 2 m;

- Passage shall not be narrower than 1.2 m with guardrails at a height of 1.2 m, width of wall sections between doorways in smoke stop lobbies shall not be less than 1.2 m.

NOTE: Cases similar to this model are illustrated in Appendix I, Figures I.8 a), b) and c).

b) Smoke stop vestibules alongside corridors (Figure I.8 h), i) and k)) shall receiving natural lighting and ventilation by openings leading to and connecting to following spaces:

- External space;

- Streets, public streets or other public spaces with total clear overhead;

- Vertical skylights which width not less than 6 m and clearance area not less than 93 $m^2$.

c) Smoke stop vestibules crossing smoke proof corridors that are not smaller than 6 $m^2$ with the smallest area of each dimension not less than 2 m are separated from adjacent areas of the buildings with class 2 fire walls. Design of smoke stop lobbies shall not obstruct movement of occupant who are evacuating. Doors shall be equipped with automatic-closing mechanism and jambs shall be tightly wedged. Smoke proof feature of smoke stop lobbies shall be guaranteed by:

- Air vents not smaller than 15 % of floor area of smoke stop lobbies and situated not more than 9 m from any sections of the lobbies. These air vents shall be connected to vertical shafts or concave ventilation compartments along the height the buildings. Dimension of vertical skylights concave compartments shall not be narrower than 6 m and clearance area shall not be less than 93 $m^2$. Walls surrounding the vertical shafts shall be able to resist fire for at least 1 hour and no other ventilation openings are situated in the shafts other than ventilation openings of smoke stop lobbies, exit stair shaft and sanitation areas (Figure I.8 d), e) and f));

- Corridors receiving horizontal ventilation with fixed ventilation openings situated on 2 outer walls. Ventilation openings on each outer walls shall not less than 50 % of clearance area of the opposite outer walls. Distance from all points of corridor floors to any ventilation opening shall not exceed 13 m (Figure I.8g)).

**3.4.11** L1 staircases and type 3 staircases shall be permitted to equipped in buildings of all occupancy fire hazard categories which fire protection height up to 28 m; in that case, in category F5 and class A or B buildings, exits leading to corridors in class A or B rooms shall travel across vestibules with positive air

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pressure at all time.

**3.4.12** L2 staircases shall be permitted to provide in buildings with fire resistance grade I, II or III with structural fire hazard level S0, S1 and occupancy fire hazard category F1, F2, F3 and F4 which the fire protection height not more than 9m. It is permissible to increase this height to 12 m (except for inpatient health care facilities) provided that if the top skylights automatically open in case of fire. The maximum permissible number of such staircases (except for buildings F1.3 and F1.4) is 50%, the remaining staircases shall have skylight in the outer wall at each floor.

When situating L2 staircases, shall satisfy following requirements: For F1.3 buildings constructed in blocks, each flat situated at a height above 4 m shall have an means of egress in accordance to 3.2.13.

**3.4.13** In buildings which fire protection height is greater than 28 m (except for F5 class C and E buildings where there are no regular workers), and F5 class A or B buildings, it is required to provide smoke stop staircase, including N1 staircases.

In buildings with multiple occupancies, staircases connects sections of buildings with different occupancies fire hazard categories shall be smoke-free staircases in accordance with the requirements of this clause, except in cases specified specificly.

NOTE: N1 staircase shall be permitted to replaced as specified in 2.5.1 c), provide that the system supply external air to vestibule and stair shaft be powered by two independent sources (1 grid power source and 1 alternative generator source) to ensure continuous power supply for steady operation in case of fire.

Permit:

a) Buildings F1, F2, F3, F4 shall be provided with no more than 50% of the staircase type N3 or N2 with the staircase entrance passing through the vestibule with the same cover solution as the class 1 fire blocking vestibule (i.e. no positive air pressure is required in this vestibule, but the covering members shall have the same fire resistance rate as the class 1 fire blocking vestibule);

b) When the building has two or more basements, the egress from these basements may follow the staircases type N3, or N2 with the staircase entrance passing through the vestibule with the same enclosure solution as the class 1 fire blocking vestibule;

c) In group F5 buildings, smoke-free staircases shall be provided to replace type N1 as follows:

- In Class A or B buildings – N2 or N3 staircases shall have regular positive air pressure;

- In Class C buildings – N2 or N3 staircases shall have positive air pressure in case of fire;

- In Class D, E – N2 or N3 staircases with positive air pressure in case of fire, or L1 staircases provided that the staircase shall be compartmentalized by a solid fire partition every 20 m in height and the passage from one compartment to another of the staircase shall be located outside the space of the staircase.

**3.4.14** In buildings with smoke stop stair enclosures, it is required to provide smoke protection for common corridors, lobbies, common spaces and waiting rooms.

**3.4.15** In buildings with fire resistance grade I and II and structural fire hazard level S0, it shall be permitted to provide type 2 staircases leading from lobbies to the 2nd storey taking into account of the requirements of 4.26.

In buildings F3.1 and F3.2, it is permissible to provide said stair even if there is no foyer.

**3.4.16** In buildings which fire protection height is not greater than 28 m with fire hazard category F1.2, F2, F3, F4, fire resistance grade I, II and structural fire hazard level S0, it shall be permitted to use type 2 stair cases to connect 2 stories or more, provide that the exit staircases meet the standard documents and the requirements of 4.27. Type 2 staircases connecting 3 stories (floors) or more shall not be counted and used as egress routes in case of fire, except for the cases specified in 3.2.1, 3.2.2, 3.2.6.

**3.4.17** Escalators shall be managed in accordance to requirements applied to type 2 staircases.

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### 3.5 Fire safety requirements for construction materials for buildings

**3.5.1** Construction materials used for buildings shall depend on the use and fire hazard of the materials.

**3.5.2** The fire safety requirements for the application of construction materials in the building are specified in accordance with the fire hazard criteria of the materials specified in Table B.7 (Appendix B).

**3.5.3** The use of finishing and decorative materials, tiling materials and floor covering materials on egress routes shall comply with the requirements of 3.3.4, and for common use rooms (except for floor covering materials of sports floors and dance hall floors) shall comply with the provisions of Table B.9 (Appendix B).

**3.5.4** In rooms of F5 buildings, Class A, B and C1 that use or store flammable liquids, the floor covering material shall have afire hazard level material that is not more dangerous than CV1.

**3.5.5** In F2.1 storage booths, it shall not be permitted for the use: types of wall, ceiling and suspended ceiling finishing materials, tiling materials with fire hazard level of materials greater than CV1; floor covering materials have fire risk level greater than CV2.

**3.5.6** In rooms that store books, records, documents and similar items, it is required to use only finishing, decoration, tiling materials and floor covering materials with fire hazard level CV0 or CV1.

**3.5.7** In museums, exhibitions and rooms of a similar nature of category F2.2, it is forbidden to use wall, ceiling and ceiling finishing materials with a higher fire hazard level than CV2, floor covering materials with a fire hazard level than CV3.

**3.5.8** In the commercial rooms of F3.1 building, it is not permissible to use wall, ceiling and suspended ceiling finishing materials with fire hazard level more than CV2, floor covering material with fire hazard level more than CV3.

**3.5.9** In the waiting rooms of buildings F3.3, wall, ceiling, suspended ceiling and floor covering materials shall have fire hazard level CV0.

**3.5.10** It is permissible for the application of fire safety requirements to finishing materials – decoration, tiling materials, floor covering materials and corresponding test criteria in accordance with the applicable standard documents as a substitute for requirements 3.5.1 to 3.5.9 and Appendix B, except for the requirements specified in A.4.

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# 4 FIRE SPREADING PREVENTION

**4.1** Fire spread shall be prevented by adopting measures to limit fire area, fire intensity and duration. To be specific:

- Utilize structure and layout – space planning solutions to prevent further spread of dangerous elements of the fire in a rooms, between rooms, between groups of rooms with different occupancy fire hazard categories, between stories, between blocks, between fire compartments and between buildings;

- Limit fire and explosion risks related to technology in rooms and buildings;

- Limit fire hazard of construction materials used on surface layers of building structures, including roofing, finishing layers of outer walls, rooms and egress routes;

- Install initial fire extinguishing devices, including automatic and manual devices;

- Install fire detection and alarm devices.

NOTE: Regulations on fire safety distance between buildings, public constructions and manufacturing facilities are specified in Appendix E. Distance from storage containing flammable liquid, exposed storage situated above ground containing flammable liquid, tanks containing LPG (Liquified Petrolium Gas) and flammable gas to other structures shall conform to specialized standards.

**4.2** Apartment buildings, dorms, public structures, manufacturing facilities and warehouses shall satisfy fire safety requirements under the Code and regulations under design standards applied to each type of construction. Number of stories (permissible fire protection height of buildings), area of fire compartments and maximum height for placement of conference rooms, lecture halls, meeting rooms, sports training spaces, and similar constructions shall conform to regulations under Appendix H.

**4.3** Building sections (rooms, areas of refuge, technical floors, basements, semi-basements and other sections) where fire fighting is difficult to be implemented shall be equipped with additional measures to limit fire area, intensity and duration.

**4.4** Effectiveness of measures adopted to prevent fire spread shall be assessed by economic – technical calculation based on requirements of 1.5.1 regarding limiting direct and indirect consequences of the fire.

**4.5** Sections of buildings and rooms belonging to different occupancy fire hazard categories shall be separated from each other by separation members with prescribed structural fire resistance rate and fire hazard levels or separated by class 1 fire partitions and (or) class 3 fire floors, unless otherwise provided in this Code or specialized regulations or standards. In such case, requirements for partitioning structures and fire prevention structures shall be considered taking into account structural occupancy fire hazard categories of rooms, fire load value, fire resistance grade and structural fire hazard levels.

For a floor with two or more different occupancies, of which one main function occupies at least 90% of the floor area and the rest is auxiliary to the main function, it is permissible not to divide the areas of fire hazard levels according to different functions by fire barriers, then the entire floor shall comply with the fire safety requirements corresponding to the fire hazard categories according to the main function. This regulation shall not apply to rooms with auxiliary functions with higher fire and explosion hazard level than rooms with main functions.

NOTE: Some of the specific requirements for buildings of category F1.3 are as follows:

a) Walls and partitions between dwelling units; walls and partitions between the common corridor (outside the apartment) and other rooms, shall have a fire resistance rating of not less than EI 30;

b) Non-load-bearing walls and partitions between apartments, shall have fire resistance rate not less than EI 30 and fire danger

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grade K0;

c) Rooms with public functions shall be separated from living rooms by fire-blocking partitions class 1 and fire-blocking floors class 3, while in buildings with fire resistance grade I, they shall be separated by fire-blocking floors class 2.

**4.6** With respect to a building which sections with different occupancy fire hazard categories have been separated by fire barriers, each section shall satisfy fire safety requirements applied to building with similar occupancy fire hazard category.

Fire protection systems shall be selected on the basis of: when sections of buildings have different occupancy fire hazard categories, occupancy fire hazard category of the whole building might be greater than occupancy fire hazard categories of any sections thereof.

**4.7** With respect to F5 buildings, if the technology allows, class A and B rooms shall be provided near the outer walls; with respect to multi-stories buildings, provide these rooms at upper stories.

**4.8** In basements and semi-basements, it is forbidden to arrange rooms of grade A and B, except in cases specified separately.

**4.9** Construction components shall not facilitate hidden fire.

NOTE: Buildings under category F1.3, loggias and balconies of floor 3 and above shall made of non-flammable material.

**4.10** Fire resistance of connecting details of construction components shall not be lower than required fire resistance applied to those components.

**4.11** Structures creating slopes in auditorium shall satisfy fire resistance rate and fire hazard level requirements according to Table 4 and Table 5 similar to floors in-between stories.

**4.12** When install service ducts, pipes and cables penetrating walls, floors and partitions, the adjoining section shall be sealed or properly processed in order to not reduce fire-related technical standards applied to the components respectively.

**4.13** Fireproof coating and impregnation layers applied on exposed surfaces of components shall satisfy requirements prescribed for finishing of said components.

Technical documents for fireproof coatings and impregnation layers shall specify frequency of replacement or restoration depending on use conditions.

In order to enhance fire resistance or reduce fire hazard level of components, do not use fireproof coatings and impregnation layers in places that cannot be restored or replaced regularly.

**4.14** Effectiveness of fireproof substances (materials) for reducing fire risks of materials shall be assessed by tests for fire hazard category of construction materials in Section 2.

Effectiveness of fireproof substances (materials) for enhancing fire resistance of materials shall be assessed by tests for fire resistance of construction materials in Section 2.

**4.15** Fire partitions in rooms with suspended ceilings shall also divide the space above the suspended ceiling, and in this space it shall not be permitted to provide channels and pipelines for transporting gaseous combustible substances, dust-gas mixtures, liquids and combustible materials.

Suspended ceilings shall not be installed in class A or B rooms.

Suspended ceilings which used to increase fire resistance rate of floor between stories and roof deck shall be in accordance with requirements of fire hazard set forth for floors between these walls and roof floors.

**4.16** At the intersection of fire barriers with the covering structures of the building, including at locations that change the shape of the building, there shall be solutions to ensure that fire does not spread through these fire barriers.

**4.17** Fire-blocking walls which separating buildings into fire compartments shall be constructed along the height of the buildings or to fire blocking floor class 1 and shall prevent fire from spreading into

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adjacent fire compartments when building structures that are on fire collapse.

**4.18** Openings in fire barriers shall be sealed in case of fire.

Windows in fire barriers shall be unopenable type, doors, gates, trapdoors and valves shall be equipped with automatic-closing mechanism and jambs shall be tightly wedged. Doors, gates, trapdoors and valves that need to be left open for utilization shall be equipped with automatically close device in case of fire.

**4.19** Total area of openings in fire barriers, other than enclosing structures of elevator hoistway, shall not exceed 25 % of area of said fire barriers. There is no limit to the area of openings in fire barriers if the nominal fire resistance rate of the opening sealing members are not less than the corresponding fire resistance rate of the fire barriers (except for class 1 fire blocking walls). Opening sealing members in fire barriers shall meet the requirements of 2.3.3 and the requirements of Section 4.

At the doors in the fire barriers used for separation of class A or B rooms from other spaces such as: rooms of a class other than class A or B, corridors, staircases and lift lobbies, shall be provided with vestibule with regular positive air pressure as required in Appendix D. Do not situate a vestibule for more than 2 class A or B rooms

**4.20** If it is infeasible to provide fire-blocking vestibules in fire barriers for separating class A or B rooms from other rooms or it is infeasible to provide doors, gates, trapdoors and valves in fire barriers for separating class C rooms from other rooms, it is required to establish measures to prevent fire spread and infiltration of combustible gas, air, fume of liquid, dust and ashes which are capable of creating explosion with appropriate contents into adjacent rooms and stories. Effectiveness of measures mentioned above shall be proven.

In openings of fire barriers between class C, D and E rooms, if it is infeasible to close by fire-blocking doors or gates, exposed vestibules shall be permitted to provided, equipped with automatic fire fighting equipment. Enclosure structures of the vestibules shall be appropriate fire prevention structures.

**4.21** Fire-rated doors and fire dampers in fire barriers shall be made from non-flammable materials.

Materials shall be permitted to use with flammability no less than Ch3 and protected by non-flammable materials not thinner than 4 mm as fire-blocking doors, gates, trapdoors and fire dampers.

Doors of fire-blocking buffer chamber, doors, gates and trapdoors in all fire barriers at room side that do not store or use flammable gas, air and materials and do not include technological processes that involve burning dusts shall be permitted to be made from materials with Ch3 flammability with thickness no less than 40 mm and without void.

**4.22** Channels, shafts and ducts carrying flammable gas, mixture of flammable dust, flammable liquid, flammable substances and materials shall not penetrate class 1 fire-blocking walls and floors.

For channels, shafts and ducts for carrying other substances and materials with types mentioned above, it is required to have devices that automatically prevent spread of burning products along the channels, shafts and ducts at penetration point of such fire barriers.

NOTE 1: Ventilation ducts and smoke ducts shall be permitted to install in fire-blocking walls of residential buildings, public constructions and auxiliary buildings if minimum thickness of fire-blocking walls (excluding the ducts) is not under 25 cm and thickness of separation layers between smoke ducts and ventilation ducts is minimum 12 cm.

NOTE 2: Openings for placement of water pipes in fire barriers shall be processed according to 4.12.

**4.23** Enclosure structures of elevator hoistway (except for shafts mentioned in 3.4.6) and elevator mechanical rooms (other than rooms on the roof), channels, shafts and mechanical panels shall satisfy requirements applied to class 1 fire-blocking partitions and class 3 fire-blocking floors. No regulations on Fire resistance rate of enclosure structures between elevator hoitsway and mechanical room.

If it is infeasible to install fire-blocking doors in enclosure structures of elevator hoitsway mentioned above, vestibules or lobbies shall be required with class 1 fire-blocking partitions and class 3 fire-blocking floors, or curtains that automatically close doorways leading to elevator hoitsway in case of fire. The curtains shall be made from non-flammable materials and have fire resistance rate not less than E

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In buildings with smoke stop stair enclosures, it is required to equip automatic smoke protection for elevator hoitsway which exits are not installed with fire-blocking vestibules with positive pressure in case of fire.

**4.24** Garbage rooms, garbage chutes and doors to garbage chute systems shall be designed and installed satisfactory to technical standards and requirements applied specifically to said components and following specific requirements:

- Garbage chutes and garbage rooms shall be separated from other sections of the buildings by fire barriers; doors to garbage chute systems shall have fire-blocking doors equipped with auto-closing mechanisms.

- Garbage chutes shall be constructed of noncombustible materials.

- Do not place garbage chutes and garbage rooms in staircases, waiting lounges or vestibules coated with fireproof layers for evacuation purposes.

- Do not place garbage chutes and garbage rooms in staircases, waiting lounges or vestibules coated with fireproof layers for evacuation purposes.

- Doors to garbage rooms shall not be situated adjacent to means of egress or doors leading outside the buildings or near windows of residential building.

**4.25** Depending on technological advances, separated staircases shall be permitted provide separately to allow access between basements/semi-basements with the 1st storey.

This staircases shall be enclosed by class 1 fire-blocking partitions and fire-blocking vestibules with positive pressure in case of fire.

Fire-blocking vestibules as mentioned above shall not be provided for staircases in F5 buildings if the staircases lead from basements/semi-basements where class C4, D and E are located to rooms of the same class on the 1st storey.

The staircases shall not be taken into account when calculate evacuation, except for cases specified in 3.2.1.

**4.26** When situating type 2 staircases leading from lobbies on 1st storey to the 2nd storey, the lobbies shall be separated from adjacent corridors and rooms by class 1 fire-blocking partitions.

**4.27** Rooms where type 2 staircases according to 3.4.16 are situated shall be separated from adjoining corridors and other rooms by class 1 fire-blocking partitions. It is permissible not to separate rooms with type 2 stairs with fire partitions when:

- The whole buildings are equipped with automatic firefighting system;

- Buildings with fire protection height not greater than 9 m with area of any storey does not exceed 300 $m^2$.

**4.28** In basement/semi-basements, class 1 fire-blocking vestibules with positive pressure shall be provided in case of fire in front of entrances to elevators.

**4.29** Selecting dimensions of buildings, fire compartments and distance between buildings shall rely on fire-resistance grades, structural fire hazard levels, occupancy fire hazard categories and fire loading values, taking into account effectiveness of used fire protection equipment, presence, location and level of equipment of fire forces, potential economic and ecological consequences due to the fire.

**4.30** During operation process, functionality of all technical equipment for fire protection shall be guaranteed according to predetermined requirements.

**4.31** Installation of automatic fire alarm and fighting system shall conform to TCVN 3890.

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**4.32** Prevent fire from spreading horizontally of the exterior of the building

**4.32.1** Class 1 fire blocking walls shall separate the outer walls with fire hazard class K1, K2, K3 and project at least 30 cm from the outer wall plane.

It is permissible not to separate external walls if the external wall has a fire hazard level K0, or a class 1 fire blocking wall adjacent to a vertical outer wall strip (vertical fire blocking strip) with a width of at least 1.2 m, has a fire resistance rate not lower than E 60 and has a fire hazard level K0.

Class 2 fire walls and class 1 fire partitions, if intersecting with external walls, shall be adjacent to the vertical fire blocking strip, with a width of not less than 1 m, with fire resistance rates prescribed for external walls according to Table 4 or Table A.1 depending on the height of the building. Class 2 fire partitions shall come into contact with a vertical solid outer wall strip, with a width of not less than 1 m, with fire resistance rates specified for external walls in accordance to Table 4 or Table A.1 depending on the height of the building.

**4.32.2** The provisions of 4.32.1 shall not be permitted if the conditions set out in FOOTNOTE 6 (Table 4) or FOOTNOTE2 (Table A.1) are satisfied with respect to the height of the building.

**4.33** Prevent fire from spreading in the vertical direction of the exterior of the building.

**4.33.1** External walls with openings without fire blocking doors or with sections with fire resistance rates that do not meet the regulations, in the position of the outer wall adjacent to the floor between stories (fire blocking belts between stories) shall be appropriately constructed to prevent the spread of fire vertically. Allow fire belts between floors to be constructed in accordance with one of the following regulations:

a) The outer wall adjacent to the floor between stories (the wall between the windows of the lower and upper stories or between the unprotected refractory wall sections of the lower and upper stories) shall be solid walls, made of non-combustible materials and have a height of at least 1.0 m;

b) The door's perch is made of non-combustible material, whose width (reaching out from the outer wall) is not less than 0.6 m, the fire resistance rate of the perch is not less than the fire resistance rate prescribed for the outer wall;

c) The outer wall adjacent to the floor between the stories is tempered glass, with a thickness of not less than 6 mm, equipped with sprinkler nozzles of automatic fire extinguishing equipment, ensuring that the nozzles are located no more than 2 m from each other from the side of the rooms (corridors) adjacent to the outer wall and not more than 0.5 m from the inside of the outer wall.

NOTE 1: The requirement for the fire resistance rate (if any) of the components that constructs the fire belt is taken in accordance with Table 4 or Table A.1 depending on the scale of the building. For vertical separation components, integrity criteria (E) shall be ensured; for joints or gaping sealings, integrity indicators (E) and insulation (I) shall be ensured, and fixed connection parts shall ensure the bearing indicators (R).

NOTE 2: The above requirements shall not apply to the location of loggia doors and balconies, whose balcony floor is larger than 0.6 m as well as to the means of egress.

**4.33.2** The fire resistance rate of the components of external walls with skylight glazing shall also meet the same requirements as for non-load-bearing external walls and specified in 4.32, 4.33.

**4.33.3** When one part of the outer wall of the building is connected to another part of the wall, forming an angle less than 135° and the horizontal distance between the nearest edges of the openings in the outer wall in other directions If the distance between the top of the corner is less than 4 m, on the corresponding part of the wall, the openings shall be provided with fire doors with fire resistance rates not less than E 30 or have a sprinkler system.

**4.33.4** The provisions of 4.33.1 to 4.33.3 shall not be applied to buildings with three floors or less or a fire protection height of less than 15 m, open above ground garages, or buildings that simultaneously satisfy the conditions set forth in FOOTNOTE 6 (Table 4) or FOOTNOTE 2 (Table A.1) depending on the height of the building.

**4.34** Fire spreading prevention between buildings

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The fire protection distance between the buildings (specified in E.1 and E.2 in Appendix E) and the boundary fire protection distance (specified in E.3 in Appendix E) shall be ensured in proportion to the area of the unprotected opening of the outer wall of the building and the fire resistance rate of the part of the wall that shall be fire protected.

**4.35** Fire spreading prevention to the void

The design of a building, a building complex, one or several voids, including equipping in its volume with open staircases, escalators, horizontal escalators, panoramic and similar elevators, as well as rooms with openings in the side corridor, should ensure the fulfillment of the following requirements:

a) The void shall be located in the volume of a fire compartment; in the openings of the floors between its floors allowing the placement of escalators, open stairs and elevators (including panoramic elevators);

b) Structures surrounding rooms and corridors in positions adjacent to the void, requiring a fire resistance rate not less than EI (EIW) 60 or made of tempered glass, with a thickness not less than 6 mm, with an unspecified fire resistance rate but equipped with sprinklers of automatic fire extinguishing equipment, ensure that the nozzles are located from the side of adjacent rooms (corridors), no more than 2 m from each other and no more than 0.5 m from the partition;

c) In openings leading to the void, including openings of escalators and of rooms in the side corridor equipped with smoke curtains and screens, whose fire resistance rate is not less than E 45, lowered in the event of a fire, they shall have automatic and remote control drive mechanisms, or equipped with fixed smoke screens. The working height of the curtains, smoke screens, when lowered should not be less than the thickness of the smoke layer produced in case of fire. The smoke layer thickness is determined by calculation in design stage. The lower boundary of the smoke layer is determined at a height not less than 2.5 m from the floor;

d) The area of the floor within the fire compartment with the void shall be determined by the total area of the bottom floor of the void and the area of the side corridors, of the aisles and of all rooms located above, located within the volume of the floor hall, limited by class 1 fire partitions. When there are no class 1 fire partitions, separating the space of the void from the adjacent rooms, the area of the fire compartment shall be equal to the total area of the corresponding stories;

e) It is permissible to provide natural smoke exhaust system from the void if there is an appropriate calculation argument;

f) The skylight panel on the roof of the void shall be made from non-combustible materials, then the structure of this roof panel shall be made from reinforced and safe (non-injurious) glass. It is permissible to use skylight panel materials whose fire hazard group is not greater than Ch1 and does not form molten droplets;

g) It is permissible for fire extinguishment in the void space, that sprinkler nozzles are installed below the overhanging structure of the floor between floors, of balconies (including under escalators...) without having to install them in the roof of the void. The sprinklers are located from 1.5 m to 2.0 m apart and no more than 0.5 m from the edge of the void.

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# 5 WATER SUPPLY FOR FIREFIGHTING

## 5.1 Water supply for outdoor fire fighting

**5.1.1** Fire safety requirements for outdoor fire fighting water supply

**5.1.1.1** Installation of outdoors fire fighting water supply shall conform to TCVN 3890 and other alternate standard documents.

**5.1.1.2** Water quality of supply sources for fire fighting shall conform to operation conditions of firefighting equipment and measures.

**5.1.1.3** Fire water piping systems usually have low pressure, when maintaining high pressure, the working pressure of the piping system shall be calculated. For high pressure pipelines, fire pumps shall be equipped with mechanisms to guarantee operation not later than 5 minutes after fire alarm signal is given.

**5.1.1.4** Minimum discharge pressure in low-pressure fire fighting water pipes (above ground) during fire fighting shall not be less than 10 m. The minimum discharge pressure in the high-pressure firefighting pipeline network shall ensure a solid water jet height of not less than 10 m when the maximum firefighting required flow and firefighting hydrant at the highest point of the building. Discharge pressure in domestic/manufacture mixed pipelines shall not be lower than 10 m and not higher than 60 m.

**5.1.2** Fire safety requirements for water flow rate for outdoor fire fighting.

**5.1.2.1** Water flow rate for outdoor fire fighting (for 1 fire) and number of simultaneous fire in a residential area calculated for loop primary pipe network shall conform to Table 7.

**5.1.2.2** Water flow rate for outdoor fire fighting (for 1 fire) of buildings of occupancy fire hazard categories F1, F2, F3 and F4 calculated for general pipelines, distribution pipelines of pipe networks, and small scale pipe networks (1 hamlet, 1 block, etc.) shall use the highest value in Table 8.

**5.1.2.3** Water flow rate for outdoor for buildings of occupancy fire hazard category F5, for 1 fire, shall conform to buildings requiring the highest value in Table 9 and Table 10.

NOTE 1: When calculating water flow rate for extinguishing 2 fires, use value of 2 buildings requiring the highest value.

NOTE 2: Water flow rate for outdoor fire fighting in independent auxiliary buildings shall conform to Table 8 similar to buildings with occupancy fire hazard category F2, F3 and F4; and in case such building located in manufacturing faculties, calculate according to general volume of manufacturing facilities and Table 9.

NOTE 3: Water flow rate for outdoor firefighting of buildings of agricultural facilities with fire resistance grade I and II with volume not exceeding 5 000 m3, fire and explosion hazard class D and E shall be 5 L/s.

NOTE 4: Water flow rate for outdoor fire fighting in radio stations and television stations does not depend of volume of the stations and number of people living in the vicinity of the stations but rather no less than 15 L/s even when Table 9 and Table 10 specify a lower value.

NOTE 5: Water flow rate for outdoor fire fighting for buildings with volume exceeding values under Table 9 and Table 10 shall comply with special requirements.

NOTE 6: In case of buildings with fire-resistance grade II and made from wooden structures, water flow rate for outdoor fire fighting shall equal with values under Table 9 and Table 10 plus 5 L/s.

NOTE 7: Water flow rate for outdoor fire fighting for buildings and areas of refrigerated food warehouses shall use values of buildings fire hazard class C.

NOTE 8: The flow of outdoor firefighting water for container storage facilities with cargo depends on the number of containers, which are taken as follows:

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- From 30 to 50 containers: take 15 L/s;
- From 51 to 100 containers: take 20 L/s;
- From 101 to 300 containers: take 25 L/s;
- From 301 to 1 000 containers: take 40 L/s;
- From 1 001 to 1 500 containers: take 60 L/s;
- From 1 501 to 2 000 containers: take 80 L/s;
- From 2 000 or more containers: take 100 L/s;

**Table 7 – Water flow rate for outdoor fire fighting in residential areas**

| **Population,** x 1 000 occupant | **Number of fire at the same time** | **Outdoor water flow rate for extinguishing 1 fire,** L/s | |
|---|---|---|---|
| | | Buildings not taller than 2 stories, regardless of fire resistance grade | Buildings of 3 stories or higher, regardless of fire resistance grade |
| ≤ 1 | 1 | 5 | 10 |
| > 1 & ≤ 5 | 1 | 10 | 10 |
| > 5 & ≤ 10 | 1 | 10 | 15 |
| > 10 & ≤ 25 | 2 | 10 | 15 |
| > 25 & ≤ 50 | 2 | 20 | 25 |
| > 50 & ≤ 100 | 2 | 25 | 35 |
| > 100 & ≤ 200 | 3 | 40 | 40 |
| > 200 & ≤ 300 | 3 | 55 | |
| > 300 & ≤ 400 | 3 | 70 | |
| > 400 & ≤ 500 | 3 | 80 | |
| > 500 & ≤ 600 | 3 | 85 | |
| > 600 & ≤ 700 | 3 | 90 | |
| > 700 & ≤ 800 | 3 | 95 | |
| > 800 & ≤ 1 000 | 3 | 100 | |
| > 1 000 | 5 | 110 | |

NOTE 1: Water flow rate for outdoor fire fighting in residential area shall not be lower than the values in Table 8.

NOTE 2: When supplying water regionally, water flow rate for outdoor fire fighting and number of simultaneous fire of each region shall depend on population in the region.

NOTE 3: Number of simultaneous fire and water flow rate for 1 fire in a region with more than 1 million in population shall conform to special technical requirements.

NOTE 4: For systems of pipe clusters, number of simultaneous fire shall depend on total population living in the areas which clusters connecting to the pipe systems. Water flow rate for restoring water supply for firefighting by pipe clusters determined by total maximum water amount supplied for residential areas (corresponding to number of simultaneous fire) for firefighting in accordance to 5.1.3.3 and 5.1.3.4.

NOTE 5: Number of simultaneous fire in residential areas to be calculated shall include fire occurring in manufacturing facilities and warehouses situated within the residential areas. In that case, calculated water flow rate shall also include value for extinguishing fire in said buildings and not be lower than values in Table 7.

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**Table 8 – Water flow rate for outdoor fire fighting in buildings under F1, F2, F3 and F4 occupancy fire hazard categories**

| **Building category** | **Water flow rate for outdoor fire fighting regardless of fire-resistance grade, calculating for 1 fire,** L/s**, for building volume,** 1 000 $m^3$ | | | | |
|---|---|---|---|---|---|
| | **≤ 1** | **> 1 & ≤ 5** | **> 5 & ≤ 25** | **> 25 & ≤ 50** | **> 50** |
| 1. Category F1.3, F1.4 buildings with one or more blocks and have number of storey: | | | | | |
| ≤ 3 | 10 [1)] | 10 [1)] | 15 | 15 | 20 |
| > 3 & ≤ 12 | 10 | 15 | 15 | 20 | 20 |
| > 12 & ≤ 16 | – | 20 | 20 | 25 | 25 |
| > 16 | – | 20 | 25 | 25 | 30 |
| 2. Category F1.1, F1.2, F2, F3 and F4 buildings with number of storey: | | | | | |
| ≤ 3 | 10 [1)] | 10 [1)] | 15 | 20 | 25 |
| > 3 & ≤ 12 | 10 | 15 | 20 | 25 | 30 |
| > 12 & ≤ 16 | – | 20 | 25 | 30 | 35 |
| > 16 | – | 25 | 30 | 30 | 35 |

[1)] For residential areas in villages, communes (rural areas), water flow rate for 1 fire shall be 5 L/s.

NOTE 1: If performance of outdoor pipelines is not enough to deliver calculated water amount for firefighting or when connecting the pipes to end sections, it is required to consider installation of tubs and/or tanks with adequate volume to store water sufficient for outdoor fire fighting for 3 hours.

NOTE 2: In residential areas without water pipes for fire fighting, tubs and/or tanks are required to guarantee fire fighting for 3 hours.

**Table 9 – Water flow rate for outdoor fire fighting in category F5 buildings**

| **Building fire-resistance grade** | **Structural fire hazard levels** | **Fire and explosion hazard classes** | **Water flow rate for outdoor fire fighting of buildings with roof openings does not depend on the width of the building, as well as buildings without openings in the roof with a width not greater than 60 m, calculated for 1 fire,** L/s**, by building volume,** 1 000 $m^3$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | ≤ 3 | > 3 & ≤ 5 | > 5 & ≤ 20 | > 20 & ≤ 50 | > 50 & ≤ 200 | > 200 & ≤ 400 | > 400 & ≤ 600 | > 600 |
| I & II | S0, S1 | D, E | 10 | 10 | 10 | 10 | 15 | 20 | 25 | 35 |
| I & II | S0, S1 | A, B, C | 10 | 10 | 15 | 20 | 30 | 35 | 40 | 50 |
| III | S0, S1 | D, E | 10 | 10 | 15 | 25 | 35 | 40 | 45 | – |
| III | S0 | A, B, C | 10 | 15 | 20 | 30 | 45 | 60 | 75 | – |
| IV | S0, S1 | D, E | 10 | 15 | 20 | 30 | 40 | 50 | 60 | – |
| IV | S0, S1 | A, B, C | 15 | 20 | 25 | 40 | 60 | 80 | 100 | – |
| IV | S2, S3 | E | 10 | 15 | 20 | 30 | 45 | – | – | – |
| IV | S2, S3 | A, B, C | 15 | 20 | 25 | 40 | 65 | – | – | – |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| V | – | E | 10 | 15 | 20 | 30 | 55 | – | – | – |
| V | – | C | 15 | 20 | 25 | 40 | 70 | – | – | – |

**Table 10 – Water flow rate for outdoor fire fighting in F5 buildings without roof opening and the width greater than 60m**

| **Building fire-resistance grade** | **Structural fire hazard levels** | **Fire and explosion hazard classes** | **Water flow rate for outdoor fire fighting of building without roof opening and wider than 60 m, for 1 fire,** L/s**, by building volume,** 1 000 m3 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ≤ 50 | > 50 & ≤ 100 | > 100 & ≤ 200 | > 200 & ≤ 300 | > 300 & ≤ 400 | > 400 & ≤ 500 | > 500 & ≤ 600 | > 600 & ≤ 700 | > 700 |
| I & II | S0 | A, B, C | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| I & II | S0 | D, E | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| NOTE: Roof openings are openings for ventilation placed on the roof structure of a building (wind roof) with an area not less than 2.5% of the construction area of that building. | | | | | | | | | | | |

**5.1.2.4** Water flow rate for outdoor fire fighting of building separated by fire-blocking walls shall depend on sections of the buildings that require the largest amount

**5.1.2.5** Water flow rate for outdoor fire fighting of building separated by fire-blocking walls shall be determined by overall volume of the buildings and the highest class of fire and explosion hazard class.

**5.1.2.6** Water flow rate for firefighting shall be guaranteed even when other water demand is largest, specifically:

- Domestic water;

- Individual business households;

- Industrial and agricultural manufacturing facilities where drinking water quality or economic purposes are inadequate for installation of separate pipelines;

- Water treatment stations, pipe and duct networks, etc;

- In case technological advances allow, part of water for manufacturing shall be permitted to use for fire fighting, connect hydrants of manufacturing pipe networks wisth hydrants of fire fighting pipe networks to guarantee adequate amount of water for fire fighting.

**5.1.2.7** Water supply systems for firefighting of facilities (water pipes, pumping stations, tanks and tubs containing water for firefighting) shall not stop supplying water for more than 10 minutes and reduce flow rate more than 30 % of calculated values for 3 days.

**5.1.2.8** In case buildings are located in areas not provided with adequate outdoor fire fighting water supply infrastructure in accordance to Tables 8, 9 and 10, comply with instructions of competent Police Departments of Fire Prevention and Fighting and Rescue.

**5.1.3** Calculated number of simultaneous fire

**5.1.3.1** Number of simultaneous fire of an industrial or agricultural facility shall be calculated based on area of the facility, to be specific:

- Consider as 1 fire if the facility area is up to 150 ha.

- Consider as 2 fires if the facility area is larger than 150 ha.

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Number of simultaneous fire calculated for an exposed or enclosed storage area containing wooden materials shall be as follows: consider as 1 fire if the facility area is up to 50 ha; consider as 2 fires if the facility is larger than 50 ha.

NOTE: The area of the facility to be calculated for the outdoor fire water supply system is the area of the facility's land (excluding forest land, green park land, agricultural land or similar lands on which there is no construction).

**5.1.3.2** When merging pipelines of a residential area and an industrial facility situated outside of the residential area, number of simultaneous fire shall be calculated as follows:

- When the industrial area is as large as 150 ha and population of the residential area is up to 10 000 people, consider as 1 fire (apply the higher value of water flow rate); and with population ranging from 10 000 to 25 000 people, consider as 2 fires (1 fire for the industrial facility and 1 fire for the residential area);

- When the industrial area is as large as 150 ha and population of the residential area is up to 10 000 people, consider as 1 fire (apply the higher value of water flow rate); and with population ranging from 10 000 to 25 000 people, consider as 2 fires (1 fire for the industrial facility and 1 fire for the residential area);

- When the population exceeds 25 000 people, take as 2 fires, where water flow rate off 1 fire shall equal total flow rate of the higher demand (of industrial facility or residential area) and 50 % of the lower demand (of industrial facility or residential area).

**5.1.3.3** Fire fighting duration shall be 3 hours, except for special cases specified below:

- With respect to buildings of fire resistance grade I, II with structures and thermal insulation layers made from non-flammable materials and areas of fire hazard class D and E, the fire fighting duration shall be 2 hours;

- For kindergartens, preschools, buildings belonging to occupancy fire hazard category F4.1, F4.3 in rural areas, with fire resistance grades I and II with structures and insulation made of non-combustible materials not exceeding 3 floors, the construction area up to 500 $m^2$ is 1 hour;

- For kindergartens, preschools, buildings belonging to occupancy fire hazard category F4.1, F4.3 in rural areas, with fire resistance grades I and II with structures and insulation made of non-combustible materials not exceeding 3 floors, construction area up to 500 $m^2$, it is permissible to use the internal fire hydrant system to replace outdoor fire water supply system;

- With respect to exposed storage containing wooden materials, not less than 5 hours.

**5.1.3.4** The maximum amount time to restore amount of fire fighting water shall not be more than:

- 24 hours for residential areas and industrial areas with areas under fire hazard class A, B and C;

- 36 hours for industrial facilities with areas under fire hazard class D and E;

- 72 hours for residential areas and agricultural facilities.

NOTE: Industrial facilities, that require up to 20 L/s for outdoor fire fighting, shall be permitted to increase maximum amount of time to restore water for firefighting as follows:

a) Up to 48 hours for areas under fire hazard class D and E.

b) Up to 36 hours for areas under fire hazard class C.

water within the specified time period, provide additional nth time of water for fire fighting. Value of n (n = 1.5; 2.0; 2.5; 3.0, etc) depends on actual restoration period, ttt, and shall be calculated by using following formula:

$$n = t_{tt} / t_{qđ}$$

In which: $t_{tt}$ - actual period of restoring fire fighting water;

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$t_{qđ}$ - period of restoring fire fighting water (according to 5.1.3.4).

**5.1.4** Fire safety requirements for pipe networks and constructions constructed thereon

**5.1.4.1** When installing 2 supply pipes or more, valves to switch between the pipes shall be required so in case 1 supply pipe is entirely or partially closed, fire fighting service is still 100 % guaranteed.

**5.1.4.2** Pipeline network carrying water for firefighting shall be loop network. Dead-end pipe shall be permitted to install, provide that: supplying water for firefighting or daily routines - fire fighting if the length of the pipelines does not exceed 200 m regardless of required water flow rate for fire fighting.

Do not install loop network of outdoor pipe networks with indoor pipe networks.

In residential areas with population of up to 5 000 people and requiring up to 10 L/s water flow rate for firefighting or having up to 12 indoor hydrants, dead-end networks longer than 200 m shall be permitted to install if tanks, tubs, gravity tanks or circulating baths are provided for dead end networks which contain the whole amount of water for fire fighting.

**5.1.4.3** The pipe shall be divided into sections by locking valves to ensure in repairing, no more than 05 fire hydrants will be disconnected

**5.1.4.4** Valves on pipelines regardless of diameters that are remotely or automatically controlled shall be electrically controlled type.

Compressed air, hydraulics or electromagnetic valves shall be permitted.

In case of not being remotely or automatically controlled, locking valves up to 400 mm in diameter shall be permitted to manually lock, valves with more than 400 mm in diameter shall be locked electrically or by hydraulics; in special cases with approved waiver statement, manual valves shall be permitted with more than 400 mm in diameter.

In all cases, it is required to allow manual operation.

**5.1.4.5** Diameter of supply pipelines and the network after the supply pipelines shall be calculated based on:

- Technical and economic factors.

- Working conditions in case accidents interrupt different sections.

Diameter of outdoor fire fighting pipelines in residential areas and manufacturing facilities shall not be less than 100 mm, in rural areas – not smaller than 75 mm.

**5.1.4.6** Fire hydrants shall be located at a distance not greater than 2.5 m to the edge of the road, but not closer than 1 m to the wall of the building; allowing the placement of water hydrants (underground posts) in the roads

**5.1.4.7** Fire hydrants shall be arranged on the pipeline network so that at least 02 posts when the required flow is 15 L/s or more, at least 01 post when the required flow is less than 15 L/s serving to all points of the building horizontally and the service radius of each water post is not greater than 200 m in terms of fire hydrants traveling outside of the building.

NOTE: On the pipeline network for residential points up to 500 people, it is permissible to replace 3-outlets type fire hydrants with an DN 80 mm riser come with water hydrants.

**5.1.4.8** The construction required to equipped with fire hydrant systems as well as automatic sprinkler fire fighting systems shall have pipes connected from the fire water supply pumping station of the project to at least 01 fire water supply 03 outlets post or 02 DN65 outlets type located on the outside of the construction wall towards the road.

**5.1.5** Requirements for tubs and tanks storing water for outdoor fire fighting.

**5.1.5.1** Functions of tubs and tanks providing water shall include circulating, fire fighting, emergency

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and containing of feed water.

**5.1.5.2** If collection of water for firefighting directly from water sources does not conform to economic and technical conditions, tanks and tubs shall contain adequate calculated amount of water for fire fighting.

**5.1.5.3** Volume of water in tanks and tubs shall be calculated so as to ensure:

- Provide fire fighting water from outdoor hydrant and other fire fighting systems;

- Provide water for dedicated fire fighting equipment (sprinklers, drenchers, etc.) that do not have separate tanks;

- Maximum water amount for daily routines and manufacturing during fire fighting process.

**5.1.5.4** Reservoirs and basins providing water for fire engines shall have access and staging area with dimensions of not less than 12 m x 12 m and surfaces capable of withstanding load of fire engines.

When determining volume of fire fighting water in tubs and tanks, it shall be permitted to take into account refilling the tubs and tanks during fire fighting process in case of water supply systems satisfactory to 5.1.2.7.

**5.1.5.5** When supplying water via 1 pipeline, it is required to have reserved water amount for fire fighting, determined in accordance to 5.1.5.3.

The reversed water amount shall be permitted not take in to account if the length of a supply pipeline does not exceed 500 m in a residential area with less than 5 000 people and entities requiring no more than 40 L/s of water for outdoor fire fighting.

**5.1.5.6** Total number of tanks and tubs for fire fighting in a pipe network shall not be less than 2 (not apply for tubs, tanks supply outdoor water of invidual construction).

The lowest and highest level of fire fighting water among all tubs and tanks in the same network shall be the same.

Upon shutting a tank or tub, the amount of water for firefighting stored in other tubs and tanks shall not be less than 50 % of the amount of water required for fire fighting.

**5.1.5.7** Storing water in dedicated tubs and tanks or exposed basins shall be permitted in case of:

- A residential with up to 5 000 people;

- Buildings, regardless of occupancy, located separately outside of residential areas having no pipe networks for supplying water for daily routines or manufacturing and for supplying necessary water amount for outdoor water supply system;

- Buildings with multi occupancies requiring not more than 10 L/s of water for outdoor fire fighting;

- Buildings with 1 to 2 stories, regardless of occupancy, having construction area not larger than area of fire compartments applied to the building types.

**5.1.5.8** Amount of water for firefighting of tubs, tanks and man-made reservoirs shall be determined based on calculation of amount of consumed water and duration of fire fighting according to 5.1.2.2, 5.1.2.3, 5.1.2.4, 5.1.2.5, 5.1.2.6 and 5.1.3.3.

NOTE 1: Calculation volume of water for firefighting of man-made reservoirs shall take into account possibilities of evaporation and freezing of water. Minimum water level shall not be less than 0.5 m.

NOTE 2: It is required to ensure accessibility of fire engines to tank, tub and similar water collecting positions.

**5.1.5.9** Tanks, tubs, outdoor fire hydrant, natural and artificial basins for firefighting shall be located within following radius:

- 200 m in case of pump trucks;

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- 100 m to 150 m within technical operation range of mobile pumps in case of mobile pumps;

- To increase operation radius, dead end pipes shall be permitted to install not longer than 200 m from the tanks, tubs and artificial basins in accordance to 5.1.5.8;

- Distance from points of collecting water in tanks, tubs or artificial basins to buildings with fire-resistance grade III, IV and V or to exposed warehouses containing combustible materials shall not be less than 30 m, to buildings with fire resistance grade I and II shall not be less than 10 m.

**5.1.5.10** If it is infeasible to suck water for firefighting directly from tanks, tubs or reservoirs by pump trucks or mobile pumps, it is required to provide basins with volume ranging from 3 $m^3$ to 5 $m^3$. Diameter of pipes connecting tubs, tanks or reservoirs with the basins shall be calculated based on factors of calculating water flow rate for outdoor fire fighting but no less than 200 mm. Valve boxes shall be installed on pipelines to lock water circulation, closing and opening of valves shall be performed from the outside of the boxes. The pipe ends in the man-made reservoirs shall be installed with sieves.

**5.1.5.11** Pressure tanks and tubs for firefighting shall be equipped with water level gauges, devices reporting water level to pump stations or water distribution stations.

Pressure tanks and tubs of high-pressure pipelines for firefighting shall be equipped with devices that automatically stop water from being carried to tubs, tanks and water towers when fire fighting pumps are operating.

**5.1.5.12** Pressure tanks and tubs that use pressurized compressed air shall have alternative compressing machines in addition to active compressing machines.

## 5.2 Indoor fire hydrant systems

**5.2.1** Residential buildings, public buildings, administrative buildings – auxiliary buildings of industrial constructions shall be equipped with indoor fire hydrant systems, minimum water flow rate for fire fighting is determined according to Table 11, in case of manufacturing facilities and warehouses, consult Table 12.

When determining necessary water flow rate, it is required to base on height of solid stream and diameter of nozzles specified in Table 13. In that case, calculate simultaneous operation of the nozzles and other fire fighting systems.

Based on water supply flow, fire hydrants are classified into:

- Low flow (from 0.2 L/s to 1.5 L/s). Equipment for low-flow fire hydrant with a diameter of DN 5, DN 10, DN 15, DN 20, DN 25, DN 40;

- Average flow (greater than 1.5 L/s).

In case of low-flow water hydrants, the total water supply flow and specific water jet height shall be determined in accordance to tables 11, 12 and 13.

**Table 11 – Minimum number of streams and water flow rate for indoor fire hydrant systems**

| Residential and public buildings | Number streams per storey | Minimum flow rate for indoor fire fighting, L/s, of 1 stream |
|---|---|---|
| **1. Residential buildings, apartment buildings** | | |
| ≤ 16 stories, when common corridor ≤ 10m | 1 | 2.5 |
| ≤ 16 stories, when common corridor > 10m | 2 | 2.5 |
| > 16 & ≤ 25 stories, when common corridor ≤ 10m | 2 | 2.5 |
| > 16 & ≤ 25 stories, when common corridor > 10m | 3 | 2.5 |

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| | | |
|---|---|---|
| **2. Administrative buildings[1)]** | | |
| ≤ 10 floors and volume ≤ 25 000 $m^3$ | 1 | 2.5 |
| ≤ 10 floors and volume > 25 000 $m^3$ | 2 | 2.5 |
| > 10 floors and volume ≤ 25 000 $m^3$ | 2 | 2.5 |
| > 10 floors and volume > 25 000 $m^3$ | 3 | 2.5 |
| **3. Club rooms containing stages, theatres, cinemas, and rooms equipped with audiovisual devices (conference rooms, seminar rooms, etc.)** | | |
| ≤ 300 seats | 2 | 2.5 |
| > 300 seats | 2 | 5.0 |
| **4. Dorms and public buildings (except Section 2) [2)]** | | |
| ≤ 10 floors and volume ≤ 25 000 $m^3$ | 1 | 2.5 |
| ≤ 10 floors and volume > 25 000 $m^3$ | 2 | 2.5 |
| > 10 floors and volume ≤ 25 000 $m^3$ | 2 | 2.5 |
| > 10 floors and volume > 25 000 $m^3$ | 3 | 2.5 |
| **5. Administrative – auxiliary buildings of industrial structures with volume** | | |
| ≤ 25 000 $m^3$ | 1 | 2.5 |
| > 25 000 $m^3$ | 2 | 2.5 |

1) Headquarters of state agencies, working buildings of enterprises, political and social organizations, post offices, radio, television and telecommunications establishments, information equipment installers, data storage and management centers, etc and the buildings with similar functions.

2) Public buildings and constructions of similar functions, such as:

– Dormitory buildings, mixed buildings, hotels, individual buildings combining other functions, guest buildings, motels, hostels and other accommodation establishments established under the Law on Tourism;

– Establishments of karaoke service, discos, bars, clubs, beauty salons, massage service businesses, amusement parks, zoos, aquariums;

– Electronics stores, supermarkets, department stores; convenience stores, restaurants, food outlets; – Polyclinics and specialties; beauty salons;

– Museums, libraries, exhibitors, galleries, archives, bookstores, fair houses;

– Stadiums, sports arenas, indoor sports arenas, fitness centers, sports centers, racetracks, shooting ranges and other sports establishments established under the Law on Physical Education and Sports;

– Airports, air traffic control stations, seaports, dry ports, inland waterway ports, bus stations, rest stops, railway stations, cable car shelters, subway buildings, motor vehicle registration facilities, business shops, car repair and maintenance, motorcycles, mopeds;

– Kindergartens, preschools, primary schools, middle schools, high schools, high schools with multi-levels of education, colleges, universities, academies, professional secondary schools, vocational schools; continuing education institutions and other educational institutions established under the Law on Education;

– Nursing homes, rehabilitation, orthopedics.

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**Table 12 – Number of streams and minimum water flow rate for indoor fire fighting in manufacturing facilities and warehouses**

| Building fire-resistance grade | Fire and explosion hazard classes | Structural fire hazard level | Minimum number of streams and water flow rate, L/s, for 1 stream, for indoor fire fighting in manufacturing facilities and warehouses with fire protection height up to 50 m in height and by volume, 1 000 m³ | |
|---|---|---|---|---|
| | | | ≤ 150 | > 150 |
| I, II | A, B, C | S0, S1 | 2 × 2.5 | 3 × 2.5 |
| | D, E | Not specified | 1 × 2.5 | 1 × 2.5 |
| III | A, B, C | S0 | 2 × 2.5 | 3 × 2.5 |
| | D, E | S0, S1 | 1 × 2,5 | 2 × 2.5 |
| IV | A, B | S0 | 2 × 2.5 | 3 × 2.5 |
| | C | S0, S1 | 2 × 2.5 | 2 × 5 |
| | C | S2, S3 | 3 × 2.5 | 4 × 2.5 |
| | D, E | S0, S1, S2, S3 | 1 × 2.5 | 2 × 2.5 |
| V | C | Not specified | 2 × 2.5 | 2 × 5 |
| | D, E | Not specified | 1 × 2.5 | 2 × 2.5 |

**Table 13 - Flow rate of water for firefighting depending on height of solid streams and diameter of nozzles**

| Height of solid stream, m | Flow rate of nozzles, L/s | Pressure, MPa, of fire hydrants with length of hose reel, m | | | Flow rate of nozzles, L/s | Pressure, MPa, of fire hydrants with length of hose reel, m | | | Flow rate of nozzles, L/s | Pressure, MPa, of fire hydrants with length of hose reel, m | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10 | 15 | 20 | | 10 | 15 | 20 | | 10 | 15 | 20 |
| | Diameter of nozzle, mm | | | | | | | | | | | |
| | 13 | | | | 16 | | | | 19 | | | |
| | Fire hydrant DN 50[1)] | | | | | | | | | | | |
| 6 | – | – | – | – | 2.6 | 0.092 | 0.096 | 0.100 | 3.4 | 0.088 | 0.096 | 0.104 |
| 8 | – | – | – | – | 2.9 | 0.120 | 0.125 | 0.130 | 4.1 | 0.129 | 0.138 | 0.148 |
| 10 | – | – | – | – | 3.3 | 0.151 | 0.157 | 0.164 | 4.6 | 0.160 | 0.173 | 0.185 |
| 12 | 2.6 | 0.202 | 0.206 | 0.210 | 3.7 | 0.192 | 0.196 | 0.210 | 5.2 | 0.206 | 0.223 | 0.240 |
| 14 | 2.8 | 0.236 | 0.241 | 0.245 | 4.2 | 0.248 | 0.255 | 0.263 | – | – | – | – |
| 16 | 3.2 | 0.316 | 0.322 | 0.328 | 4.6 | 0.293 | 0.300 | 0.318 | – | – | – | – |
| 18 | 3.6 | 0.390 | 0.398 | 0.406 | 5.1 | 0.360 | 0.380 | 0.400 | – | – | – | – |
| | Fire hydrant DN 65[1)] | | | | | | | | | | | |
| 6 | – | – | – | – | 2.6 | 0.088 | 0.089 | 0.090 | 3.4 | 0.078 | 0.080 | 0.083 |
| 8 | – | – | – | – | 2.9 | 0.110 | 0.112 | 0.114 | 4.1 | 0.114 | 0.117 | 0.121 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | – | – | – | – | 3.3 | 0.140 | 0.143 | 0.146 | 4.6 | 0.143 | 0.147 | 0.151 |
| 12 | 2.6 | 0.198 | 0.199 | 0.201 | 3.7 | 0.180 | 0.183 | 0.186 | 5.2 | 0.182 | 0.190 | 0.199 |
| 14 | 2.8 | 0.23 | 0.231 | 0.233 | 4.2 | 0.230 | 0.233 | 0.235 | 5.7 | 0.218 | 0.224 | 0.230 |
| 16 | 3.2 | 0.31 | 0.313 | 0.315 | 4.6 | 0.276 | 0.280 | 0.284 | 6.3 | 0.266 | 0.273 | 0.280 |
| 18 | 3.6 | 0.38 | 0.383 | 0.385 | 5.1 | 0.338 | 0.342 | 0.346 | 7.0 | 0.329 | 0.338 | 0.348 |
| 20 | 4.0 | 0.464 | 0.467 | 0.470 | 5.6 | 0.412 | 0.424 | 0.418 | 7.5 | 0.372 | 0.385 | 0.397 |
| 1) DN – Short for Diameter Nominal – units in millimeters (mm). | | | | | | | | | | | | |

**5.2.2** For calculation of pump capacity and reserved water for fire fighting, number of streams and water flow rate for fire fighting in sections of public buildings that are situated at fire protection height above 50 m shall be 4 streams and 2.5 L/s per stream. With respect to F5 buildings with A, B or C fire hazard classes with FLS height exceed 50m, it shall be 4 streams and 5 L/s per stream.

**5.2.3** With respect to manufacturing facilities and warehouses constructed from materials that are prone to damage of fire, minimum water flow rate for determining pump capacity and amount of water reserved for firefighting specified in Table 12 shall be increased in following cases:

- In case of steel structures that do not receive fire protections in buildings of fire-resistance grade III, IV (class S2, S3), as well structures made from natural wood or compressed wood (which is fire-retardant-treated wood), shall increase by 5 L/s;

- In case of flammable substances surrounding structures of buildings with fire-resistance grade IV (class S2, S3), increase by 5 L/s for buildings with up to 10 000 $m^3$ in volume. In case of buildings with more than 10000 $m^3$ in volume, increase flow rate by 5 L/s for every extra 100 000 $m^3$ or for extra volume beyond the increased 100 000 $m^3$.

**5.2.4** Number of fire fighting streams for each fire point shall be 2 streams for structure that require more than 2 streams.

**5.2.5** With respect to building sections with different occupancies, fire fighting water flow rate shall be separately calculated for each section according to 5.2.1 and 5.2.2. In that case, water flow rate for indoor fire fighting shall be calculated as follows:

- With respect to buildings that are not separated by fire-blocking walls, calculate based on general volume;

- With respect to buildings separated by class 1 or 2 fire-blocking walls, calculate based on volume of building sections that require higher water flow rate.

When connecting buildings of fire-resistance grade I and II by passages made from non-flammable materials and equipped with fire-rated doors, volume of buildings serving determination of water flow rate for firefighting shall be volume of individual buildings; in case of no fire-blocking doors, calculate based on overall volume and higher fire hazard class.

**5.2.6** Hydrostatic pressure in domestic – firefighting water systems measured in sanitation – technical equipment installed at the lowest elevation shall not exceed 0.45 MPa.

Hydrostatic pressure of separate fire fighting systems measured in fire hydrants installed at the lowest elevation shall not exceed 0.90 MPa.

During calculation, if pressure in fire fighting systems exceeds 0.45 MPa, separate fire fighting system shall be installed.

When pressure between valves and connecting ends of fire hydrants exceeds 0.4 MPa, barrier and device that adjust pressure shall be provided to lower excess pressure.

**5.2.7** Discharge pressure of fire hydrants shall guarantee height of solid streams necessary for firefighting at any given time of the day even in the highest and furthest areas. Minimum height and

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operation radius of solid streams for firefighting shall equal height of the area calculated from floor to the highest point of beams (ceiling) but no less than following values:

- With respect to residential buildings, public buildings, manufacturing facilities and auxiliary buildings of industrial structures, up to 50 m in fire protection height and no less than 6 m in radius.

- With respect to residential buildings, fire protection height greater than 50 m and not smaller than 8m in radius.

- With respect to public buildings, manufacturing facilities and auxiliary buildings of industrial structures, fire protection height greater than 50 m and no less than 16 m in radius.

NOTE 1: Pressure of fire hydrants shall take into account losses due to fire hose reels with 10 m, 15 m and 20 m in length.

NOTE 2: To receive solid streams with up to 4 L/s of flow rate, use DN 50 fire hydrants and DN 65 hydrants for higher flow rate. In case economic – technical documents permit, may use DN 50 hydrants for flow rate exceeding 4 L/s.

**5.2.8** Pressure tanks in buildings shall be designed to ensure generation of solid stream higher than 4m at the highest storey or at the storey situated immediately below the storey where the tanks are placed and shall not be less than 6 m for remaining stories; in that case, ensure 2 streams with flow rate of 2.5 L/s in 10 minutes if number of calculated streams is 2 or more and 1 stream in other cases.

When installing fire hydrants as sensors for automatic operation of fire fighting pumps, consideration to pressure tanks is not required.

**5.2.9** In case of installing fire hydrant systems separately from automatic fire fighting systems, volume of reservoir tanks containing water shall provide enough water to be used in 1 hour for fire fighting and other demands.

When installing fire hydrant systems on automatic fire fighting systems, working duration of the hydrant shall equal the working duration of the fire fighting systems.

**5.2.10** When domestic water systems and fire fighting water systems in buildings with at least 6 stories are connected, upper vertical pipes shall be connected in loop model. In that case, in order to guarantee household water change, vertical pipes shall be connected to one or many vertical drainage pipes with valves in loop model.

Dry pipes of fire fighting systems installed in buildings that are not heated, valves shall be installed in places where the valves cannot be frozen.

**5.2.11** Determination of location and number of indoor riser and fire hydrant shall be in accordance with following requirements:

- It shall be permitted to install double hydrant on riser in manufacturing facilities and public buildings when number of calculated streams is not less than 3 and not less than 2 in residential buildings;

- In residential buildings with corridor length up to 10 m and number of stream are 2 for each points, it shall be permitted to provide 2 streams on one riser;

- In residential buildings with corridor length up to 10m, as well as manufacturing facilities and public buildings with 2 calculated streams or more per points, it is required to provide 2 streams from 2 adjacent fire cabinets (2 different fire hydrants).

NOTE 1: Shall install fire hydrants in technical floor, garrets and basement technical floors if objects and structures in such paces made from combustible materials.

NOTE 2: Number of streams generated from each cabinet shall not exceed 2.

**5.2.12** Fire hydrants shall be installed in a way that hydrant openings are 1.20 m ± 0.15 m above the floor and in cabinets with ventilation hole and applied with seal. Double hydrant shall be permitted to install vertically, 1 hydrant located on 1 lower hydrant, the lower hydrant shall be at least 1 m above the floors.

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**5.2.13** The indoor fire hydrant system shall have a dry hydrant installed outside the building, with a connector of an appropriate size for fire department connection. For buildings with 17 stories or more, the dry hydrant for water supply for the indoor fire hydrant system in the building shall be divided into zone with zone height not greater than 50m. These hydrants shall be provided with check valves and sealed opening.

**5.2.14** Indoor hydrants shall be installed at the entrances of the corridors (where water is not subject to freezing) of staircases (except smoke stop stair enclosures), in lobbies, corridors, passages and other accessible locations. Installation of indoor hydrants mentioned above shall not obstruct egress operations.

**5.2.15** In areas protected by automatic fire fighting systems, indoor fire hydrants on DN 65 pipes or larger shall be permitted to provide, following control valve clusters of water sprinkler systems.

**5.2.16** In enclosed areas where water can be frozen, pipes of indoor hydrant systems following the pump stations shall be permitted to be dry pipes.

**5.2.17** Valves to cut water from dead end branching pipes and major cut valves from circular steel pipelines shall be installed in a manner that each section shall only cut water from a maximum of 5 hydrants located on the same storey.

**5.2.18** Based on the occupancy of the protected object, the following options for equipping the fire extinguishing water system could be selected:

- Option 1: use medium-flow fire hydrants. This option is allowed to apply to all types of buildings;

- Option 2: use of small-flow fire hydrants in combination with dry hydrant piping. This option is allowed to apply to all types of building;

- Option 3: use medium-flow fire hydrants. This option is allowed to apply to buildings equipped with automatic fire extinguishing systems for the entire project;

- Option 4: use of small-flow fire hydrants in combination with dry hydrant piping. This option is allowed to apply to all types of buildings.

In one project, it is permissible to combine many different options for equipping fire hydrants.

### 5.3 Fire water pumping station

**5.3.1** Fire pumps, whether designed separately or combined with domestic and production water systems, shall have alternative pumps, with a capacity equivalent to the main pump. The number of alternative pumps is prescribed as follows:

- When calculating the demand for one to three main fire pumps, there shall be at least one alternative pump;

- When calculating the demand for four or more main fire pumps, there shall be at least two alternative pumps;

The fire pumps shall be connected to two separate power sources from the mains, the power supply from the generator or using an internal combustion engine pump. It is permissible not to equip alternative pumps or backup power sources when supplying water to manufacturers, warehouses with fire resistance grade I, II with fire hazard class, explosion class D, E and outdoor fire water supply flow requires less than 20 L/s.

**5.3.2** Fire pumps can be controlled on-site manually or remotely automatically and shall ensure that the pump is activated and operated no later than 3 minutes upon the activation of the fire alarm signal. When the water supply for outdoor firefighting system requires 25 L/s or more, there shall be a remote automatic fire pump control mechanism.

**5.3.3** When the designers of the indoor fire hydrant system have insufficient water pressure to supply the fire hydrants, there shall be a remote pump control unit located right at the fire hydrant.

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# 6 FIREFIGHTING AND RESCUE

**6.1** Buildings and constructions shall guarantee fire fighting and rescue by adopting solutions regarding: structures, premise - spatial distribution, technical - construction and organization.

The solutions include:

- Provide fire engine driveways, fire engine accessway and access for fire department and fire-fighting facilities which are integrated or separated with passage ways, aisles depending on building occupancy;

- Provide fire fighting transports methods outside of buildings and prepare other necessary facilities to provide fire department an fire fighting technical equipment with access to stories and roof of buildings, which includes elevators that are installed with “fire brigade transportation” (hereinafter referred to as “fire lifts”);

- Provide water supply pipes for firefighting integrated with water pipes providing water for daily routines or placed separately and if necessary, install standpipe, fire department connection hydrant to supply water to indoor system for fire department, hydrants, water tanks for firefighting or other sources of water supply for fire fighting;

- Provide smoke protection for passages of fire department inside the buildings;

- Provide medical emergency equipment for personal use and group use where necessary;

- Distribute and develop constructions, fire brigade and stations suitable for number of employees and necessary fire fighting technical equipment, satisfactory to fire fighting conditions in buildings or areas of operation of the brigade and stations as per the regulations.

The solutions mentioned above shall be selected based on fire-resistance grades, structural fire hazard levels and occupancy fire hazard categories of buildings.

In localities that do not have sufficient conditions for public transport infrastructure and general water supply as prescribed by this Code, firefighting and rescue solutions shall be carried out according to the separate guidelines of state management agencies in charge of fire protection in those localities.

## 6.2 Fire engine driveways and accessways

**6.2.1** General Requirements.

**6.2.1.1** Clearwidth of fire engine driveway shall not be less than 3.5 m.

**6.2.1.2** Clearwidth of fire engine accessway shall ensure accessibility for deployment of fire-fighting facilities in compliance with height protection height and occupancy fire hazard category of buildings mentioned in Table 14.

**Table 14 – Dimensions of fire engine accessway**

| **Occupancy fire hazard category / Dimension criteria of accessway** | **Dimensions of fire engine accessway,** m **based on fire protection height of the building,** m | | |
|---|---|---|---|
| | **≤ 15** | **> 15 & ≤ 28** 1) | **> 28** |
| 1. F1.3 building | | | |
| a) Width of fire engine accessway | Not required | ≥ 6 | ≥ 6 |
| b) Length of fire engine accessway | Not required | ≥ 15 | ≥ 15 |

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| | | | |
|---|---|---|---|
| 2. Other building category<br>a) Width of fire engine accessway<br>b) Length of fire engine accessway | Not required<br>Comply to Table 15, Table 16 | ≥ 6<br>Comply to Table 15, Table 16 | ≥ 6<br>Comply to Table 15, Table 16 |
| 1) Fire engine accessways are not required for building with no more than 50 occupants on each storey, calculated in accordance to Table G.9 (Appendix G), and distance from fire engine driveway to the standpipe shall not more than 18 m. | | | |

**6.2.1.3** It shall only permitted overhead obstacles to be placed on fire engine driveways and accessways if all following requirements are satisfied:

- Clear height to for fire-fighting facilities to travel through shall not be lower than 4.5 m;

- Dimensions of overhead obstacle (measured along the length of fire engine driveway and accessway) shall not exceed 10 m;

- In case of 2 or more overhead obstacles stretching across fire engine driveway or accessway, clearance space between these obstacles shall not be lower than 20 m;

- Length of the end of fire engine driveway or accessway unobstructed by overhead obstacles shall not be less than 20 m;

- Length of fire engine driveway and accessway shall not take into account sections with overhead obstacles.

**6.2.1.4** Along outer walls of buildings, it is required to provide entrances penetrate through the outer wall into the building from elevated positions (elevated entrances) in accordance to clause 6.3 to deploy fire fighting and rescue activity.

**6.2.2** Fire engine driveways and accessway shall be situated in a manner that satisfies following requirements:

**6.2.2.1** F1, F2, F3 and F4 buildings that fire protection height is not greater than 15 m are not required to have fire engines accessway but are required to have driveways not further than 60 m to grant fire engines with access to any point on plan layout of the buildings.

**6.2.2.2** F1.3 buildings which fire protection height is greater than 15 m shall comply with all following requirements:

- Fire engine driveway shall not further than 18 m away from all entrances of vestibules of fire lifts or exit staircases equipped with D65 fire hydrants for fire department (of dry systems);

- Fire engine accessway shall granting access to at least 1 whole outer side of each building block. Fire engine accessways shall be positioned not closer than 2 m and not further than 10 m from outer walls of the buildings;

- Design of fire engine driveways and accessways shall comply all the requirements of Table 14.

**6.2.2.3** F1.1, F1.2, F2, F3 and F4 buildings or sections thereof which fire protection height is greater than 15 m shall have a fire engine accessway at each elevated entrance area to provide fire engines with direct access to door panel of the elevated entrance. Length of fire engine accessway shall conform to Table 15 based on accessible floor area of the storey with the largest accessible floor area. In case of buildings with multi-level floors, the value shall be calculated as follows:

a) With respect to buildings with multi-level floors, including basements communicate with above-ground stories, accessible floor area shall equal to the sum of areas of all accessible floors of all said stories;

b) With respect to buildings with at least 2 groups of multi-level floors, accessible floor area shall equal the sum of areas of accessible floors with the greatest values;

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c) F5 buildings shall have one fire engine accessway for fire-fighting facilities. Length of fire staging area shall conform to Table 16 based on total compartment volume of the buildings (excluding basements).

If manufacturing conditions do not require entrances, 3.5 m wide driveways for fire engines shall be permitted, driveway surface shall be reinforced with materials guaranteeing load-bearing capacity of fire engines and drainage of surface water.

Distance from edge of fire engine driveways to walls of buildings shall not exceed 5 m for buildings with fire protection height shorter than 12 m, not exceed 8 m for buildings with fire protection height from 12 m to 28 m and not exceed 10 m for buildings with fire protection height greater than 28 m.

If necessary, distance from the nearest edge of driveways to the buildings to outer walls of the buildings and construction shall be increased up to 60 m provided the buildings and constructions are led to by dead end road and provided with fire engine's U-turn area and fire hydrants. In that case, distance from buildings and constructions to fire engine's U-turn area shall not be less than 5 m and no greater than 15 m and distance between dead end road shall not exceed 100 m.

NOTE 1: Width of buildings and constructions shall be determined based on distances between reference axes.

NOTE 2: Reservoirs used for firefighting shall have passages and access with yards whose dimensions shall not be less than 12 m.

**Table 15 – Length of fire staging area in F1.1, F1.2, F2, F3 and F4 buildings or sections thereof**

| **Accessible floor area,** $m^2$ | **Required length of fire staging area, based on circumference,** m | |
|---|---|---|
| | **Buildings not protected by sprinkler systems** | **Buildings protected by sprinkler systems** |
| ≤ 2 000 | 1/6 circumference and not less than 15 m | 1/6 circumference and not less than 15 m |
| > 2 000 & ≤ 4 000 | 1/4 circumference | 1/6 circumference and not less than 15 m |
| > 4 000 & ≤ 8 000 | 1/2 circumference | 1/4 circumference |
| > 8 000 & ≤ 16 000 | 3/4 circumference | 1/2 circumference |
| > 16 000 & ≤ 32 000 | Surround the building premises [1)] | 3/4 circumference |
| > 32 000 | Surround the building premises [1)] | Surround the building premises [1)] |
| [1)] It is permissible not to follow the boundaries of the premises but shall meet the provisions of 6.2.3. | | |

**Table 16 – Length of fire staging area in F5 buildings or sections thereof**

| **Compartment volume,** $m^3$ | **Required length of fire staging area, based on circumference,** m | |
|---|---|---|
| | **Buildings not protected by sprinkler systems** | **Buildings protected by sprinkler systems** |
| ≤ 28 400 | 1/6 circumference & not less than 15 m | 1/6 circumference & not less than 15 m |
| > 28 400 & ≤ 56 800 | 1/4 circumference | 1/6 circumference and not less than 15 m |
| > 56 800 & ≤ 85 200 | 1/2 circumference | 1/4 circumference |
| > 85 200 & ≤ 113 600 | 3/4 circumference | 1/4 circumference |
| > 113 600 & ≤ 170 400 | Surround the building premises [1)] | 1/2 circumference |
| > 170 400 & ≤ 227 200 | Surround the building premises [1)] | 3/4 circumference |
| > 227 200 | Surround the building premises [1)] | Surround the building premises [1)] |

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1) It is permissible not to follow the boundaries of the premises but shall meet the provisions of 6.2.3.

**6.2.2.4** Allocate fire engine driveway and accessway in multi-purpose buildings shall satisfy following requirements:

a) If non-residential stories (not under F1.3) are only situated at the lower sections of buildings, building fire protection height for determination of requirements for fire engine driveway and accessway shall be based on non-residential sections of the buildings;

b) In case of multi-purpose buildings that do not have any sections under category F1.3, the required lengths for fire engine driveway and accessway shall be the larger value of the two which are determined based on:

- Total compartment volume of F5 sections of buildings; or

- Determined in accordance to table 15.

c) With respect to multi-purpose building has section under F1.3, length of fire engine accessway shall be calculated based on 6.2.2.3 while satisfying requirements in 6.2.2.

For the basements, it is required to provide fire engine driveway not further than 18 m away from all above-ground entrances leading to vestibules of fire lifts or exit staircases equipped with D65 fire hydrants for fire department (of dry systems).

**6.2.3** Fire engine accessway shall be provided to guarantee distance from edge of the staging area that is nearest to the building to the middle point of elevated entrance is not closer than 2 m and not further than 10 m.

**6.2.4** Surfaces of firefighting staging area shall be even. If situated on a tilted surface, slope shall not exceed 1:15. Slope of driveways for fire engines shall not exceed 1:8.3.

**6.2.5** If the length of dead end fire engine driveway or accessway is greater than 46 m, it is required to provide u-turn lots designed according to 6.4 at the end of the dead end sections.

**6.2.6** Public roads can be used as fire engine accessway, if positioning of said roads conforming to regulations on distances to elevated entrances under 6.2.3.

**6.2.7** Fire engine driveway and accessway shall be clear at all time. Spaces between fire engine accessway and elevated entrance shall not be obstructed by trees or other immovable objects.

**6.2.8** It is required to mark all corners of fire engine accessways and driveways other than public roads utilized as fire engine accessways or driveways. Marking shall be implemented by reflection paints to ensure visibility at night and positioned at both sides of fire engine driveways or accessways with distance not further than 5 m.

At the end sections of fire engine driveways or accessways, it is required to have warning signs with white background, red letters and height of each letter not less than 50 mm. Height from ground level to the lowest points of the signs shall range from 1.0 m to 1.5 m. Signs shall be visible at night and shall not be more than 3 m away from fire engine driveways or accessways. All parts of fire engine driveways or accessways shall not be more than 15 m away from the nearest signs.

**6.2.9** Surfaces of fire engine driveways and accessways shall be able to withstand vehicular load of the fire engines according to design requirements and in accordance to vehicle types of Police Departments of Fire Prevention and Fighting and Rescue where the constructions are built.

### 6.3 Fire emergency access for fire fighting and rescue shall satisfy following requirements

**6.3.1** Fire emergency access shall be clear and unobstructed at all time when the buildings are being occupied. Fire emergency access can be openings on outer walls, windows, balcony doors, glass walls and doors that can be opened from inside and outside. Do not situate any objects or obstacles on the floors inside the buildings within 1 m from the Fire emergency access.

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**6.3.2** Fire emergency access shall be positioned opposite from usable spaces. Fire emergency access shall not be provided in warehouses, mechanical rooms, exit staircases, smoke stop lobby, fire lift lobbies or spaces that lead to a dead end.

**6.3.3** Outer surface of door panels of Fire emergency access shall be marked with red or yellow equilateral triangles whose sides are not smaller than 150 mm and vertexes can be directed upwards or downwards. On the inside, mark the following phrase "LỐI VÀO TỪ TRÊN CAO – KHÔNG DƯỢC GÂY CẢN TRỞ" (Fire emergency access – Do not obstruct) with letter height not less than 25 mm.

**6.3.4** Fire emergency access shall not be narrower than 850 mm, not shorter than 1 000 mm, lower edges of the entrances shall not be more than 1 100 mm away from floor surfaces and upper edges of the entrances shall not be less than 1 800 mm away from the floor surfaces.

**6.3.5** Number and position of Fire emergency access for each fire compartment of buildings or building sections not included in category F1.3 shall satisfy following requirements:

- In case of F1.1, F1.2, F2, F3, F4 and F5 buildings, number of Fire emergency access shall be calculated based on length of fire staging area. Provide 1 Fire emergency access for every section of fire staging area of or less than 20 m in length;

- Fire emergency access shall be positioned remote from each other along the sides of buildings. The furthest distance along outer walls between 2 consecutive Fire emergency access served by 1 fire engine accessway shall not exceed 20 m. Minimum 1 Fire emergency access shall be provided for every 20 m in length of fire staging area, except for sections of single storey buildings not included in category F5.

- With respect to F1.1, F1.2, F2, F3 and F4 buildings with fire protection height ranging from 15 m to 50 m, it is required to provide Fire emergency access on all stories other than the 1st storey and opposite from fire engine accessway.

- With respect to F5 buildings, it is required to provide Fire emergency access above fire engine accessway with fire protection height of up to 50 m.

Requirements for Fire emergency access shall not apply to F1.3 buildings, including auxiliary areas (e.g. gyms, clubs, etc. areas serving the buildings' inhabitants) in F1.3 buildings.

**6.4** U-turn spaces shall be designed in accordance to one of following requirements:

- Equilateral triangles whose sides are not less than 7 m, one vertex is situated at the dead end road and 2 other vertexes are situated symmetrically on both sides of the roads;

- Squares which sides are not less than 12 m;

- Circles whose diameter is no less than 10 m;

- Rectangles perpendicular to the dead end roads, symmetrical on both sides of the roads and not smaller than 5 m x 20 m.

NOTE: Requirements mentioned above are minimum values, fire prevention and fighting and rescue managing agencies shall be permitted to issue specific regulations based on technical requirements of local fire-fighting facilities.

**6.5** With respect to narrow roads only sufficient for 1 lane, it is required to design expanded sections that are at least 7 m in width and 8 m in length every 100 m to allow fire engines and other vehicles to avoid each other with ease.

**6.6** For buildings of 2 or more floors with a flat roof or roof with a slope of less than 25% with a height greater than or equal to 10 m taking into account the roof frills or the upper edge of the outer wall (roof parapet) there shall be roof discharge directly from the staircase or passing through the attic, or through the type 3 stairs, or follow the fire ladder outside the building.

Number of roof discharge and positioning thereof shall be based on occupancy fire hazard categories

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and the dimensions of the buildings. Group buildings F1, F2, F3 and F4 shall have at least 1 access to the roof for each area of 9 300 $m^2$ roof. For F5 group buildings, comply with the provisions of A.1.3.1.

It is permissible not to provide fire lift on the main side of the building if the width of the building is not more than 150 m and there is a fire water supply pipe in front of the building.

**6.7** In garrets of buildings other than F1.4 buildings, roof discharge via fixed staircases and doors, trapdoors or windows shall not smaller than 0.6 m x 0.8 m.

Roof discharge or garret discharge from staircases shall be allocated with treads with landings in front of the exits, through class 2 fire-blocking doors not smaller than 0.75 m x 1.5 m. The treads and landings mentioned above shall be permitted to be steel but shall have slope not higher than 2 : 1 (63.5$^o$) and not narrower than 0.7 m.

F1, F2, F3 and F4 buildings which fire protection height up to 15 m shall be permitted to have roof discharge or garret discharge from staircases via class 2 fire-blocking trapdoors with dimensions of 0.6 m x 0.8 m following fixed steel ladders.

**6.8** In technical floors including technical basements and garrets, clear height of passages shall not be less than 1.8 m; in garrets along the entire buildings, not less than 1.6 m. Width of said passages shall not be less than 1.2 m. In separate sections not more than 2 m in length, the height of the passages shall be permitted to reduce down to 1.2 m and width to a minimum of 0.9 m.

**6.9** Buildings with garrets shall have trapdoors in enclosing structures of the pockets of the garrets.

**6.10** At areas where elevation differences of the roofs exceed 1.0 m (which includes elevated areas for skylights – ventilation openings), firefighting transport methods shall be provided.

At areas where height differences of the roofs exceed 10 m, if each roof section larger than 100 m2 has separate exits leading to the roofs satisfactory to 6.6, or height of the lower sections of the roofs identified according to 6.6 does not exceed 10 m, may not install fire fighting transport methods.

**6.11** When arranging access to the roof with fire ladders outside the building as required at 6.6, it is required to use P1 fire fighting transport methods to reach areas at a height of 20 m and areas of the roofs where elevation differences range from 1.0 m to 20 m. P2 fire fighting transport methods shall be used to reach height above 20 m and areas with elevation difference of more than 20 m.

Fire fighting transport methods shall be made of non-flammable materials, positioned in a visible locations and at least 1.0 m away from any window, 0.7 m wide. With respect to P1 fire fighting transport methods situated at a height of 10 m or higher, install circular guardrails with radius of 0.35 m, center of the circular guardrails shall be 0.45 m away from the transport methods. Circular guardrails shall be 0.7 m away from one another and landings with 0.6 m high guardrails shall be positioned at places leading to the roofs. With respect to P2 fire fighting transport methods, install handrails and intermediate landings no more than 8 m from one another.

**6.12** The gap between stair flights and handrails of stair flights shall have clear width not less than 100 m when projected on a flat surface.

**6.13** Minimum 1 fire lift shall be installed in each fire compartment of buildings which fire protection height greater than 28 m (50 m for F1.3 buildings) or buildings with the lowest basements situated at a depth greater than 9 m (measure down to elevation of means of egress leading outside).

Other technical requirements such as power supply, control, signal transmission, communication and equipment serving fire protection systems and similar shall conform to technical standards applied solely to fire lift.

Location and installation of fire lift shall satisfy following basic requirements:

- Do not use elevators for cargo transportation as fire lifts;

- In normal conditions, fire lift can be used for passenger transportation. Fire lift shall be permitted to installed with separate elevator lobbies or in lobbies shared with passenger elevators and integrated by

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a single automatic group control system;

- Fire lifts shall be installed in adequate number to ensure that distance from a fire lifts to any point on the storey accessible by that lifts does not exceed 60 m;

- In case of a building with a single fire lift, such fire lift shall be able to access all stories adjacent to the storey that is on fire;

- In case of multiple fire lifts provided in the same elevator shafts, the lifts may grant access to different building sections provided that sections accessible by a fire lift are displayed on that elevator;

- In any case, working schemes of fire lifts shall be consistent and ubiquitous, e.g. lift granting access to odd numbered stories, even numbered stories or every storey;

- In case of refuge floors, each refuge floor shall be granted access to by at least 1 fire lift;

- In normal operation conditions, doors of fire lifts shall not be opened in order to grant access to refuge floors and doors leading to elevator shafts from the refuge floors shall be locked and shall only be unlocked when fire service mode is turned on;

In case of fire, fire lifts shall be able to enable fire department:

- To be the only individuals capable of controlling and operating while carrying their equipment to access the fire easily, safely, quickly and in a familiar fashion;

- To be protected while using the lifts from impact of fire and smoke via appropriate measures, particularly when the fire department exits from such lifts;

- To have clear and safe passages to access the fire lifts and stories accessible from said lifts;

- Not to travel more than 2 stories to access any storey that is on fire within the buildings when there are 2 or more firefighting elevators;

- Fire lifts shall be protected in separate lift shafts (separate from other types of elevators) and no more than 3 fire lifts shall be installed in a single lift shaft. Structures covering lift shafts shall have fire resistance rate not lower than REI 120;

- Lobbies of fire lifts which are vestibules shall satisfy all following requirements:

- Not smaller than 4 $m^2$;

- Not smaller than 6 $m^2$ when integrated with lobbies of smoke stop stair enclosures;

- Protected by class 1 fire-blocking partitions;

- Installed with D65 standpipe for fire department;

- Installation of fire lifts shall take into account movement direction of fire department and ensure that the fire department can access any rooms on any storey of the buildings;

- Load capacity of fire lifts shall not be less than 630 kg in case of F1.3 apartment buildings and no less than 1 000 kg in case of manufacturing facilities and other public buildings;

- Travel speed of fire lift shall not be less than H/60 (m/s). In which H refers to lifted height (m);

- Structures covering fire lift cars shall be made from non-flammable or mildly flammable materials.

**6.14** In case of buildings with pitched roofs having the slope of up to 12 %, height up to valances or upper edges of outer walls (parapet) exceeding 10 m and buildings with pitched roofs having the slope of more than 12 % and height up to valances exceeding 7 m, guardrails and handrails shall be installed on the roofs satisfactory to applicable regulations. The guardrails and handrails shall be installed in case of flat roofs, balconies, loggias, outdoor corridors, exposed staircases, stair treads and landings independent of fire protection height of buildings.

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**6.15** Water supply system for firefighting shall be sufficient to enable fire brigade and fire-fighting facilities to access and use at any time.

**6.16** Supply of water for fire fighting, equipment and allocation of other dedicated firefighting equipment and tools in buildings and constructions shall conform to basic regulations under Section 5 of the Code and relevant technical regulations.

**6.17** Fire control room

**6.17.1** Public and residential buildings and higher than 10 stories; buildings with 2 or 3 basements; assembly occupancy public constructions (e.g. theaters, cinemas, bars, karaoke which required 2 exits in accordance to A.4; and buildings with similar occupancy with each storey occupied by more than 50 people according to Table G.9 under Appendix G); garages for automobiles, motorcycles and bicycles, manufacturing facilities and warehouses larger than 18 000 $m^2$ shall have fire control room which shall be regularly occupied by specialized personel.

**6.17.2** Fire control room:

- Be large enough to equip devices in accordance to fire protection requirements of the buildings but not less than 6 $m^2$;

- Have 2 entrances/exits: one leads to empty spaces outside of the buildings and another leads to primary corridors for evacuation;

- Be separated with other building sections by class 1 fire barriers;

- Be installed with communication and contact devices of fire alarm systems which connect to all building section;

- Be equipped with panels for monitoring and controlling fire fighting devices, smoke control devices and layout diagram which dictating position of fire fighting equipment of the buildings.

**6.18** All basements in buildings with 2 to 3 basements shall be equipped with two-way emergency communication devices between the fire control room to:

- Equipment rooms related to fire fighting systems, particularly rooms where pumps of sprinkler systems are located, pump rooms which supplying vertical pipe systems, circuit switch rooms, generator rooms and elevator machine rooms;

- All rooms installed with devices that control smoke control systems;

- All fire lifts;

- All refuge room;

- Ventilation system control rooms.

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# 7 IMPLEMENTATION

**7.1** Transitional provisions

**7.1.1** With respect to dossiers on construction design approved in terms of fire fighting by authority having jurisdiction before the effective date hereof, continue to comply with the approved dossiers on construction design.

**7.1.2** With respect to dossiers on construction design approved after the effective date hereof, comply with the Code.

**7.2** Ministry of Construction is responsible for publicizing and guiding application of the Code for relevant entities.

**7.3** Central and local regulatory agencies specialized in fire fighting and constructions are responsible for inspecting compliance with the Code in preparing, appraising, approving and managing constructions of buildings and structures within their management as per the law.

**7.4** Authority having jurisdiction specialized in fire fighting and constructions are responsible for cooperating in developing regulations related to specifications to design and implement driveways and accessways for fire engines satisfactory to properties of local fire-fighting facilities.

**7.5** Difficulties that arise during the implementation of the Code should be submitted to Department of Science Technology and Environment (Ministry of Construction).

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# APPENDIX A

(regulations)

## ADDITIONAL REGULATIONS OF FIRE SAFETY FOR SPECIFIC GROUP OF BUILDINGS

### A.1 Manufacturers and warehouses

#### A.1.1 Scope of application

**A.1.1.1** The manufacturer used for manufacturing of products, goods under class F5.1 and F5.2 have not more than 1 basement.

**A.1.1.2** Not applicable for industrial buildings with special functions (production or storage buildings of explosive materials and substances; terminals of petroleum and petroleum products, natural gas, flammable gases, as well as flammable substances; manufacturing or storage buildings of toxic chemicals; mining works; and similar occupancy buildings).

**A.1.1.3** Not applicable for the following buildings and rooms:

a) Warehouse and storage room of dry mineral fertilizers and plant protection chemicals, radioactive substances, non-flammable gases contained in the bottle under a pressure greater than 70 kPa, cement, cotton, flour, cattle feed, fur and fur products as well as agricultural products;

b) Buildings or rooms used for cold warehouse and grain warehouse;

c) Industrial buildings 2 basements and more.

**A.1.1.4** It is permissible for not applicable for manufacturers with foreign standards on fire prevention in design according to Vietnam law stipulation, but it shall be approved by Vietnam Fire and Rescue Police Department.

#### A.1.2 General regulations

**A.1.2.1** Total area of the building is equal to total area of all floors (the floor above the ground, even technical floor, semi-basement and basement) with premise dimension measured within the scope limited by internal surface of enclosing walls (or by axis of boundary column in area without enclosing walls); tunnel; indoor supporting floor; platform (bridge) for loading and unloading; corridors (in premises) and corridors connecting to other buildings. Total area of building does not include: Area of technical basements with height from floor to the bottom of structure overhang above, less than 1.8m (where it is not required the way to maintain technical pipelines); area above suspended ceiling; as well as floor area of multi-level racks used to maintain rail below the crane, maintain the crane, conveyors, monorails and lighting equipment.

Area of rooms with the height from over 2 floors, within the scope of a multi-floor building (2-floor or multi-stories room) is calculated into total area of building within the scope of one floor.

When determining the number of building's floors, each supporting rack floor, floor of multi-level rack and mezzanines located at any height but with an area over 40% of the area for one floor of that building, shall be calculated as one floor.

The area of 1 floor of the building within the scope of a fire compartment is determined by the internal circumference of the enclosing wall of the floor, excluding the area of the staircase room. If the floor of supporting rack, floor of multi-level rack and mezzanine floor are covered in that area, to one floor building, the area of all supporting rack floor, floor of multi-level rack and mezzanine floor shall be calculated; to multi-floor building, only the area of supporting rack floor, floor of multi-level rack and mezzanine floor are in the scope of distance along the height between levels of supporting rack floor, floor of multi-level rack and mezzanine floor with area at each level not over 40% of floor area. The area

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of platform (bridge) for loading and unloading used for means of roadway and railway transport shall be excluded in the area of the building floor within the scope of fire compartment.

The construction area is determined by the outer circumference of the building at the elevation of foot wall, including the projections, passageways under the building, and parts of the building that have no external containment structure.

**A.1.2.2** Construction volume of the building is determined as total volume area of sections of the building above ground from level ± 0,00 and up, and the underground sections from finishing level of the bottom underground basement floor to the level ±0,00.

Volume of the sections above ground and underground of building shall be calculated according to dimension from the external enclosing structure, including light and ventilation openings of each section of the building.

**A.1.2.3** The height of rooms from the floor surface to the bottom of the projections under ceiling or roof shall not be less than 2.2m. The aisles with frequent occupant and exit routes shall have a height from the floor surface to the bottom of projections of technical pipes and equipment shall not be less than 2.0m, and such height for aisles without regular occupant shall not be less than 1.8 m. Clear height of the entrance to a building for fire engine shall not be less than 4.5 m.

**A.1.2.4** To technical floor, if technological requirements require the way to maintain technical equipment, technical pipelines and technological equipment, the height of this way shall be selected in accordance with A.1.2.3.

**A.1.2.5** The exit from the basement shall be located outside the operating area of the lifting equipment.

**A.1.2.6** The width of vestibule and fire-blocking vestibule outside the elevator door shall be wider than the width of door at least 0.5 m (0.25 m toward each side of door) and the depth of those vestibule shall not be less than 1.2m, at the same time, higher than the width of door at least 0.2 m.

When used by the wheelchair-accessible workers, the depth of the vestibule and fire-blocking vestibule shall be at least 1.8 m and the width shall be at least 1.4 m.

**A.1.2.7** In rooms with fire and explosion hazard classes A and B, it is required to install easily-detachable outer shields.

In case the area is not enough to provide easily-detachable glass outer shields, non-flammable materials shall be permitted as follows:

- Steel, aluminum;

- Flexible tile, metal tile;

- Stone and effectively heat-retaining materials.

The area of easily-detachable outer shields shall be determined by calculation. In case there is no calculation data, the area of easily-detachable outer shields shall not be less than 0.05 $m^2$ per 1 $m^3$ of class A room volume and not less than 0.03 $m^2$ per 1 $m^3$ of class B room volume.

NOTE 1: If using glass with thickness of 3, 4 or 5 mm for easily-detachable outer shields, the corresponding area shall not be less than 0.8; 1.0 and 1.5 $m^2$. It shall not be permitted to use tempered class, 2 layers, 3 layers glass, stalinite and polycarbonate in easily-detachable outer shields.

NOTE 2: Roll-type covering sheet on the area of easily-detachable outer shields of the roof shall be arranged into pieces with area of not more than 180 $m^2$.

NOTE 3: The calculated load of the volume of the easily-detachable outer shields on the roof shall not exceed 0.7 kPa.

### A.1.3 Layout - space

**A.1.3.1** The buildings with height from ground design level to the edge or the above surface of parapet wall over or equal to 10 m, then each 40 000 m·, there shall have 1 way to the roof, if the area of

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roof site is not equal 40 000 $m^2$, it is also required to provide at least 1 way to the roof. The roof discharge of one-floor building shall be provided along outside open steel stairs, the roof discharge of multi-floor building shall be provided from staircases.

To the building with the height from designed earth level to the top floor surface not greater than 30m and the height of the top floor is not enough for staircase to discharge to the roof, open steel ladder shall be permitted to provide exit from staircase to the roof through this ladder.

**A.1.3.2** The arrangement of rooms with different fire hazards in the same building and their separation shall comply with the requirements for fire resistance rates of the covering of such rooms, exit routes and means of egress, smoke exhaust equipment, vestibules and fire-blocking vestibules, staircases and ladders as well as roof discharges shall be stipulated in the related section of this Code and specialized regulations and standards.

It shall be permitted to arrange 1 floor with function as a warehouse or administration room inside industrial building, as well as one floor with function of production and administration inside the warehouse if requirements on fire prevention distance specified in Appendix E and related regulations of this Code are complied.

In bonded warehouses, one floor with fire resistance grade I and II and structural fire hazard level S0, if any exit corridors are enclosed by fire partitions class 1 and has positive pressure in case of fire, the length of that corridor shall be excluded in the length of exit route.

**A.1.3.3** When arranging storage in an industrial building, the maximum permissible area of the storage within a fire compartment and their height (number of floors) shall not exceed the values given in Appendix H.

When there are supporting rack floor, floor of multi-level rack and mezzanine floor with area of each height greater than 40% floor area, the floor area shall be determined as of multi-stories building.

**A.1.3.4** When arranging technological lines with different fire and explosion hazard levels in one building or one room, solutions shall be provided to prevent the spreading of fire and explosion among those lines. The prevention effect of those solutions shall be considered and evaluated in technological section of project. If the selected solutions does not ensure the prevention effectiveness, the technological lines with different fire and explosion hazard class shall be arranged in separated rooms and partitioned off in accordance with requirements in Appendix E.

**A.1.3.5** Basements with class C1, C2, C3 rooms shall be divided into sub-fire compartments with an area of not more than 3 000 $m^2$ each, by class 1 fire partitions. These sub-compartments shall be smoke protected as required in Appendix D. The upper storey floor of these basements shall be at least a category 3 fire floor. The above-mentioned rooms shall be separated from the corridor by category 1 fire partitions.

The width of corridors shall not less than 2m and leads directly to external or through a smoke stop staircase.

**A.1.3.6** Works components of loading and unloading platform (bridge) and loading and unloading platform (bridge) enclosing components adjacent the buildings with fire resistant grade I, II, III and IV, fire hazard class S0 and S1 shall be made of non-combustible materials.

**A.1.3.7** Platform (bridge) for loading and unloading goods shall have at least 2 ladders or ramps arranged far from each other (dispersed).

**A.1.3.8** Selection of structures and materials for foundation and cover of warehouse floor and storage room shall consider related factors to ensure the prevention of dust generation.

The slab surface of areas with risk of forming explosive mixtures of gases, dust, liquids and other substances with a concentration that can cause an explosion or fire in case of any spark caused by impact of an object on the floor or static electrostatic contamination, appropriate measures shall be taken to prevent electrostatic contamination and not generate spark upon impact.

Cargo warehouses with temperature exceeding 60 °C shall use heat-resistant floor.

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**A.1.3.9** Warehouse rooms in manufacturer buildings shall be isolated from other types of rooms according to the specific regulations below.

Manufacture room, technical room and storage room (occupancy fire hazard category F5) with fire and explosion hazard class C1 to C3 are located in residential and public building, if there is no other regulation, they shall be separated with other rooms and corridors in accordance to minimum requirements as follows:

- Building under fire resistance grade I separated by fire-blocking partition class 1 and fire-blocking floor of not less than class 2;

- Building under fire resistance grade II, III, IV separated by fire-blocking partition class 1 and fire-blocking floor of not less than class 3.

Storage room, manufacture room, laboratory etc... with fire and explosion hazard classes C1, C2 and C3 or higher shall not permitted in other buildings occupied by 50 occupants at the same time.

Manufacture room, technical room and storage room with fire and explosion hazard classes C4 located in residential or public building shall be separated with other rooms and corridors by fire-blocking partitions not less than class 2.

Storage rooms with fire and explosion hazard classes C1, C2 and C3 in industrial buildings shall be separated with other areas by fire-blocking partition class 1 and fire prevention floor not less than class 3. Warehouses storing cargoes with multi-level racks shall be separated by fire-blocking wall class 1 and fire-blocking floor class 1. Such warehouses shall have outer walls if storing finished products under fire and explosion hazard classes C1, C2 and C3 in industrial building.

NOTE: High-rises multi-levels racks are racks with a cargo height of over 5.5 m.

**A.1.3.10** Cargo warehouse with fire and explosion hazard class C on high-rise supporting rack shall be arranged in one-floor building with fire resistance grade from I to IV and building's structural fire hazard class S0.

Cargo racks shall have horizontal, solid supporting levels and made of non-flammable materials and distance between levels not greater than 4m by the height.

**A.1.3.11** When dividing a cargo storage room with the same level of fire hazard by partitions according to technological or sanitary conditions, requirements for such partitions shall be clearly stated in the technology description of project.

**A.1.3.12** Window openings of warehouse shall be attached with a flip-up door plate with total area determined based on calculation to ensure the exhaustion of smoke in case of fire.

In storage room, window-panel shall be permitted to omit, provided that smoke purging system is installed and calculated properly with requirements in Appendix D.

**A.2 Buildings (which fire protection height from 50m up to 150m) under occupancy fire hazard category F1.2, F4.2, F4.3 and multi-purposes buildings**

**A.2.1** Minimum fire resistance grade of buildings in this group is I.

**A.2.2** Building shall be divided into fire compartment by height, with the height of each fire compartment shall not greater than 50m. Fire compartments shall be separated by fire-blocking wall and fire-blocking floor or technical floors. Technical floor shall be divided by fire-blocking floor with fire resistance rate not less than REI 90. Fire resistance rate of fire-blocking wall and fire-blocking floor shall comply with requirements in A.2.24.

Each unit or a fire compartment (when not divided into a unit) shall have an independent fire protection system (ensuring operation as expected when necessary, regardless of whether the fire protection system in the other fire compartment works or not) and have an initial fire fighting instrument room.

**A.2.3** The largest permissible area of an above ground floor within a fire compartment:

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- Not greater than 3 000 $m^2$ - for the podium;

- Not greater than 1 500 $m^2$ - for category F1.2 (hotels, dormitories);

- Not greater than 2 000 $m^2$ - for category F1.3;

- Not greater than 2 500 $m^2$ - the remaining cases.

Walls and partitions between the units shall have corresponding fire resistance rate not lower than those specified in A.2.24.

**A.2.4** Rooms with occupant load of fixed seats from 300 to 600 seats – shall not be permitted to allocated at fire protection height of over 15m; the number of fixed seats from 150 to 300 seats - shall not be permitted to allocated at fire protection height of over 40m, and with the number of fixed seats from 100 to 150 seats - shall not be permitted to allocated at fire protection height over 50m. Public rooms allocated at fire protection height of over 50 m, the number of fixed seats shall not exceed 100.

**A.2.5** Buildings with restaurant, bars and public rooms of category F3.2 and F3.6, at the fire protection height over 50m and total people occupied at the same time in that room, according to Table G.9 (Appendix G), more than 50 people, then the distance from the means of egress of rooms to the nearest smoke stop staircase shall not greater than 20 m.

NOTE: Regarding floors at the fire protection height of over 50m without corridor enclosed by fire barrier according to requirements in A.2.24, the travel distance to smoke stop staircase shall be calculated from the furthest points of room.

The roof which used to allocate restaurants, bars, refreshments or areas for sightseeing, walking where the occupant load at the same time, according to Table G.9 (Appendix G), is greater than 50 people, shall have minimum 2 exits.

**A.2.6** Regarding assembly occupancy rooms with the occupant load presents at the same time can be more than 500 people, such room shall be separated from other rooms by fire-blocking walls and floors with fire resistance rates as specified in A.2.24. Distance from the means of egress of this room to the nearest smoke-stop staircase shall not be greater than 20m.

**A.2.7** Rooms where the disabled people usually have regular activities shall not be located higher than 2nd floor, if there is any the disabled people using wheelchair, those room shall not be higher than 1st floor.

In case the disabled people occupy in higher floors, there should be additional solutions to ensure that the disabled people can move safely to the means of egress or to the refugee room in case of fire. Additional solution shall be explained by calculation on the basis of applicable standard documents.

**A.2.8** It is not allow to arrange storage room, room stores books and flammable objects, which area greater than 50 $m^2$ at fire protection height over 50 m, as well as arrange under or adjacent to the rooms where the occupant load over 50 people calculated in accordance to Table G.9 (Appendix G).

**A.2.9** It shall not be permitted to arrange rooms with fire and explosion hazard (class A or B) within the building.

**A.2.10** Transformers of substations located in or adjacent to the building shall be of a dry or non-combustible oil (insulating oil) type, and shall be located on the 1st floor, semi-basement, first basement or any technical floor. Substations shall be separated by fire barriers with fire resistance rates as specified in A.2.24.

It is permissible to use diesel generators as stand-alone power supplies and on-site backup sources. It is then permissible to arrange rooms where diesel generators are located no deeper than basement 1 or on floors above ground, within the size range of the building or in a separate standing building when the following requirements are fulfilled:

- The fire resistance rate of the load-bearing wall and floor structures of the room shall be taken not less than REI 180;

- Traffic between the room where the diesel generator is located and other rooms shall pass through a

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class 1 fire blocking vestibule, which has a positive air pressure in case of fire;

- In order to prevent fuel spillage, in the event of a fuel spill outside the dike, trays should be placed under the generators to accommodate all the spilled fuel;

- Provide gas analyzers to detect fuel leaks and emit signals to the room of the fire station, as well as arrange incident ventilation with aerated ventilation;

- Arranged in the rooms where diesel generators, automatic fire suppression equipment are located;

- The volume of the oil tank located in the frame structure of each diesel generator should not exceed 1 m3;

- The power of diesel generators and the supply and storage of fuel, which shall ensure the operation of fire protection systems, are determined from the specified time necessary for their operation in case of fire.

It is permissible to use gas-fueled generators, when placing these machines in a separate standing building, with fire safety requirements already specified in the relevant standard documents.

**A.2.11** The lift lobbies shall be separated from corridors and adjacent rooms by fire-blocking partitions with fire resistance rate specified in A.2.24.

Materials of elevator cabin components shall be structured as of fire lift.

**A.2.12** Fire lift shall be located in the separated hoitsway with independent lift lobby. The exit from this lift to external shall not through common hall.

The number of fire lifts for each fire compartment shall be calculated so that the distance from that lift to any point on the served floor layout shall not be more than 45 m.

The enclosing structure (walls, floor, ceiling, door) of cabin of fire lift shall be made of non-combustible materials or from Ch1 material group.

Surface finishing cladding materials of cabin covering components are applicable as for rooms as specified in A.2.25.

**A.2.13** Fire resistance rate of hoistway and machine room of elevator shall follow regulations in A.2.24.

**A.2.14** Corridors shall be divided into compartments separated by fire-blocking partition class I. Fire-blocking door installed on these fire-blocking partitions shall have automatic-closing mechanism and door gaps shall be sealed (except for the feet). The length of each corridor shall be as follows:

- Apartment block: Not exceed 30 m.

- Non-apartment block: Not exceed 60 m.

**A.2.15** All smoke stop staircase of the building shall lead to external directly at the first floor, at the same time, there also shall be roof discharge through class 1 fire-blocking door.

**A.2.16** The egress route shall be calculated with an increase of occupant load in the building or rooms 1.25 times compared to the designed numbers (except performance rooms and other rooms with the number of seats is fixed).

**A.2.17** If in the same time, the sections of building or floor are used by many different types of user or for many different purpose, the requirements of exit for the whole building or that floor shall be calculated on the basis of occupancy or purpose of use with the most stringent requirements of exit or determinate the requirements of exit separately for each section of the building.

**A.2.18** If the building, floor or a part of building is used for many purposes with different activities at many different times, the occupancy or purpose of use related to the largest number of people shall be taken to be the basis for determination of exit requirements.

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**A.2.19** When the door of apartment or room is located on dead-end corridor, the distance from such door to the nearest exit shall not exceed 15 m. When the door is located between the smoke stop staircases, such distance shall not exceed 20 m.

**A.2.20** The building with fire protection height over 100 m shall arrange refuge floor, refugee room shall meet the requirements of A.3.2.

**A.2.21** Fire engine accessway and driveway shall be in accordance to the requirements in 6.2.

**A.2.22** The building shall have room for storage of local fire fighting equipment provided according to current regulations, located at the lower floor of each vertical fire compartment. At the first floor, room of initial fire fighting equipment of the building shall be arranged next to central control room for fire protection system. At the above fire compartments, room of initial fire fighting equipment shall be located not further than 30m from smoke stop staircase or fire lift.

**A.2.23** The fire spreading prevention along the exterior of the building shall comply with the requirements at 4.32, 4.33.

**A.2.24** Fire resistance requirements of structures and components of the building

**A.2.24.1** Fire resistant rate of construction members shall not be lower than regulated value in Table A.1.

**Table A.1 – Minimum fire resistance rate of construction members**

| **Name of structure components (building members)** | **Minimum fire resistance rate for building with FLS height,** m | |
|---|---|---|
| | **> 50 & ≤ 100** | **> 100 & ≤ 150** |
| **(1)** | **(2)** | **(3)** |
| 1. Load-bearing columns, load-bearing walls, bracing systems, rigid walls, trusses, parts of floors between floors and roof decks of buildings without attic floors (beams, stringers, floor slabs) [1)] | R 150 | R 180 |
| 2. Non-load bearing exterior walls | E 60 | E 60 |
| 3. Slabs between the floors (including attic floors and slab over the basement) | REI 120 | REI 120 |
| 4. Components of roofs | | |
| 4.1 Roofing panels | RE 30 | RE 30 |
| 4.2 Beam, stringers, ribs, frame, trusses | R 30 | R 30 |
| 5. The roof used for exit and rescue | | |
| 5.1 Roofing panels | RE 120 | RE 120 |
| 5.2 Beam, stringers, ribs, frame, trusses | R 150 | R 180 |
| 6. Staircase structures | | |
| 6.1 Interior wall | REI 150 | REI 180 |
| 6.2 Stair tread and stair landing | R 60 | R 60 |
| 7. Fire-blocking wall and fire-blocking floor | REI 150 | REI 180 |
| 8. Shaft structure | | |

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| | | |
|---|---|---|
| 8.1 Elevator hoistway and shaft of technical pipelines, technical channel and box which not penetrate fire compartment border | REI 120 | REI 120 |
| 8.2 Elevator hoistway and shaft of technical pipelines, technical channel and box which penetrate fire compartment border; Fire lift hoistway | REI 150 1) | REI 180 1) |
| 9. Interior non-load bearing wall (partitions) | | |
| 9.1 Partitions between hotel rooms, office rooms and similar rooms | EI 60 | EI 60 |
| 9.2 Partitions between rooms with the atrium; partition between corridors and rooms in hotels and office rooms | EI (EIW) 60 | EI (EIW) 60 |
| 9.3 Partition between rooms with emergency generator and diesel power station | REI 180 | REI 180 |
| 9.4 Partitions of retails with area of greater than 2 000 $m^2$ and partitions of assembly rooms occupied by more than 500 people at the same time | EI 180 | EI 180 |
| 9.5 Partitions between apartments | EI 90 | EI 90 |
| 9.6 Partitions between apartments with corridors and with other rooms | EI 30 | EI 60 |
| 9.7 Partitions of lift lobbies | EI (EIW) 60 | EI (EIW) 60 |
| 9.8 Partitions of vestibules, lobbies of fire lifts | EI (EIW) 60 | EI (EIW) 90 |
| 9.9 Partitions between indoor sauna rooms with other rooms | EI (EIW) 60 | EI (EIW) 60 |
| 9.10 Partitions of rooms of life service establishments, with area of greater than 300 $m^2$ | EI 60 | EI 60 |
| 9.11 Partitions of storage room, book and newspaper storage and similar rooms | EI 90 | EI 120 |
| 9.12 Partitions of rooms of transformers | EI 60 | EI 60 |
| 1) Parts of a building such as load-bearing walls, columns, braces, rigid walls, parts of floors (beams, stringers or floor slabs) are classified as load-bearing parts of the building if they refer involved in ensuring the overall stability and shape of the building in the event of a fire. Load-bearing parts that do not contribute to the overall stability of the building shall be indicated by the designer in the building's technical documentation. | | |
| NOTE 1: The fire resistance rate R of the load-bearing structure which is the support for the fire-blocking floor shall not be less than the Fire-resistance rate R of the fire-blocking floor itself.<br>NOTE 2: It is permissible to apply the regulations on the fire resistance rate of non-bearing external walls according to footnotes 5 and 6 of Table 4. | | |

**A.2.24.2** The fire resistance rate of entrance doors, caps and opening-fitting plates on building structures with fire retardability requirements as specified in Table A.1 shall have a fire resistance rate not less than EI 30 (EIW 30) in the case of providing in components with a fire resistance rate EI 60 (EIW 60), and not less than EI 60 (EIW 60) in the remaining cases.

**A.2.24.3** The doors of elevator lobbies and the doors of elevator machine room shall be the ones that prevent the permeation of air, smoke.

**A.2.24.4** In technical shafts which only used for water supply and drainage pipelines made of non-combustible materials, fire-blocking doors and fire dampers class 2 (EI 30) shall be permitted.

**A.2.25** Regulations on using materials according to fire hazards

**A.2.25.1** Roofing materials shall be incombustible. In case if the roof is covered by a combustible

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waterproof coating, an incombustible material with thickness of not less than 50 mm shall be covered on that coating.

**A.2.25.2** Finishes of wall, ceiling and floor coating on the egress route (corridor, hall, waiting room) as well as in technical floors shall be made of non-combustible materials.

**A.2.25.3** Materials for finishing walls, ceilings, decorative ceilings and floor covering in rooms shall comply with the provisions of Table B.9 (Appendix B).

**A.2.25.4** In big room which number of audience seat greater than 50 seats, parts of soft backed seating, curtains shall not be made of flammable material (group BC3). In these rooms, it does not depend on the number of seats, the chairs shall not be made of materials with toxicity of higher than ĐT2.

Fabrics and fibers for interior decoration purposes are not made of flammable materials (BC3).

**A.2.26** Equipment for fire alarm, fire fighting and rescue.

**A.2.26.1** The building shall be equipped with addressable fire alarm system; automatic fire alarm bells shall be arranged at all areas, including: Apartments, offices, corridors, lift lobbies, lounge, technical rooms where people work regularly...except rooms which are always wet in normal use environment conditions.

**A.2.26.2** The building shall be equipped with public alarm system and exit control.

**A.2.27** Water supply for fire fighting

**A.2.27.1** Indoor fire fighting water supply system (pipeline network and equipment system) shall be designed separately with pump station arranged independently with other occupancy rooms.

**A.2.27.2** Indoor fire fighting water flow rate for each fire compartment shall be enough for 4 streams, water flow rate for each stream shall not be less than 2.5 L/s.

**A.2.27.3** Fire compartments which including public rooms shall be permitted to arrange fire hydrants with flow rate not less than 2.5 L/s, provided that there shall have risers ensuring to supply water for hydrants with flow rate of 5 L/s.

**A.2.27.4** Two connecting pipes shall be required with suitable diameter to connect indoor fire fighting water supply system and automatic fire fighting equipment with fire vehicles drive outside the building.

It is required to have gate valves and check valves inside the building to regulate the fire fighting water flow to the system. Connectors outside the building shall be located at convenient positions for the access of fire engine and shall be marked with clear, legible instructions.

**A.2.27.5** The arrangement of sprinkler of automatic water fire fighting system for rooms, lobbies, halls, exit routes and other components shall ensure to protect window openings (from the outside or inside of the room) and doorway of apartments, offices and other rooms which those doors open to the corridor.

**A.2.27.6** Spraying intensity of automatic fire fighting system shall not less than 0.08 $L/(s \cdot m^2)$.

**A.2.27.7** Water flow rate of sprinkler fire fighting system shall be ensured not less than10 L/s.

**A.2.27.8** Vestibules of smoke stop staircases shall be required to equipped with D65 hydrants for fire department (of dry pipe system). At the first floor, these pipelines shall have fittings for connection with the high pressure pumps of fire engines.

**A.2.28** Electricity system

**A.2.28.1** Power supply for the below technical equipment and systems shall ensure the working duration of those equipment within the time not less than 3h since the initiation of fire and shall be taken from 2 independent supply sources:

- Fire lift;

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- Equipment of fire protection system;

- Automatic fire alarm system and instruction for exit;

- Equipment of automatic fire fighting system and fire water supply;

- Fire protection equipment for technical equipment system;

- Equipment for rescuing.

**A.2.28.2** Electric cables from transformers and independent supply sources to input distribution equipment at each fire compartment shall be installed in separated channel (box) with Fire resistance grade as specified in A.2.24, or fire resistant cables.

**A.2.28.3** At input distribution equipment of each fire compartment, there shall have protective breaker and have fire protection measure.

**A.2.28.4** At floor distribution cabinet, and power panel of apartment, there shall have protective breakers. Structure of this cabinet shall be ensured to eliminate the spread of fire to the outside of cabinet.

**A.2.28.5** Where cables and wire penetrate construction members which required fire resistance, the gap seal connection of cables shall have fire resistance rate shall not lower than of structures which cables and wires go through.

**A.2.28.6** The lighting for exit shall maintain its operation in high temperature condition.

**A.2.28.7** Electric cables, wires from distribution cabinet of each floor to the room shall be passed inside channel or construction structure made of non-flammable materials.

**A.2.28.8** Connection of electric wire and cable from input distribution equipment to fire protection system (electric equipment of fire fighting system, fire alarm system, smoke exhaust, emergency lighting for exit and similar) shall be performed by fire resistant cables (electric wire and cable with insulation layer, fire resistance rate not less than 120 minutes).

**A.2.29** Ventilation system and smoke control system

**A.2.29.1** Categories of rooms with different occupancies located in the scope of the same fire compartment shall have heating, ventilating, and air-conditioning systems operated independently.

**A.2.29.2** Rooms of ventilation equipment shall be located in the scope of fire compartment where that equipment serves, allowed to place ventilation equipment of service system for different fire compartments, in a general room, except the following cases:

- Equipment of systems supplying air, recirculation air, serving rooms with fire and explosion hazard class C1 to C3, shall not install along with equipment of systems sued for rooms with other fire and explosion hazard classes;

- Equipment of systems supplying air serving for residential rooms shall not be placed along with equipment of systems supplying air for rooms used in life services, as well as with equipment of air exhaust system;

- Equipment of air exhaust system (eliminate air with unpleasant odors outside, from the smoking room, toilet...), shall not be placed along with equipment of inlet air system;

- Equipment of local exhaust and intake system of dangerous explosive mixtures shall not be placed along with other equipment of system.

**A.2.29.3** It shall not be permitted that ventilation system serving different fire compartments utilize the same receiving outside air device (intakes air louver). Horizontal distance between air intakes located at adjacent fire compartments shall not less than 3 m.

**A.2.29.4** Horizontal distance between equipment receiving the outside air (intakes) and diffuser of the

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same air exhaust system installed on the exterior facade shall not less than 10 m. If horizontal distance is not ensured, it is required to ensure vertical distance shall not less than 6 m.

**A.2.29.5** Air ducts and distribution ducts of all systems in the scope of fire compartment which they serve shall be permitted to have configuration as follow:

- Made of non-flammable materials with fire resistance rate not less than EI 15, provided that the ducts is placed in a common shaft, with structure surrounding the shaft has fire resistance rate not less than REI 120, and there have fire dampers at positions that the ducts penetrating the structures surrounding that shaft;

- Made of non-flammable materials and have fire dampers at positions that the ducts penetrating walls and floor requiring fire resistance ability;

- The sections of ducts installed outside the fire compartment they serve, calculated from the fire barrier on the edge of that fire compartment, shall have fire resistance rate not less than EI 180.

**A.2.29.6** When arranging air ducts and distribute ducts of all systems serving different fire compartments in a channel or general shaft, the surrounding structure of that channel or shaft shall not be less than REI 180 and the structure of those ductworks shall meet the following regulations:

- Fire resistance rate not less than EI 60 when the duct is located in fire compartment which they serve and installed with fire damper at the positions where the duct penetrates structures surrounding channel and shaft;

- Fire resistance rate not less than EI 60 when the duct is located outside fire compartment which they serve and t installed with fire damper at the positions where the duct penetrates fire-blocking floors at the edge of fire compartment, fire resistance rate of the floor is REI 180.

**A.2.29.7** The air hose having requirements of Fire resistance grade shall be made of non-flammable materials with thickness not less than 0.8 mm and shall have parts for compensation of axial thermal expansion. The inserting of joints of air hose shall be performed by non-flammable materials.

**A.2.29.8** Fire dampers shall have automatic and remote control actuators. Fire dampers with actuators made of thermal elements shall not be permitted. Fire resistance rate of fire dampers shall meet the following regulations:

- Not less than EI 90 when corresponding fire barrier has fire resistance rate REI 120 or higher;

- Not less than EI 60 when corresponding fire stop part has fire resistance rate REI 60.

**A.2.29.9** Smoke exhaust and purging system shall ensure the following regulations:

- Fire resistance rate of exhaust fans shall meet the working requirements according to the calculated temperature of the air stream;

- Air ducts and channels shall made of non-flammable materials with fire resistance rate not less than:

EI 180 – to air ducts and channels outside the fire compartment which they serve;

EI 120 – to vertical air ducts and channels located within the fire compartment which they serve;

- Smoke dampers shall have automatic and remote control actuators, with fire resistance rate not less than:

EI 60 – to car parking spaces and isolated corridors of closed garages;

EI 45 – to the room that occupied by over 50 people, calculated according to Table G.9 (Appendix G), in a certain time; and to atriums;

EI 30 – to corridors, halls, lobbies, side corridors.

**A.2.29.10** Fans used to release fire products to the outside shall be located in separated rooms,

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surrounded by class 1 fire partitions.

**A.2.29.11** Shafts enclosing ductworks of air intake system to control smoke shall have fire resistance rate not less than fire resistance rate of the floor which they penetrate. Fire resistance rate of air ducts of intake air system shall not be less than:

EI 60 – to air ducts of each floor of air intake system for fire vestibules, isolated corridors of closed garages;

EI 30 – to air ducts of intake air system to protect staircases and hoistways, as well as fire vestibules at the elevation on the ground.

**A.2.29.12** Fire dampers of intake air system to control smoke shall has fire resistance rate not less than required fire resistance rate for air ducts of such system.

**A.2.29.13** The control of equipment and actuators of smoke control system shall be performed automatically (from fire detection system) and remote control (from control console of on-duty staff and from buttons located in the means off egress of the floors or in fire cabinets). In all scenarios on fire danger situation, conventional ventilation and air conditioning systems shall be shut off (not allowed to use at smoke control mode), and turn on exhaust and supply air system to control smoke.

**A.2.29.14** Information of location and actual status of equipment and actuators of smoke control system shall be monitored and recognized at control station.

**A.2.29.15** Mechanisms and operating equipment of smoke control system shall ensure operation reliability determined by a safety probability of not less than 0.999.

**A.2.30** Garbage collecting system

**A.2.30.1** Body of waste chutes shall made of non-combustible materials.

**A.2.30.2** The valve gate of waste chutes shall be arranged in a separated room which is separated with other spaces by fire rated partition with fire resistant rate of not less than EI 120. Fire rated door installed on this partition shall have fire resistant rate not less than EI 60, equipped with automatic-closing mechanism and seal tightly the door gaps.

### A.3 Apartment buildings under occupancy fire hazard category F1.3 with a fire protection height from over 75 m to 150 m

### A.3.1 Buildings with fire protection heights from over 75 m to 100 m

**A.3.1.1** The minimum fire resistance grade of the building is level I, the fire resistance requirements of the structure and building parts are selected according to A.2.24, except for the cases specified in A.3.1.10 and A.3.1.14.

**A.3.1.2** The building shall be divided into vertical fire compartment, with the height of each fire compartment not being greater than 75 m, the subsequent fire compartment each shall not greater than 50m. Fire compartments shall be separated from each other by a fire-blocking floor with minimum fire resistance rate REI 150 or by a technical floor with horizontal load-bearing structure (floor and ceiling) with fire resistance rate not less than REI 90.

**A.3.1.3** The maximum allowable area of a building floor within a fire compartment shall be in accordance to A.2.3.

**A.3.1.4** At the intersections between the fire-blocking floors and the fire barriers with the building's cover structure, there shall be solutions to ensure that fire does not spread through the fire barriers. Fire spreading prevention along the exterior of the building shall comply with the requirements at 4.32, 4.33.

**A.3.1.5** Each vertical fire compartment shall have fire protection system (fire water supply, smoke exhaust, emergency lighting, automatic fire alarm - fire fighting) operating independently. Fire compartments shall be permitted to share the same water supply pump station, fire pump station, smoke exhaust fan, and fire alarm control cabinet.

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**A.3.1.6** Above the exit from the garages on the first floor shall be arranged with eaves made of non-combustible materials with a width of not less than 1.0 m and the distance from this eave to the lower edge of the upper window opening shall not less than 4.0 m.

**A.3.1.7** The compartment dividing and the permissible length of the divided sections of the indoor corridor shall comply with A.2.14. The allowable limit distance from the apartment's entrance door to the nearest emergency exit (staircase or exit lead to external) shall comply with A.2.19.

**A.3.1.8** Clear width of stair flights and stair landings of stair case type N1, N3 in the residential section of the building shall not less than 1.20 m; not less than 1.05 m for staircase type N2, with clearance distance between stair flights not less than 100 mm.

**A.3.1.9** From all smoke-stop staircases, there shall be stair flights leading to the roof through class 2 fire doors.

**A.3.1.10** Other occupancy parts of the building (including technical rooms and auxiliary rooms serving the apartment) shall be separated from the apartment part of the building by a solid fire blocking wall with fire resistance rate REI 150 and fire-blocking floor class 1 and have separate means of egress.

**A.3.1.11** The insulation (if any) of the exterior wall of the building shall be made of non-combustible materials. It is permissible to use insulation from materials with fire groups Ch1 and Ch2 if it is protected from all sides by concrete or plaster with a thickness of not less than 50 mm. At the places of installation of window and door molds on the wall in addition to the thickness of this concrete layer (plaster) shall be not less than 30 mm.

**A.3.1.12** Fire doors shall be arranged appropriately for each case as follows:

a) Except for paragraphs b) and c) below, the fire resistance rate of the door shall be taken not less than EI 30 (EIW 30) in the case of use in components with a fire resistance rate EI 60 (EIW 60) and not less than EI 60 (EIW 60) in the remaining cases.

b) Fire door is class 2 in the following cases: the doors from the vestibules enter the smoke stop staircases, into the lift lobbies and into the rooms with the waste chutes.

c) Doors of elevator hoitsway (elevator landing doors) entering the lift lobby shall be smoke-stop doors.

**A.3.1.13** Finishing materials for ceilings, walls and floors on escape routes, in lift lobbies, common halls and technical floors shall be non-combustible materials.

**A.3.1.14** Sound insulation of rooms, as well as thermal insulation for equipment and technical pipelines shall be made of non-combustible materials.

**A.3.1.15** The main pipes following the riser of the technical system (drainage, stormwater conduction, hot and cold water supply) shall made of non-combustible materials or placed in technical shafts, channels made of non-combustible materials. Requirements for garbage collection systems shall comply with A.2.30.

**A.3.1.16** Smoke control, automatic fire alarm and fire fighting systems for building shall comply with the following additional regulations:

a) All rooms other than apartments (garages, auxiliary rooms, technical rooms, public spaces, garbage compartments and rooms with similar functions) and waste chutes shall have sprinklers (except for electrical and electronic engineering rooms with requirements for arrangement of gaseous fire extinguishing systems or devices);

b) Above the doors to the apartment shall have sprinklers connected to the fire fighting water supply pipe with the flow relay;

c) The automatic fire alarm system shall clearly indicate the address of each apartment. In the rooms of the apartment and the floor corridors, including the elevator lobby, smoke detectors shall be installed. Each apartment shall be equipped with a loudspeaker system to guide escape, ensuring that people in the apartment can clearly hear the announcement and instructions when there is an incident;

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d) It is necessary to equip fire alarm system, equipment, automatic fire fighting means in the channels of electrical engineering, communication and other technical shafts with fire risk;

e) The power supply for the fire protection system includes: elevators in service of transporting fire-fighting forces and means; smoke control system; fire alarm system, automatic fire fighting; shall be taken from independent switchboards or separate electrical panels with different paint colors along two separate routes to the distribution equipment of each fire compartment.

**A.3.1.17** Fire protection requirements for electrical wires and cables of power supply for fire protection systems shall comply with A.2.28.

### A.3.2 Buildings with fire protection height from greater than 100m up to 150 m

**A.3.2.1** Buildings with fire protection height from greater than 100m up to 150 m, in addition to complying with regulations in A.3.1, it is required to provide refugee room, refuge room shall meet following requirements:

a) Refuge floor shall not be greater than 20 floors from each other, the first refuge floor shall be permitted to situate not higher than 21st floor. Refuge room's area shall be separated to other areas by fire barrier with fire resistance rate not less than REI 150. Other areas other than refuge room's area shall be permitted to used for public function. Not allow to arrange apartments or a part of apartments on the refuge floor;

NOTE: Technical floors or a part of technical floor shall be permitted to be refuge room, provide that they satisfy the requirements specified in b), c), d), e) f).

b) Refuge room shall have area with norm of 0.3 $m^2$/people, ensuring that it is sufficient to accommodate the maximum total number of egress occupant of the upper floors from the refuge floor up to and including the next refuge floor, or the remaining upper floors for the top refuge floor. The refuge area shall not be permitted to be used for commercial activities, but can be used as a yard/play area for children or for exercise;

NOTE: Particularly for a building or part of a building having a fire hazard category other than F1.3 then the provisions of A.2.16 shall be applied.

c) Refuge shall be ventilated naturally through fixed wall opening on two outer walls (ventilation opening) to ensure the following requirements:

- Total area of ventilation opening s shall be equal to 25% of area of refuge room;

- The lowest height of ventilation opening (from the bottom to the top edge) shall not be less than 1.2 m;

- Ventilation opening s for refuge room shall be arranged at least 1.5m horizontally and 3.0 m vertically from other unprotected wall opening which are at the equal position or under them. If ventilation openings of refuge room have total area of not less than 50 % area of refuge room, the vertical distance shall be permitted to reduce to 1.5m;

d) Items or equipment stored in refuge room shall be made of non-combustible materials.

e) Refuge room shall have means of egress directly into the smok stop stair and means of egress lead to fire lift vestibule. Egress routes lead to refuge room shall go through a smoke stop vestibule/fire lift vestibule or a side corridor;

f) Refuge room shall have fire protection equipment including: indoor hydrants, sprinkler automatic fire fighting system, emergency lighting, telephone, radio system for exit instruction and similar.

g) Inside the exit staircase and on the outside surface of the exit staircase at the refuge floor, there shall have a notice board with the content "GIAN LÁNH NẠN/FIRE EMERGENCY HOLDING AREA" at the height of 1 500 mm from the finished floor of landing of refuge room floor. The height of words on notice board shall be not smaller than 50 mm.

NOTE: Besides written in Vietnamese and English, the content of notice board shall be permitted to be written in other languages upon the characteristics of popular users in the building.

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h) It shall be permitted to not include refuge room's area to norms of land use coefficients and construction floor area of works.

**A.4 Karaoke and discotheque buildings (in group F2.1)**

**A.4.1** The fire resistance grade of karaoke and disco service buildings shall comply with the provisions of this Code and minimum level IV.

**A.4.2** The floors of karaoke, discotheque service buildings shall have no less than two exits.

It is permissible from each floor to have one means of egress, when satisfy all of the following conditions:

- For buildings with a fire protection height of not more than 15 m, the area of each floor under consideration shall not be greater than 300 $m^2$. For buildings with fire protection height from over 15 m to 21 m, the area of each floor under consideration shall not be greater than 200 $m^2$;

- The entire building shall be protected by automatic sprinkler fire fighting system;

- The largest occupant loads on each floor does not exceed 20 people;

- There shall be at least one means of escape from the floors leading to an open balcony, or leading to a safe zone on an open terrace, or leading to a type 3 staircase

NOTE: An open balcony or open terrace means that it is open to the outdoors and the cover (if any) shall ensure easy egress and rescue when the fire fighter approaches.

**A.4.3** Means of egress from each floor of karaoke and discotheque businesses shall lead into staircase with class 2 fire doors. The egress route on each floor shall be protected by a fire barrier with fire resistance rates as follows:

a) For buildings with fire resistance grade I – shall be made of non-combustible materials with a fire resistance rate of at least EI 30;

b) For houses with fire resistance grade II, III, IV – shall be made of non-combustible or weakly combustible materials (Ch1) with a fire resistance rate of at least EI 15.

**A.4.4** The egress route shall be provided with additional signs indicating low-level egress in accordance to TCVN 13456.

**A.4.5** Finishing and decorative materials (including suspended ceiling panels if any), tiling materials and floor covering materials used in karaoke and discotheque service businesses shall have a fire hazard levels not greater than CV1.

**A.4.6** Fire control rooms (if any) shall comply with 6.17.

**A.4.7** Fire alarm systems, automatic fire fighting systems, fire protection instruments in karaoke and discotheques service buildings shall comply with TCVN 3890, TCVN 5738, TCVN 7336.

**A.4.8** Light and horn of fire alarm system shall be provided in the corridors, common halls, lobbies, concourses and in each room of the karaoke and discotheque service building. The electrical system of the audible and visible system shall be connected interactively, automatically shut off when there is a signal from the automatic fire alarm system and manual shut-off control (the manual interrupt control button shall be located in the fire control room or at the reception area with signposts) in case of fire.

**A.4.9** Karaoke and discotheque service building shall have an open terrace and an fire engine access as defined in 6.3.1 to 6.3.4 for access by firefighters.

**A.4.10** Billboards of karaoke and discotheque service building shall comply with the regulations of QCVN 17:2018/BXD.

NOTE: The review, remediation and assurance of fire safety in accordance with this Code for karaoke and discotheque service building put into use before the effective date of this Code shall comply with the separate instructions of competent police agencies.

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# APPENDIX B

(regulations)

## CLASSIFICATION OF CONSTRUCTION MATERIALS ACCORDING TO FIRE CHARACTERISTICS AND FIRE SAFETY REQUIREMENTS FOR MATERIAL

### B.1 Classification of construction materials according to fire characteristics

#### B.1.1 Types of non-combustible and combustible materials

Construction materials are classified into two types: Combustible and non-combustible materials according to the value of fire testing parameters as follows:

Non-flammable materials, shall ensure throughout the test period:

- Temperature increase of furnace shall not exceed 50 ºC;

- The weight of sample shall not be reduced over 50 %;

- The lengthening time of fire shall not be over 10 seconds.

Fire materials are the types that when performing tests, none of three above factors is satisfied.

NOTE: Testing parameters are determined according to TCVN 12695 (ISO 1182) standards or similar standards. EXAMPLE: Some following materials are classified as non-flammable materials: General inorganic materials such as concrete, clay bricks, ceramic, metals, masonry and plaster, and similar.

#### B.1.2 Classification of flammable materials by flammability

**Table B.1 - Classification of flammable materials by flammability**

| Flammable group of materials | Fire parameters | | | |
|---|---|---|---|---|
| | Air temperature in smoke releasing duct T, ºC | Damage level which reduces the length of sample L, % | Damage level which reduces the mass of sample, m, % | Self-ignition interval, s |
| Ch1 - mildly flammable | ≤ 135 | ≤ 65 | ≤ 20 | 0 |
| Ch2 - moderate flammable | ≤ 235 | ≤ 85 | ≤ 50 | ≤ 30 |
| Ch3 - flammable | ≤ 450 | > 85 | ≤ 50 | ≤ 300 |
| Ch4 - highly flammable | > 450 | > 85 | > 50 | > 300 |

NOTE 1: Testing parameters are determined according to current national standards or similar standards of fire testing method of construction materials.

NOTE 2: If testing according to TCVN 12695 (ISO 1182), the materials meeting the following requirements are also classified into weak flammable materials Ch1:

- Temperature increase of furnace shall not exceed 50 ºC;

- Mass of sample are reduced not over 50%;

- The duration of the flame does not exceed 20 seconds.

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### B.1.3 Classification of combustible materials by combustibility

**Table B.2 - Classification of combustible materials by combustibility**

| Combustibility group of materials | Critical surface heat flux intensity, kW/m$^2$ |
|---|---|
| BC1 - limited combustible | ≥ 35 |
| BC2 - moderately combustible | ≥ 20 & < 35 |
| BC3 - combustible | < 20 |
| NOTE: The critical surface heat flux intensity is determined according to ISO 5657 or equivalent standard. | |

### B.1.4 Classification of flammable materials according to the spread of fire on surface

**Table B.3 - Classification of flammable materials according to the spread of fire on surface**

| Group of fire spread on the surface of material | Critical surface heat flux intensity, kW/m$^2$ |
|---|---|
| LT1 - no spreading | ≥ 11 |
| LT2 - limited spreading | ≥ 8 & < 11 |
| LT3 - moderate spreading | ≥ 5 & < 8 |
| LT4 - fast spreading | < 5 |
| NOTE: Testing parameters are determined according to ISO 5658-2, ISO 9239 or equivalent standards. | |

### B.1.5 Groups of combustible materials by combustibility

**Table B.4 - Classification of flammable materials by smoke generation ability**

| Groups by smoke generation of materials | Value of smoke generation coefficient of materials, m$^2$/kg |
|---|---|
| SK1 − low smoke production | ≤ 50 |
| SK2 − moderate smoke production | > 50 & ≤ 500 |
| SK3 − high smoke production | > 500 |
| NOTE: Testing parameters are determined according to standards ISO 5660–2 or equivalent standards.. | |

### B.1.6 Classification of flammable materials by toxicity

**Table B.5 - Classification of flammable materials by toxicity**

| Group by toxicity of materials | $H_{CL50}$ Index, g/m$^3$, corresponding to exposure time, min | | | |
|---|---|---|---|---|
| | 5 | 15 | 30 | 60 |
| ĐT1 – low toxicity | > 210 | > 150 | > 120 | > 90 |
| ĐT2 – moderate toxicity | > 70 & ≤ 210 | > 50 & ≤ 150 | > 40 & ≤ 120 | > 30 & ≤ 90 |
| ĐT3 – high toxicity | > 25 & ≤ 70 | > 17 & ≤ 50 | > 13 & ≤ 40 | > 10 & ≤ 30 |
| ĐT4 – extra high toxicity | ≤ 25 | ≤ 17 | ≤ 13 | ≤ 10 |
| NOTE: Testing parameters and calculation of $H_{CL50}$ index according to stipulations of ISO 13344 or equivalent standards. | | | | |

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### B.1.7 Fire hazard level of materials

**Table B.6 Fire Hazard Level of Materials**

| Combustible technical characteristics of the material | Fire hazard level of materials | | | | | |
|---|---|---|---|---|---|---|
| | CV0 | CV1 | CV2 | CV3 | CV4 | CV5 |
| 1. Flammable | Non-flammable | Ch1 | Ch1 | Ch2 | Ch3 | Ch4 |
| 2. Combustible | – | BC1 | BC2 | BC2 | BC2 | BC3 |
| 3. Smoke production | – | SK2 | SK2 | SK3 | SK3 | SK3 |
| 4. Toxicity of combustion products | – | ĐT2 | ĐT2 | ĐT2 | ĐT3 | ĐT4 |
| 5. Fire spread on the surface of material | – | LT1 | LT1 | LT2 | LT2 | LT4 |

NOTE: The list of indicators of fire hazard of building materials sufficient to determine the fire hazard level of materials from CV0 to CV5 is determined according to Table B.7.

**Table B.7 – List of necessary fire hazard criteria depending on the use of building materials**

| Uses of building materials | List of necessary fire hazard criteria depending on the use of building materials | | | | |
|---|---|---|---|---|---|
| | Group on flammability | Group on fire spreading on the surface | Group on combustible | Group on smoke production | Group on toxicity of combustion products |
| 1. Wall and ceiling finishing materials, including coatings from paint, enamel, varnish [1)] | + | – | + | + | + |
| 2. Floor covering materials, including carpets | – | + | + | + | + |
| 3. Roofing material | + | + | + | – | – |
| 4. Waterproof and vapor-resistant materials with a thickness greater than 0.2 mm | + | – | + | – | – |
| 5. Insulation | + | – | + | + | + |

[1)] Fire specification assessment is not required for coatings up to 0.3 mm thick, coated on walls, ceilings or floors made from non-combustible materials.

NOTE 1: The symbol "+" means that this criteria needs to be applied.

NOTE 2: The symbol "–" means that this criteria does not need to apply..

NOTE 3: When applying waterproofing materials that are the surface coating of the roof, the criteria of fire hazard should be applied in accordance with section 3.

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## B.2 Fire safety requirements for materials

**Table B.8 - Scope of application of finishing materials, decoration, tiling materials and floor covering materials on the egress route**

| Occupancy fire hazard classification building, construction, fire compartment | Number of floors and height of the building | Fire hazard level of the material | | | |
|---|---|---|---|---|---|
| | | Use for walls and ceilings (including suspended ceiling panels if applicable) | | Floor covering | |
| | | Vestibule, staircase, lift lobby | Common corridor, hallway, concourse | Vestibule, staircase, lift lobby | Common corridor, hallway, concourse |
| F1.2; F1.3; F2.3; F2.4; F3.1; F3.2; F3.6; F4.2; F4.3; F4.4; F5.1; F5.2; F5.3 | ≤ 9 stories or ≤ 28 m | CV2 | CV3 | CV3 | CV4 |
| | > 9 stories & ≤17 stories; or > 28 m & ≤ 50 m | CV1 | CV2 | CV2 | CV3 |
| | > 17 stories or > 50 m | CV0 | CV1 | CV1 | CV2 |
| F1.1; F2.1; F2.2; F3.3; F3.4; F3.5; F4.1 | Does not depend on the number of floors or height | CV0 | CV1 | CV1 | CV2 |

**Table B.9 - Scope of application of finishing, decoration, tiling materials and floor covering materials in common rooms, except sports grounds and dance room floors**

| Occupancy fire hazard category of building | Room occupant load capacity, person | Fire hazard level of the material | |
|---|---|---|---|
| | | Use for walls and ceilings (including suspended ceiling panels if applicable) | Floor covering |
| F1.2; F2.3; F2.4; F3.1; F3.2; F3.6; F4.2; F4.3; F4.4; F5.1 | > 800 | CV0 | CV2 |
| | > 300 & ≤ 800 | CV1 | CV2 |
| | > 50 & ≤ 300 | CV2 | CV3 |
| | ≤ 50 | CV3 | CV4 |
| F1.1; F2.1; F2.2; F3.3; F3.4; F3.5; F4.1 | > 300 | CV0 | CV2 |
| | > 15 & ≤ 300 | CV1 | CV2 |
| | ≤ 15 | CV3 | CV4 |

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# APPENDIX C

(regulations)

# FIRE AND EXPLOSION HAZARD CLASS OF ROOM UNDER MANUFACTURE AND WAREHOUSE FUNCTION

## C.1 Fire and explosion hazard class of the room

**Table C.1 - Classification of fire and explosion hazards for the room**

| Fire hazard class of the room | Characteristics of substances and materials (formed) in the room |
|---|---|
| A<br><br>High fire and explosion hazards | - Flammable gases, liquids with ignition temperature of not less than 28 ºC, which mass can form explosive dangerous gas-vapor mixture, when ignited, generating calculated residual explosion pressure in the room does not exceed 5 kPa.<br><br>- Substances and materials which are potentially flammable when reacting with water, oxygen in the air or react with each other, with mass so that calculated residual explosion pressure in the room not exceeding 5 kPa. |
| B<br><br>Fire and explosion hazards | Dust or burning fiber, flammable gases, liquids with ignition temperature of not less than 28 ºC, burning liquids and its mass can form explosive dangerous gas-dust or gas-vapor mixture, when ignited, generating calculated residual explosion pressure in the room does not exceed 5 kPa. |
| C1 to C4<br><br>Fire hazards | - Flammable or difficult-to-fire liquids, flammable and difficult-to-fire solids and materials (even dust and fibers), substances that when reacting with water, oxygen in the air or with each other can generate fire, in room temperature with substances and materials not belong to Class A or Class B.<br><br>- Classify rooms into classes C1 to C4 according to specific fire load of subjects included in that room as follows:<br><br>C1 − Specific fire load greater than 2 200 MJ/m$^2$;<br><br>C2 − Specific fire load from 1 401 MJ/m$^2$ to 2 200 MJ/m$^2$;<br><br>C3 − Specific fire load from 181 MJ/m$^2$ to 1 400 MJ/m$^2$; |
| D<br><br>Moderate fire hazard | Non-flammable substances and materials at the hot, red hot or melted state which the processing is along with the generation of heat radiation, sparks and flames; Flammable solids, liquids, and gases used as fuels |
| E<br><br>Low fire hazard | Non-combustible substances and materials at the cool state. |

## C.2 Fire and explosion hazard class of the building and construction

### C.2.1 Class A

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**C.2.1.1** The building, construction is classified ad Class A if total area of Class A rooms shall not exceed 5% of total area of all the rooms in that building, or exceed 200 $m^2$.

**C.2.1.2** The building, construction shall not be classified as Class A building if total area of Class A rooms does not exceed 25% of total area of all the rooms in that building (but not exceed 1 000 $m^2$) and those Class A rooms are equipped automatic fire extinguishing devices.

**C.2.2 Class B**

**C.2.2.1** The building, construction is classified as Class B if simultaneously satisfying two following conditions :

- The building, construction is not Class A.

- Total area of Class A rooms and B exceeds 5% of total area of rooms in the building, construction or exceeds 200 $m^2$.

**C.2.2.2** The building, construction shall not be classified as Class B if total area of Class A and Class B rooms does not exceed 25% of total area of all the rooms in that building (but not exceed 1 000 $m^2$) and those Class A rooms are equipped automatic fire extinguishing devices.

**C.2.3 Class C**

**C.2.3.1** The building, construction is classified as Class C if satisfying both following conditions

- The building, construction is not Class A or B;

- Total area of Class A, B and C1, C2, C3 exceeds 5% (10%, if there is no Class A and Class B) of total area of all rooms in the building, construction.

**C.2.3.2** The building, construction shall not be classified as Class C if total area of Class A, Class B, C1, C2 and C3 rooms does not exceed 25% of total area of all the rooms in that building (but not exceed 3 500 m2) and those rooms are equipped automatic fire extinguishing devices.

**C.2.4 Class D**

**C.2.4.1** The building, construction is classified as Class D if satisfying both following conditions:

- The building, construction is not Class A, B or C;

- Total area of Class A, B, C1, C2, C3 and D rooms exceeds 5% of total area of all the rooms in the building.

**C.2.4.2** The building, construction shall not be classified as Class D if total areas of Class A and Class B, C1, C2, C3 and D rooms does not exceed 25% of total area of all the rooms in that building (but not exceed 5 000 $m^2$) and those Class A, B and C1, C2, C3 rooms are equipped automatic fire extinguishing devices.

**C.2.5 Class E**

The building, construction is classified as Class E if it is not Class A, B, C or D.

**C.3 Methods for identifying signs for classification**

**C.3.1** Methods for identifying signs for classification off buildings, constructions and rooms with manufacture and warehouse functions into categories according to fire and explosion hazards specified in the standards.

**C.3.2** Some building and rooms belong to workshop, warehouse, production department shall be permitted to classified as fire and explosion hazard class as follows:

**C.3.2.1 Class A**

- Workshop for production and use of sodium and potassium;

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- Workshop of artificial fiber, rubber production;

- Workshop of petroleum, oil;

- Workshop of hydrogenation for gas distillation and division;

- Workshop of production of artificial liquid fuels, recovery and collection and distillation of dissolved organic liquids with a vapor temperature of 28 ºC or less;

- Storage of gas tank, petroleum depot;

- Rooms for storage of alkaline and acid batteries of power plant;

- Liquid pumping station with vapor ignition temperature from 28 ºC or less.

**C.3.2.2 Class B**

- Production and transportation workshop of coal dust, sawdust, washing stations of fuel oil containers and other liquids with vapor ignition temperature from 28 ºC to 61 ºC.

- Rooms for grinding and rolling solids, processing workshop of artificial rubber, workshop of sugar production, fuel oil storage of power plant, liquid pumping stations with vapor ignition temperature from 28 ºC to 61 ºC.

**C.3.2.3 Class C**

- Workshop for sawing wood, workshop for making wooden art;

- Textile and garment workshop;

- Paper industrial workshop with dry production process;

- Preliminarily processing enterprises of cotton, jute and other fibers;

- Seed sieving, shaking parts of mill and seed storages;

- Workshop of re-processing oil and fat, distillation of asphalt, storage of flammable materials and greases;

- Power distribution equipment with breaker and electrical equipment with grease of greater than 60 kg per unit of equipment;

- Overpasses, corridors used to transport coal and peat;

- Closed warehouse for coal, general warehouse, liquid pumping stations with ignition temperature of over 61 ºC.

**C.3.2.4 Class D**

- Foundry and metallurgy workshop, forging and welding workshop;

- Repair station of locomotive;

- Workshop of metal hot rolling and metal processing by heat;

- Building for placement of internal combustion engines;

- Laboratory of high voltage;

- Main building of power plant (furnace, turbine compartment, …);

- Boiler station.

**C.3.2.5 Class E**

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- Mechanical workshop for cold processing of metal (except magnesium alloy);

- Ore storage yard;

- Soda production workshop (except of furnace part);

- Blower stations, press of air and non-flammable gases;

- Acid re-processing workshop;

- Repair station of electric vehicles and engines of electric scooters;

- Workshop of stamping, molding and cold rolling Asbestos ore minerals, salt and other non-combustible materials;

- Workshop of textile and paper industry with wet production process;

- Processing workshop of food, fish, meat, milk;

- Electrical control station;

- Water cleaning works (sedimentation, filtration, bleaching, …);

- Water pumping and intake of power plant;

- Parts with Carbonic Acid and Chlorine, cooling tower, non-flammable liquid pumping stations.

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# APPENDIX D

(regulations)

# SMOKE CONTROL AND PROTECTION

## D.1 General requirements

**D.1.1** Smoke protection for buildings and constructions is intended to prevent and (or) limit the spread of smoke and fire products (hereinafter collectively referred to as smoke) in the buildings, for the purpose of:

- Create safe conditions for the egress of occupant and protect property in the event of a fire;

- Create the necessary conditions for firefighters for rescuing, detecting and localize fires in the building.

**D.1.2** Smoke protection solutions for buildings and constructions include:

- Division, isolation of smoke into smoke zones (smoke reservoirs);

- Natural smoke venting in case of fire;

- Smoke exhaust ventilation: including smoke exhaust system and anti-smoke air supply based on natural mechanism or mechanical forced mechanism;

- Create positive pressure for areas that required to prevent smoke contamination.

One or more of the above-mentioned solutions can be applied simultaneously, and the lower boundary of the smoke layer shall not be lower than 2 m from the highest floor that can be walked in the room or in the smoke-protected corridor.

**D.1.3** The equipment of the smoke exhaust system and anti-smoke air supply, regardless of the mechanism of operation (natural or forced), shall be driven (activated) automatically (upon automatic fire alarm signals or from automatic fire fighting equipment) and driven (activated) remotely (from the dispatch room of the building, or fire control room or from buttons placed on means of egress or in fire alarm cabinets. These buttons shall be arranged so that humans can easily activate them).

The equipment of the smoke protection system (including ducts) shall be installed in accordance with the manufacturer's regulations, periodically inspected and properly maintained. Auxiliary instrument for installation and suspension of equipment shall ensure the maintenance of the operability of the equipment as prescribed by the manufacturer during the operation period.

**D.1.4** When turning on the smoke exhaust system of the building in case of fire, the ventilation systems, general air conditioning and ventilation systems and air conditioners serving the technological requirements (if any) of the building (except for systems serving technological safety), and closing the regularly open fire dampers. The shutdown of ventilation systems, air conditioning can be complete or partial, depending on the specific design, but shall satisfy the condition of preventing smoke and fire spreading through the general air conditioning, ventilation system.

**D.1.5** The smoke exhaust ventilation system shall be independent for each fire compartment, except:

- Positive pressure air supply systems to protect staircases and lift shafts connecting between different fire compartments;

- The smoke exhaust systems protecting the void and the undivided void corridors which are not separated into fire compartments.

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**D.1.6** The compensatory air supply system (the supply of air from the outside to compensate for the volume of smoke that has been sucked out) shall only be used in coordination with the smoke exhaust system. It is not permissible to apply a compensatory air supply system separately without a corresponding smoke exhaust system. In any case, the pressure difference on the exit doors shall ensure that the average person can easily open the door.

The same smoke protection system shall not be shared for rooms with different occupancy fire hazard categories.

**D.1.7** It shall be permitted to change the requirements in this Appendix D on the basis of technical statement of smoke protection solutions in accordance with the applicable standard.

**D.1.8** For some rooms with special functions or special technological requirements (such as clean rooms, cold storage), smoke protection may comply with the applicable standard documentation. In all cases, it is necessary to ensure the safety of people in the building to egress and rescue forces to approach.

NOTE: The concept and classification of cleanrooms is defined by ISO 14644 or equivalent standard.

**D.2** Smoke extraction shall be performed from the following areas:

a) From corridors (except side corridors) and concourses, lobbies, halls of buildings, public buildings, administrative-auxiliary buildings (in industrial facilities) and mixed buildings with a fire protection height greater than 28 m;

b) From corridors and walking tunnels of basements, semi-basements of buildings, public buildings, administrative-auxiliary buildings (in industrial facilities), manufacturers and mixed buildings, when these corridors and walking tunnels connect with rooms with regular workers;

c) From corridors with a length greater than 15 m without natural smoke venting when there is a fire of buildings of 2 floors or more:

- Class A, B and C manufacturers and warehouses;

- Public buildings, including administrative-auxiliary buildings in industrial facilities;

- Mixed building;

d) From common corridors (except for side corridors) and common halls, concourses, lobbies of multi-purpose buildings with smoke-stop exit staircase.

e) From the void and commercial corridors surrounding the void (hereinafter collectively referred to as the void);

f) From rooms where people work regularly, for production or warehouses, including the storage of books, documents, artifacts, restoration workshops of the museum (for shelved storage rooms, it does not depend on the presence of regular workers), if these rooms are class A, B, C1 to C3 in fire resistance grade I to IV buildings, or class C4, D, E in fire resistance grade IV buildings;

g) From each room connected to the smoke-free staircase, or from each room without natural smoke venting when there is a fire:

- Area of 50 $m^2$ or more, often or temporarily occupied by many person (occupant load of more than 1 person per 1 $m^2$ of floor, excluding the occupied area of equipment and items);

- Commercial booths, displaying products and goods;

- Reading and book storage rooms of libraries, exhibition halls, museums with an area of 50 $m^2$ or more, with people working regularly, used to store or use combustible substances and materials;

- Dressing room, sending items with an area of 200 $m^2$ or more;

h) Closed garages, underground or above ground, built separately or as part of other functional

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buildings and also the separated ramps of these garages.

It is permissible to exhaust smoke through adjacent corridors from rooms with an area of up to 200 $m^2$ and fire hazard class C1, C2, C3, or storing or using combustible substances and materials.

For commercial rooms and offices with an area not larger than 800 $m^2$, when the distance from the farthest point of the room to the nearest exit is not greater than 25 m, it is permissible to smoke through adjacent areas such as corridors, lobbies, halls and void corridors.

It is not allowed to divide the dead-end corridor of the building with partitions with doors into sections with a length of less than 15 m.

NOTE 1: An area without natural smoke venting during a fire is an area where there is no openings on an external building structure (outer wall) or an area with an open doorway but the area is not enough for discharging the fire product.

NOTE 2: In case of fire, in order to provide natural smoke venting for corridors, open windows or door holes in the outer wall shall be provided with the following requirements:

- The upper edge of the opening shall not lower than 2.5 m and the bottom edge of the opening shall not higher than 1.5 m from the floor;

- The total width of the openings shall not less than 1.6 m for each section of 30 m of corridor length;

- The opening shall be easily opened manually when the person is standing on the floor.

NOTE 3: In case of fire, in order to provide natural smoke venting for room, there shall be open windows or door holes in the outer wall similar to NOTE 2, with a minimum width of 0.24 m for each meter of outer wall length. If the outer wall is only located on 1 side of the room, the distance from this outer wall to the inner partition wall shall not be greater than 20 m. If the openings are located in two external building structures facing each other, the distance between those two structures shall not be more than 40 m, in this case, the length of the outer wall shall not be less than 1/3 of the total length of the inner room partitions.

**D.3** Requirements specified in D2 shall not required to apply for:

a) Rooms with area up to 200 $m^2$, being equipped with foam or water based automatic fire fighting system (except rooms with fire hazard class A, B, rooms directly connected to smoke-free staircases N2 and N3, and enclosed garages with manual parking (drivers shall park themselves));

b) Rooms equipped with automatic fire fighting equipment with gas, powder, aerosol (except for closed parking garages operated by driver);

c) Corridors and halls when all rooms with doors opening to these corridors or halls are smoke extracted;

d) Rooms with area up to 50 $m^2$ located in the main room which is smoke extracted;

e) The corridors (except those specified in a) and b) of D.2) without natural smoke venting in case of fire, if there are no regular workers in all rooms where doors enter this corridor, and these doors are smoke-sealed fire doors;

f) Public rooms constructed at the 1st floor (ground floor) in categories F1.2 and F1.3, with structure separated with residential area and there is a direct exit to the external when the distance from the furthest point of the room to this exit not greater than 25 m and the area not greater than 800 $m^2$.

**D.4** Smoke extraction rate shall be determined by calculation in the following cases:

a) From the corridors specified in D.2 a), b), c), d) – for each section of length not greater than 60 m;

b) From the rooms specified in D.2 e), f), g), h) – for each smoke zone with area not greater than 3 000 $m^2$.

**D.5** Smoke extraction systems protecting corridors shall be separated from smoke extraction systems to protect rooms.

It shall be permitted to provide general smoke exhaust system to protect the corridors of the rooms in paragraph f) of D.3 and the corridors of the rooms on the upper floors, if all of these rooms are in a fire compartment.

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**D.6** Smoke intakes of smoke extraction shafts to draw smoke from corridors shall be placed under the ceiling of the corridor and not lower than the doorway (the upper edge of the entrance opening of the means of egress). Smoke intakes shall be permitted to install on branch ducts leading to smoke extraction shaft. The length of corridors need to install a smoke intake air grill shall be as follows:

- No greater than 45 m if it is a straight corridor;

- Not greater than 30 m if it is a zigzag corridor;

- Not greater than 20 m if it is an enclosed loop corridor.

The length of the corridor is calculated as the total length of the corridor segments located in a row, which are rectangular or near-rectangular.

**D.7** When the smoke is exhausted directly from rooms with an area of more than 3 000 m2, the room (by cover solution (using smoke barriers) or hypothetical solution) shall be divided into smoke zones (smoke reservoirs) with an area not greater than 3 000 $m^2$ and shall take into account the possibility of fire in one of those areas. Each smoke air grill shall only counted for an area not exceeding 1 000 $m^2$.

If smoke barriers (smoke screens) are used to divide the room into smoke zones, it is permissible to design only one smoke exhaust system in the smoke zone with fire. If a hypothetical solution is used to divide the room into smoke zones, there shall be a corresponding calculation base and all smoke exhaust systems shall be designed simultaneously for all smoke zones.

NOTE: A smoke screen is a remote automatic control screen, or a fixed structural part made from a material that does not allow smoke to penetrate with a non-hazardous combustion not more than Ch1 on a non-combustible background (mesh, fabric and other forms), attached to the protected room ceiling or attached to the opening in the wall and lowered to a segment not less than the thickness of the smoke layer formed, which prevents smoke from spreading as well as dividing the room into smoke zones.

**D.8** For direct smoke exhausting for rooms and corridors of single-storey buildings, a forced smoke exhaust system can be applied, or a natural smoke mechanism through smoke collector wells with smoke damper, through smoke exhaust vents, or through open and non-wind-catching skylights.

NOTE 1: A forced smoke exhaust system is a smoke exhaust system, in which the force that draws smoke out is generated and maintained by the exhaust fan.

NOTE 2: A natural smoke venting system is a smoke exhaust system, in which smoke discharges itself outside the building through openings in the covering structure of the building based on the laws of natural physics

In multi-storey buildings, it is necessary to provide a forced smoke exhaust system. It is permissible to provide natural smoke venting system for the top floor of a multi-storey building, through smoke dampers, smoke hoods, or open skylights, shutters that open and do not let in the wind.

For single-storey buildings and the top floor of multi-storey buildings, it is permissible to use natural smoke venting in case of fire instead of a smoke exhaust system when the following conditions are met:

- Smoke discharging calculations shall be provided in accordance with the applicable standard, with the worst conditions for smoke exhaust (in terms of outdoor air temperature, external wind velocity, fire location, location and opening status of the openings and other factors). In the calculation, the lower boundary of the smoke layer shall be no less than 2 m to the highest walkable floor in the considered corridor or room.

- The doorways, openings and skylights mentioned in the smoke exhaust calculation shall always be open, or automatically open in case of fire and shall ensure that they can be controlled and opened remotely by humans. The open area of doorways and skylights when there is a fire shall be consistent with the calculation.

**D.9** The smoke exhaust system shall meet the following requirements:

a) The arrangement of exhaust fans (including fan auxiliary parts for connection to the tube) with appropriate fire resistance rates (for example: 0.5 h at 200 ºC; 0.5 h at 300 ºC; 1 h at 300 ºC; 1 h at

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400 ºC; 1 h at 600 ºC or 1.5 at 600 ºC, ...) shall be performed basing on calculated temperature of airflow movement, corresponding to the class of the served room;

b) Ductworks and channels, if there is a requirement for fire resistance rates, shall be made from non-combustible materials (including insulation coatings and flame refractory protection of ducts) and have class B tightness (tightness grade as determined in EN 15727 or equivalent standard), with a fire resistance rate not less than:

- EI 120 - ductworks and smoke channels outside the scope of fire compartment which such system serves; provided that at the positions of ductworks and smoke channels penetrate the walls, fire blocking floor of fire compartment shall not be installed with normally opening fire dampers;

- EI 60 – ductworks and smoke channels in the scope of served fire compartment, when used to extract smoke from closed garages;

- EI 45 – ductworks and smoke channels in the scope of served fire compartment, when extract burning products directly at that service area;

- EI 30 – other cases in the scope of served fire compartment

NOTE 1: There is no requirements of fire resistance rate to ductworks in the channels or technical shafts enclosed by fire barriers with equivalent fire resistance rate according to the requirements.

NOTE 2: Normally open fire dampers shall be type which closed in case of fire.

c) Normally closed fire dampers have a fire resistance rate not less than:

- EI 60 – for enclosed garages;

- EI 45 – used for direct smoke discharge from protected rooms;

- EI 30 – for corridors and halls when installing dampers on branch ducts from smoke collector wells;

- EI 30 – for corridors and halls when installing smoke dampers directly on the opening of smoke collector wells;

d) Smoke and burning products shall be released to the outside of buildings by either of the following ways:

- Exhaust to roof: shall ensure a distance of at least 5 m from the smoke discharge point to the air intake of the anti-smoke air supply system. The smoke exhaust duct height is at least 2 m if the roof is made of combustible materials, allowing a lower smoke exhaust height if the roof is protected by non-combustible materials within a distance of at least 2 m from the edge of the smoke outlet, or without protection if a vertical smoke exhaust roof fan is used;

- Discharge through the smoke hoods, taking into account wind velocity outside the building;

- Through openings, exhaust shaft at the outer wall without doorway or not less than 5m from doorways vertically and horizontally and over 2m from the ground. Distance to the doorways can be reduced if smoke velocity is not less than 20 m/s;

- Through separate smoke discharge wells located on the ground at a distance of not less than 15 m taking into account the outer wall with windows (in case the outer wall windows are smoketight doors, always closed or automatically closed when there is a fire, the minimum distance is not specified), or calculated from the suction airgrill of the ventilation air supply system of neighboring buildings or of the anti-smoke air supply system of the building under consideration. It is permissible to replace this requirement with other smoke discharge solutions in accordance with the applicable standard documentation.

Smoke shall be permitted to exhaust from smoke extraction ducts from basements and semi-basements through ventilated compartments. In this case, smoke exhaust opening shall be located at least 6m from the foundation of the first basement ventilation compartment (minimum 3m vertically and 1m horizontally from the structure of the building) or at least 3m from floor surface to wet exhaust equipment. Smoke

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valves shall not be installed on these ducts.

Exhaust fans shall be placed in separate rooms with cover structures that have a fire resistance rate not lower than the required fire resistance rate of the chimneys passing through these covering structures, or placed immediately in the rooms they protect.

The exhaust fans can be placed on the roof or outside the building with a covering structure that ensures no access from strangers.

**D.10** In case of fire, smoke-proof air supply system shall supply air from the outside to the following areas:

a) In the hoistway (when at the door to the shaft without fire blocking vestibule protected by a smoke-proof air supply system) in the building provided with smoke stop stair enclosure;

b) In vestibule of fire lift;

c) Type N2 smoke stop staircases;

d) In fire blocking vestibule of type N3 smoke stop staircases.

e) Fire blocking vestibule from the elevator doors to the garages of underground garages;

f) Fire blocking vestibules on stairs inside the building, leading into rooms of the 1st floor from basements or semi-basements with rooms that use or store combustible substances and materials or have corridors without natural smoke venting. In the buffer compartments in the workshops, casting, rolling and other thermal processing booths allow air to enter from the ventilation booths of the building;

g) Fire blocking vestibule at the entrance of atrium and sales area, from the elevation of basement and semi-basement;

h) Buffer chamber (if required in the Code regarding providing N2 staircase vestibule) on the floor under the fire of N2 staircases in apartment buildings with fire protection height over 75 m, mixed buildings with fire protection height over 28 m, and public buildings with fire protection height over 50 m;

i) The lower part of the rooms and corridor is protected by a smoke exhaust system, in order to compensate for the volume of smoke that has been exhausted out;

NOTE: The lower part of the rooms or corridors: is the part of the room or corridor that is under the smoke layer when there is a fire, protected by a smoke exhaust system and anti-smoke air supply.

j) Fire blocking vestibule which separates car storage rooms of above-ground closed garages and underground garages with other function rooms;

k) Fire blocking vestibules, dividing car storage spaces from closed ramps of underground garages;

l) Fire blocking vestibules at the entrance to the foyer, vestibule from the N2 staircase connected to the upper floors of the building;

m) Fire blocking vestibule (elevator lobby) at the exit from the elevator to the semi-basement and basement of the building;

n) Rooms in a safe zone (if any) on the floor where the fire is located.

It is permissible to supply positive pressure air into the common corridors of rooms that are directly smoke exhausted, as well as into corridors connected to entertainment areas, lounges, other corridors, halls, concourses, and voids, atriums protected by smoke exhaust systems.

In fire blocking vestibule (elevator lobby) on the exit from the elevator to the basements of the building, air from the lift shafts is not allowed through normally closed fire dampers, if the main stop floor of these elevators is located on the 1st floor of the building, and the lift shafts are protected by a anti-smoke air supply system with air supply not to go beyond the floor main stop.

When providing safety zones in lift lobbies, air entering these halls shall not allowed through normally

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close fire dampers from adjacent lift shafts.

**D.11** Air supply flow rate used to control smoke shall be calculated to ensure residual pressure from 20 Pa to 50 Pa at the following positions:

a) In Lift shafts – when all lift shaft doors are closed, except for doors on the main stop level of the elevator;

b) In staircases of type N2 – take a greater flow rate value in the following cases:

- On the floor with fire: When the doors from the corridor, concourse, lobbies and hallways to the passageway to the staircase are all opened, or the doors from the rooms directly to the staircase are open;

- Doors from the indoors to the outdoors are open, while all other doors leading from corridor, concourse, lobbies and hallways on all floors are closed;

c) In fire blocking vestibules on the floor with fire (when the doors are closed).

The air flow into the fire blocking vestibule on the entrances to the N2 or N3 staircases, to the type 2 staircases, on the entrances to the basements and semi-basements, in front of the lift lobbies of underground garages, should be calculated to ensure that the air flow velocity through the openings is not less than 1.3 m/s, taking into account the simultaneous operation of the smoke exhaust system.

The positive pressure value is determined compared to the rooms adjacent to the protected room.

**D.12** When calculating the parameters of the anti-smoke air supply system, the following requirements shall be observed:

a) Residual pressure not less than 20 Pa and not greater than 50 Pa in the following areas:

- N2 staircase;

- Fire blocking vestibule on doors to N2 or N3 staircases from floors;

- Fire blocking vestibules on the entrance to the void, atrium from the basements and semi-basements;

- Fire blocking vestibules separate the garage from the ramps of the underground garage;

- The lift lobbies of the basements and semi-basements;

- The common corridors of the rooms are directly smoke exhausted;

- Rooms of the safe zone (if any);

- Lift shaft doors.

b) When there are two-leaf doors then take into account the area of the larger wing, then this area shall not be less than the area required for egress. In the opposite case, the entire area of the two-leaf door shall be taken;

c) The lift shaft stops at the main stop floor;

d) The residual pressure on the closed doors of the exit shall not exceed 50 Pa under the simultaneous effect of the smoke exhaust system and anti-smoke air supply.

**D.13** The anti-smoke air supply system shall satisfy the following conditions:

a) Blower fans can be installed at the following locations:

- In rooms where there are no other types of fans, with the fire resistance rate of the enclosure structure not lower than the required fire resistance rate for structures intersecting with ducts;

- Within a fire compartment: in rooms containing the general ventilation system's air supply system if it

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satisfies the requirements of design standards, or installed directly in staircases, corridors and fire blocking vestibules;

- On the roof and outside the building, with a covering structure that avoids the approach of strangers.

b) Ducts and channels shall be made from non-combustible materials (including insulation coatings and flame refractory protection of ducts), have class B tightness and fire resistance rates not lower than:

- EI 120 - for air collection wells and air supply channels outside the scope of the served fire compartment;

- EI 120 - for channels of the air supply system protecting the vestibules of fire lift shafts;

- EI 60 - for channels that supply air to the fire blocking vestibule on the entrance to the N2 or N3 staircase from the floors, as well as air supply to the spaces of the closed garage;

- EI 30 - for air collection wells and air supply channels outside the scope of the served fire compartment;

NOTE: There is no requirements of fire resistance rate to ductworks in the channels or technical shafts enclosed by fire barriers with equivalent fire resistance rate according to the requirements.

c) The outside air intake openings shall be located no less than 5 m from the smoke outlet of the smoke exhaust system;

d) Normally closed fire dampers in supply air channels to the fire blocking vestibule have a fire resistance rate of not less:

- EI 120 - for systems specified in b) of D.10;

- EI 60 - for systems specified in b) of D.10;

- EI 30 for systems in f), g), i) of D.10, as well as m) of D.10 including b) of D.13.

NOTE: Resistance rates are not required for normally closed fire dampers of air supply duct located in channels or technical shafts covered by fire barriers with equivalent fire resistance rates as prescribed.

e) Fire dampers shall not be required for systems serving only one fire blocking vestibule. It is not permissible to apply non-insulated damper blades in fire dampers that normally close in channels that direct air into the fire blocking vestibule;

f) The minimum distance between the smoke intake of the smoke exhaust system and the air supply door of the anti-smoke air supply system mentioned in section i) of D.10 shall not be less than 1.5 m vertically.

**D.14** Some requirements for space-premises solutions and structural solutions

**D.14.1** The enclosure structures for general ventilation equipment located in the fire compartment in which it serves shall have a fire resistance rate not lower than EI 45.

The covering structures of the rooms for ventilation equipment to exhaust smoke – as required by D.9 and a) of D.13.

Doors to the above rooms shall be class 2 fire doors (except for rooms with general ventilation equipment of class E).

**D.14.2** The covering structures of rooms for general ventilation and smoke exhaust ventilation equipment located outside the fire compartment it serves shall have a fire resistance rate not lower than EI 150. Doors to the above rooms shall be class 1 fire doors.

**D.14.3** In buildings not protected by smoke exhaust systems, elevator doors shall not be permitted to be opened on any one floor.

**D.14.4** The exit from the elevator to the underground garage shall have a fire blocking vestibule

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protected by a smoke-proof air supply system.

**D.14.5** To compensate for the volume of smoke that has been sucked out of the room by the smoke exhaust system, the air supply system shall be designed according to a natural or forced mechanism:

a) Air according to the natural mechanism can be supplied through openings in the outer wall or through air supply shafts with valves that are automatically driven and driven remotely. The openings shall be arranged in the lower part of the protected room. In order to compensate for the voids, atriums and corridors surrounding the voids, atriums, it is possible to use the door openings of the direct egress to the outdoors, then these doors shall be controlled automatically remotely. The total ventilation area of the openings shall be determined in accordance with D.4 and meet the requirements that the air flow velocity through the openings shall not exceed 6 m/s;

b) The forced anti-smoke air supply system can be designed independently or using the air supply systems themselves to the fire blocking vestibule or lift shafts (except fire lift shafts and N2 staircases).

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# APPENDIX E

(regulations)

## FIRE PROTECTION DISTANCE

**E.1 The fire protection distance between residential buildings, buildings, and public buildings (including office buildings and service buildings), shall be selected in accordance with Table E.1.**

The minimum fire protection distances between residential buildings and public buildings (including office buildings, service buildings) are specified in Table E.1.

The minimum fire protection distance between residential buildings and public buildings (including office buildings, service buildings) are specified in Table E.1.

In case it is necessary to ensure the distance between buildings and constructions serving firefighting and rescue, the distance between the two constructions shall meet the corresponding requirements, in addition to the provisions of this Appendix for fire protection distance.

NOTE: Determine the same fire protection distance for garages as for warehouses; for auxiliary-administrative buildings in industrial facilities - similar to public buildings.

**Table E.1 - Fire protection distance between residential buildings and public buildings and distance from residential buildings and public buildings to manufacture and warehouses buildings**

| Fire resistance grade of the first building | Structural fire hazard level of the first building | Minimum fire protection distance, m, to the second residential buildings and public buildings with fire resistance grade and fire hazard level of construction | | | |
|---|---|---|---|---|---|
| | | I, II, III S0 | II, III S1 | IV S0, S1 | IV, V S2, S3 |
| 1. Residential buildings and public Buildings | | | | | |
| I, II, III | S0 | 6 | 8 | 8 | 10 |
| II, III | S1 | 8 | 10 | 10 | 12 |
| IV | S0, S1 | 8 | 10 | 10 | 12 |
| IV, V | S2, S3 | 10 | 12 | 12 | 15 |
| 2. Manufacturers and warehouses | | | | | |
| I, II, III | S0 | 10 | 12 | 12 | 12 |
| II, III | S1 | 12 | 12 | 12 | 12 |
| IV | S0, S1 | 12 | 12 | 12 | 15 |
| IV, V | S2, S3 | 15 | 15 | 15 | 18 |

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NOTE 1: The distance between buildings and constructions is the clear distance between walls or their external structures. In case the structures of buildings or works are made from combustible materials and protruded by over 1m, the distance between these structures shall be taken.+

NOTE 2: The fire protection distance between the solid walls (without window openings) of residential buildings, public buildings (with fire resistance grade I to IV; structural fire hazard level S0, S1; outer wall finishes with minimum combustion Ch1; outer layer (waterproofing) of roofs at least Ch1 and LT1) to other buildings and structures shall be permitted to take 20 % smaller of the value specified in this table.

NOTE 3: For 2-stories buildings with assembled combustible frame and panel structures grade V, as well as buildings roofed with combustible materials, the fire protection distance shall be increased by 20 % of the value specified in this table.

NOTE 4: It is not required for a fire protection distance between residential buildings, public buildings if the wall is higher and wider between two buildings, or both adjacent walls of the two buildings are class 1 fire barrier walls.

NOTE 5: Not specify the distance between buildings as well as buildings and other works serving the living when the total constructed land area (including non-constructed land between them) shall not exceed the maximum allowable floor area within the scope of a fire compartment determined by the worst fire resistance grade and fire hazard levels (see Appendix green H).

NOTE 6: The distance between public buildings is not specified when the total area of construction land (including the area of non-building land between them) does not exceed the largest permissible floor area within the scope of a fire compartment (see Appendix H).

This note shall not apply to buildings under the F1.1 and F4.1 occupancy fire hazard categories, and building of flammable gases, flammable liquids and combustible liquids service, as well as substances and materials that are likely to explode and burn when acting on water, oxygen in the air or between them.

NOTE 7: It is allowed to reduce the fire protection distance specified in this table by 50% for buildings with fire resistance grades I and II, structural fire hazard class S0 and each building is equipped with automatic fire fighting throughout the building.

## E.2 Fire protection distance between manufacturers, warehouses

The fire protection distance between buildings in an industrial facility, depending on the fire resistance grade, structural fire hazard levels and fire and explosion hazard class, shall not be less than the values specified in Table E.2.

**Table E.2 Fire protection distance between buildings in an industrial facility**

| **Structural fire resistance grade and hazardous levels** | **Fire protection distance between buildings**, m | | |
|---|---|---|---|
| | **Fire resistance grade I & II. Fire resistance grade III & IV & S0 class** | **Fire resistance grade III & S1 class** | **Fire resistance grade III & S2, S3 class. Fire resistance grade IV & S1, S2, S3 class. Fire resistance grade V** |
| 1. Fire resistance grade I & II. Fire resistance grade III & IV S0 level | Class D and E buildings: Not specified | 9 | 12 |
| | Class A, B, C buildings: 9 m (see NOTE 3) | | |
| 2. Fire resistance grade III & S1 level | 9 | 12 | 15 |
| 3. Fire resistance grade III & S2, S3 level. Fire resistance grade IV & S1, S2, S3 level. Fire resistance grade V | 12 | 15 | 18 |

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NOTE 1: The minimum distance between buildings and works is the clear distance between walls or their external structures. In case the building or the work has the structures made from combustible materials protruded by over 1 m, the minimum distance to be taken is the distance between these structures.

NOTE 2: It shall not be required the distance between F5 buildings and industrial works in the following cases:

a) If the total floor area of from 2 buildings or more have the fire resistance grade at levels III, IV does not exceed the allowable area of the largest floor within the scope of a fire compartment (Appendix H) according to the highest fire hazard class, the lowest fire resistance grade and lowest fire hazard level.

b) If the wall of a building or building is higher or larger and faces up another work which is a type 1 fire blocking wall.

c) If buildings and constructions under fire resistance grade III, regardless of the fire risk of the rooms in them, there are standing walls opposite which are class 2 fire walls with openings provided and sealed with fire doors or type 2 fire dampers.

The distance between buildings shall meet the requirements of distance for firefighting and rescue services.

NOTE 3: The given distance for buildings and works with the fire resistance grade at levels I, II, as well as buildings of grade III and IV with grades S0 with manufacture classes A, B, C are reduced from 9 m to 6 m when those buildings are equipped throughout with automatic fire extinguishing systems.

## E.3 Determine the area of the opening that is not protected against fire of the outer wall and the corresponding fire resistance rate of the part of the outer wall that shall be protected against fire

**E.3.1** The fire protection distance follows the boundaries set forth in this section to determine the proportion of the area of the outer wall that is not protected against fire and the fire resistance rate of the outer wall.

**E.3.2** The boundary fire protection distance is the width of the open and unchanged space, measured horizontally perpendicular 90° from the outer wall of the building to the boundary line of the adjacent land, or to the median of the contiguous road, or to a conventional line between the outer wall of adjacent buildings in the same property.

The convention line is defined as follows

- In case of existing building, the conventional line will be parallel and a distance from the exterior of the available building corresponding to the total unprotected exterior area and firewall resistance rate of this building (see tables E.3, E.4a and E.4b);

- If both buildings are newly built, the conventional road is the one that fits the unprotected exterior area and the outer wall resistance rates of both buildings

- If the exterior of the building has an irregular shape, the demarcation line is determined according to the safest option from the different outer wall planes.

NOTE: The non-fire protected part of the outer wall is usually the following parts:

a) Openings (doors, windows, and similar doors) that do not meet the requirements of fire doors in fire blocking walls;

b) The wall sections have a fire resistance rate lower than the fire resistance rate of the corresponding fire blocking wall;

c) The sections of the wall where the outer surface uses materials with fire hazards equal to and higher than groups Ch1 and LT1.

**E.3.** The ratio of the largest total area of openings that are not protected against fire to the total area of the wall facing the boundary line is determined according to tables E.4a and E.4b. The fire resistance rate of the part of the wall that is protected against fire is specified in Table E.3.

NOTE: In all cases, the requirements for fire protection shall be complied with according to the exterior of the building at 4.32, 4.33.

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**Table E.3 - The fire resistance limit of the outer wall depends on the boundary line fire protection distance**

| Building under occupancy fire hazard category | Fire protection distance according to the boundary line, m | | | | Unprotected opening area |
|---|---|---|---|---|---|
| | ≥ 0 & ≤ 1,5 | > 1,5 & ≤ 3 | > 3 & ≤ 9 | > 9 | |
| 1. Categories F3.1, F3.2; karaoke, discotheques of F2.1; F5 class C | E 120 | E 60 | 0 | 0 | See Table E4a |
| 2. Category F5 class A, B | E 180 | E 120 | E 60 | 0 | See Table E.4a |
| 3. Other building categories | E 60 | E 60 | 0 | 0 | See Table E.4b |

**Table E.4a – The ratio of the largest total area of unprotected openings against fire to the total area of the wall facing the boundary line, % (for building under sections 1, 2 Table E.3)**

| Distance of fire protection according to the boundary line, m | Total external wall area, $m^2$ | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 14 | 19 | 23 | 28 | 37 | 47 | 56 | 65 | 74 | 84 | 93 | 140 | 186 | 233 | 326 | 465 | 930 | ≥ 1860 |
| 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.2 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 1.5 | 6 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 1.8 | 9 | 7 | 7 | 6 | 6 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 2.1 | 12 | 10 | 8 | 8 | 7 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 2.4 | 17 | 13 | 11 | 9 | 9 | 7 | 7 | 6 | 6 | 6 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 |
| 2.7 | 21 | 16 | 13 | 12 | 10 | 9 | 8 | 7 | 7 | 7 | 6 | 6 | 5 | 5 | 5 | 4 | 4 | 4 | 4 |
| 3.0 | 27 | 20 | 16 | 14 | 12 | 11 | 9 | 8 | 8 | 7 | 7 | 7 | 6 | 5 | 5 | 5 | 4 | 4 | 4 |
| 4.6 | 69 | 48 | 38 | 31 | 27 | 21 | 18 | 16 | 14 | 13 | 12 | 12 | 9 | 8 | 7 | 6 | 6 | 5 | 4 |
| 6.1 | 100 | 91 | 70 | 57 | 48 | 38 | 31 | 27 | 24 | 22 | 20 | 18 | 16 | 12 | 10 | 9 | 7 | 6 | 5 |
| 7.6 | 100 | 100 | 100 | 91 | 77 | 59 | 48 | 41 | 36 | 32 | 29 | 27 | 20 | 16 | 14 | 11 | 9 | 7 | 5 |
| 9.0 | 100 | 100 | 100 | 100 | 100 | 86 | 59 | 56 | 52 | 46 | 42 | 38 | 27 | 22 | 18 | 15 | 12 | 8 | 6 |
| > 9.0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

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**Table E.4b – The ratio of the largest total area of openings that are not protected against fire to the total area of the wall facing the boundary line, % (for buildings in section 3, Table E.3)**

| **Distance of fire protection according to the boundary line,** m | **Total outer wall area,** $m^2$ | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **9** | **14** | **19** | **23** | **28** | **37** | **47** | **56** | **65** | **74** | **84** | **93** | **140** | **186** | **233** | **326** | **465** | **930** | **≥ 1860** |
| 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.2 | 9 | 8 | 8 | 8 | 8 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 1.5 | 12 | 11 | 10 | 9 | 9 | 9 | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 1.8 | 18 | 15 | 13 | 12 | 11 | 10 | 10 | 9 | 9 | 9 | 9 | 8 | 8 | 8 | 8 | 7 | 7 | 7 | 7 |
| 2.1 | 25 | 20 | 17 | 15 | 14 | 12 | 11 | 11 | 10 | 10 | 10 | 9 | 9 | 8 | 8 | 8 | 8 | 7 | 7 |
| 2.4 | 33 | 2.5 | 21 | 19 | 17 | 15 | 14 | 13 | 12 | 11 | 11 | 11 | 10 | 9 | 9 | 8 | 8 | 7 | 7 |
| 2.7 | 43 | 32 | 27 | 23 | 21 | 18 | 16 | 15 | 14 | 13 | 12 | 12 | 11 | 10 | 9 | 9 | 8 | 8 | 7 |
| 3.0 | 55 | 40 | 33 | 28 | 25 | 21 | 19 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 9 | 8 | 7 |
| > 3.0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| NOTE: Intermediate values can be determined by interpolation according to tables E.4a and E.4b. | | | | | | | | | | | | | | | | | | | |

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# APPENDIX F

(regulations)

## NOMINAL FIER RESISTANCE RATE OF CERTAIN COMPONENTS

### F.1 Wall member structure

**Table F.1 - Masonry or concrete wall**

| Structure and material | Minimum thickness excluding plaster, mm, to ensure fire resistance rate | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | For load-bearing building element structures | | | | | | For non-load bearing building element structures | | | | | |
| | REI 240 | REI 180 | REI 120 | REI 90 | REI 60 | REI 30 | EI 240 | EI 180 | EI 120 | EI 90 | EI 60 | EI 30 |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) |
| 1. Wall of reinforced concrete, with minimum thickness of protective concrete layer of main load-bearing reinforcement is 25 mm: | | | | | | | | | | | | |
| a) No plastering (design based on applicable standards) | – | – | – | – | – | – | – | – | – | – | – | – |
| b) Sand cement plaster 12.5 mm thick | 180 | – | 100 | 100 | 75 | 75 | – | – | – | – | – | – |
| 2. Light concrete wall aggregate Group 2 [3]: Sand cement plaster 13 mm thick | – | – | – | – | – | – | 150 | 150 | 150 | 150 | 150 | 150 |
| 3. Baked clay brick walls, concrete brick walls: | | | | | | | | | | | | |
| a) No plastering | 200 | 200 | 100 | 100 | 100 | 100 | 170 | 170 | 100 | 100 | 75 | 75 |
| b) Sand cement plaster 13 mm thick | 200 | 200 | 100 | 100 | 100 | 100 | 170 | 170 | 100 | 100 | 75 | 75 |
| 4. Light concrete wall aggregate Group 1 [1]: | | | | | | | | | | | | |
| a) No plastering | 150 | – | 100 | 100 | 100 | 100 | 150 | – | 75 | 75 | 75 | 50 |
| b) Sand cement plaster 12.5 mm thick | 150 | – | 100 | 100 | 100 | 100 | 100 | – | 75 | 75 | 75 | 50 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5. Light concrete wall aggregate Group 2 [2]: | | | | | | | | | | | | |
| a) No plastering | – | – | 100 | 100 | 100 | 100 | 150 | – | 100 | 100 | 75 | 50 |
| b) Sand cement plaster 12.5 mm thick | – | – | 100 | 100 | 100 | 100 | 150 | – | 100 | 100 | 75 | 50 |
| 6. Pressurized aerated concrete block walls with volumes from 480 kg/m$^3$ to 1,200 kg/m$^3$: | 180 | 140 | 100 | 100 | 100 | 100 | 100 | – | 62 | 62 | 50 | 50 |
| 7. Hollow concrete block wall, 1 hollow in wall thickness, aggregate Group 1 [1]: | | | | | | | | | | | | |
| a) No plastering | – | – | 100 | 100 | 100 | 100 | 150 | – | 100 | 100 | 75 | 75 |
| b) Sand cement plaster 12.5 mm thick | – | – | 100 | 100 | 100 | 100 | 150 | – | 100 | 75 | 75 | 75 |
| 8. Hollow concrete block wall, 1 hollow along the thickness of the wall, aggregate Group 2 [2]: | | | | | | | | | | | | |
| a) No plastering | – | – | – | – | – | – | 150 | – | 150 | 125 | 125 | 125 |
| b) Sand cement plaster 12.5 mm thick | – | – | – | – | – | – | 150 | – | 150 | 125 | 125 | 100 |
| 9. Baked clay honeycomb brick walls with a porosity ratio of less than 50%: | | | | | | | | | | | | |
| Sand cement plaster 12.5 mm thick | – | – | – | – | – | – | – | – | – | – | 100 | 75 |
| 10. Multi-layer hollow walls, with an outer layer of brick or baked blocks made of clay, concrete with a thickness of not less than 100 mm and: | | | | | | | | | | | | |
| a) Brick or block inner layer made of clay or concrete | 100 | 100 | 100 | 100 | 100 | 100 | 75 | – | 75 | 75 | 75 | 75 |
| b) Brick inner layer or aggregated concrete block Group 1 [1] solid or with holes | 100 | 100 | 100 | 100 | 100 | 100 | 75 | – | 75 | 75 | 75 | 75 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11. Multi-layer hollow walls have an outer layer of baked clay honeycomb bricks with a porosity ratio of less than 50% as of item 9 and an inner layer of pressurized aerated concrete block with a volume of 480 kg/m$^3$ to 1200 kg/m$^3$: | 150 | 140 | 100 | 100 | 100 | 100 | 75 | 75 | 75 | 75 | 75 | 75 |

1) “Type 1 Aggregates” means: cinder, foam, pumice, blast furnace slag, fly ash, bricks and crushed clay products (including keramzite), burned clinker and crushed limestone.

2) “Type 2 Aggregates” means: flint gravel, granite and all forms of crushed natural stone except limestone

NOTE 1: Principle of determining fire resistance rates of members see also section 2.

NOTE 2: The fire resistance rates in the table are for stationary structures only. The super-static structures are calculated for fire resistance according to the applicable standards.

NOTE 3: Parameters of member sections shall be considered simultaneously

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**Table F.2 - Non-load bearing exterior walls**

| Structure and material | Fire-resistance rate |
|---|---|
| 1. Steel frame walls have an outer layer of non-combustible material plates, and the inner layer is: | |
| a) 12.5 mm thick sand or gypsum cement plastering layer on steel mesh | EI 240 |
| b) Two layers of cladding 9.5 mm thick | EI 30 |
| c) 9.5 mm thick plasterboard plastered 12.5 mm thick | EI 30 |
| d) 12.5 mm thick plasterboard plastered 5 mm thick | EI 30 |
| 2. Wooden frame walls have an outer layer 10 mm thick of sand cement or cement - lime [1)] and the inner layer is: | |
| a) 16 mm thick sand or gypsum cement plastering layer on steel mesh | EI 60 |
| b) Cladding 9.5 mm thick plasterboard 12.5 mm thick | EI 60 |
| c) 12.5 mm thick plasterboard plastered 5 mm thick | EI 60 |
| d) The pressurized aerated concrete block has a thickness equal to: | |
| 50 mm | EI 180 |
| 62 mm | EI 240 |
| 75 mm | EI 240 |
| 100 mm | EI 240 |
| 3. Wooden frame walls with an outer layer 100 mm thick are bricks or blocks made of baked clay, concrete, the inner layer plaster is 16 mm thick on the wire mesh | EI 240 |
| 4. The wooden frame wall has an outer layer of overlapping panels or plywood 9.5 mm thick [1)] and the inner layer is: | |
| a) 16 mm thick sand or gypsum cement plastering layer on steel mesh | EI 30 |
| b) Cladding 9.5 mm thick plasterboard 12.5 mm thick | EI 30 |
| c) 12.5 mm thick plasterboard plastered 5 mm thick | EI 30 |
| d) The pressurized aerated concrete block has a thickness equal to: | |
| 50 mm | EI 180 |
| 62 mm | EI 240 |
| 75 mm | EI 240 |
| 100 mm | EI 240 |
| [1)] It shall be considered that the presence of diaphragms of combustible vapors in the thickness of these structures does not contribute to their fire resistance. | |
| NOTE: Principle of determining fire resistance rates of members see also section 2. | |

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## F.2 Reinforced concrete beams

**Table F.3 – Reinforced concrete beams**

| Character | The minimum value of the parameter, mm, to ensure the fire resistance rate | | | | | |
|---|---|---|---|---|---|---|
| | R 240 | R 180 | R 120 | R 90 | R 60 | R 30 |
| 1. Concrete using silicon-based aggregates: | | | | | | |
| a) Average thickness of concrete layer protecting the load-bearing reinforcement | 65 1) | 55 1) | 45 1) | 35 | 25 | 15 |
| b) Girder cross section width | 280 | 240 | 180 | 140 | 110 | 80 |
| 2. Concrete using silicon-based aggregates, plastered 15 mm thick on thin wire mesh: | | | | | | |
| a) Average thickness of concrete layer protecting the load-bearing reinforcement | 50 1) | 40 | 30 | 20 | 15 | 15 |
| b) Girder cross section width | 250 | 210 | 170 | 110 | 85 | 70 |
| 3. Concrete using silicon-based aggregates, plastered 2) 15 mm thick on thin wire mesh: | | | | | | |
| a) Average thickness of concrete layer protecting the load-bearing reinforcement | 25 | 15 | 15 | 15 | 15 | 15 |
| b) Girder cross section width | 170 | 145 | 125 | 85 | 60 | 60 |
| 4. Concrete using lightweight aggregates: | | | | | | |
| a) Average thickness of concrete layer protecting the load-bearing reinforcement | 50 | 45 | 35 | 30 | 20 | 15 |
| b) Girder cross section width | 250 | 200 | 160 | 130 | 100 | 80 |

1) Additional reinforcement can be added to hold the protective concrete layer if needed.

2) Vermiculite/gypsum shall have a volumetric mixing ratio between 1.5:1 and 2:1.

NOTE 1: Principle of determining fire resistance rates of members see also section 2.

NOTE 2: The fire resistance rates in the table are for stationary structures only. The super-static structures are calculated for fire resistance according to the applicable standards.

NOTE 3: Parameters of member sections shall be considered simultaneously

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## F.3 Prestressed reinforced concrete beams

**Table F.4 – Prestressed reinforced concrete beams**

| Character | The minimum value of the parameter, mm, to ensure the fire resistance rate | | | | | |
|---|---|---|---|---|---|---|
| | R 240 | R 180 | R 120 | R 90 | R 60 | R 30 |
| 1. Concrete using silicon-based aggregates: | | | | | | |
| a) Average thickness of prestressed reinforced concrete layer (rod, cable) | 100 [1)] | 85 [1)] | 65 [1)] | 50 [1)] | 40 | 25 |
| b) Girder cross section width | 280 | 240 | 180 | 140 | 110 | 80 |
| 2. Concrete using silicon-based aggregates, plastered 15 mm thick on thin wire mesh: | | | | | | |
| a) Average thickness of prestressed reinforced concrete layer (rod, cable) | 90 [1)] | 75 | 50 | 40 | 30 | 15 |
| b) Girder cross section width | 250 | 210 | 170 | 110 | 85 | 70 |
| 3. Concrete using silicon-based aggregates, plastered [2)] 15 mm thick on thin wire mesh: | | | | | | |
| a) Average thickness of prestressed reinforced concrete layer (rod, cable) | 75 [1)] | 60 | 45 | 30 | 25 | 15 |
| b) Girder cross section width | 170 | 145 | 125 | 85 | 60 | 60 |
| 4. Concrete using silicon-based aggregates plastered with vermiculite / gypsum [2)] 25 mm thick: | | | | | | |
| a) Average thickness of prestressed reinforced concrete layer (rod, cable) | 50 | 45 | 30 | 25 | 15 | 15 |
| b) Girder cross section width | 140 | 125 | 85 | 70 | 60 | 60 |
| 5. Concrete using lightweight aggregates: | | | | | | |
| a) Average thickness of prestressed reinforced concrete layer (rod, cable) | 80 | 65 | 50 | 40 | 30 | 20 |
| b) Girder cross section width | 250 | 200 | 160 | 130 | 100 | 80 |

[1)] Additional reinforcement can be added to hold the protective concrete layer if needed.

[2)] Vermiculite/gypsum shall have a volumetric mixing ratio between 1.5:1 and 2:1.

NOTE 1: Principle of determining fire resistance rates of members see also section 2.

NOTE 2: The fire resistance rates in the table are for stationary structures only. The super-static structures are calculated for fire resistance according to the applicable standards.

NOTE 3: Parameters of member sections shall be considered simultaneously

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## F.4 Reinforced concrete columns

**Table F.5 – Reinforced concrete column (with 4 sides all exposed to fire)**

| Character | The minimum value of the parameter, mm, to ensure the fire resistance rate | | | | | |
|---|---|---|---|---|---|---|
| | R 240 | R 180 | R 120 | R 90 | R 60 | R 30 |
| 1. Concrete using silicon-based aggregates: | | | | | | |
| a) No additional safeguards | 450 | 400 | 300 | 250 | 200 | 150 |
| b) Plastering of cement or plaster 15 mm thick on thin wire mesh | 300 | 275 | 225 | 150 | 150 | 150 |
| c) Vermiculite/gypsum plaster[1)] | 275 | 225 | 200 | 150 | 120 | 120 |
| 2. Concrete using limestone or silicon-based aggregates: | | | | | | |
| There may be auxiliary reinforcement in the protective concrete layer if needed | 300 | 275 | 225 | 200 | 190 | 150 |
| 3. Concrete using silicon-based aggregates: | 300 | 275 | 225 | 200 | 190 | 150 |

[1)] Vermiculite/gypsum must have a mixing ratio by volume between 1.5:1 and 2:1.

NOTE 1: Principle of determining fire resistance rates of members see also section 2.

NOTE 2: The fire resistance rates in the table are for stationary structures only. The super-static structures are calculated for fire resistance according to the applicable standards.

NOTE 3: Parameters of member sections shall be considered simultaneously

**Table F.6 – Reinforced concrete column (with 1 side exposed to fire)**

| Character | The minimum value of the parameter, mm, to ensure the fire resistance rate | | | | | |
|---|---|---|---|---|---|---|
| | R 240 | R 180 | R 120 | R 90 | R 60 | R 30 |
| Concrete using silicon-based aggregates: | | | | | | |
| a) No additional safeguards | 180 | 150 | 100 | 100 | 75 | 75 |
| b) Vermiculite/gypsum plaster[1)] 15 mm thick on the surface exposed to fire | 125 | 100 | 75 | 75 | 65 | 65 |

[1)] Vermiculite/gypsum must have a mixing ratio by volume between 1.5:1 and 2:1.

NOTE 1: Principle of determining fire resistance rates of members see also section 2.

NOTE 2: The fire resistance rates in the table are for stationary structures only. The super-static structures are calculated for fire resistance according to the applicable standards.

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## F.5 Steel structure

**Table F.7 – Armored steel support column (column weight over 1 m long not less than 45 kg)**

| Protective structures and upholstery | The smallest thickness, mm, of the protective layer to ensure the fire resistance rate | | | | | |
|---|---|---|---|---|---|---|
| | R 240 | R 180 | R 120 | R 90 | R 60 | R 30 |
| **A. Solid protection layer [1] (no plastering)** | | | | | | |
| 1. Concrete uses natural aggregates, no poorer than 1:2:4 [2]: | | | | | | |
| a) Concrete does not participate in bearing force, with reinforcement[3] | 50 | – | 25 | 25 | 25 | 25 |
| b) Concrete with load-bearing participation and reinforcement (designed according to applicable selection standards) | 75 | – | 50 | 50 | 50 | 50 |
| 2. Solid brick baked clay | 100 | 75 | 50 | 50 | 50 | 50 |
| 3. Solid block of foam slag concrete or pumice concrete, with reinforcement[3] at all horizontal circuits | 75 | 60 | 50 | 50 | 50 | 50 |
| **B. Hollow protection [4]** | | | | | | |
| 1. Baked clay solid brick with reinforcement at all horizontal circuits, without plastering | 115 | – | 50 | 50 | 50 | 50 |
| 2. Solid block of foam slag concrete or reinforced pumice concrete[2] at all transverse, non-plastered circuits | 75 | – | 50 | 50 | 50 | 50 |

[1] Solid protective layer means that an outer shell is fastened to the steel column, does not create a gap between the contact surface, and all coupling circuits in that part of the housing are sealed and dense.

[2] 1:2:4 ratio is the cement ratio: sand:raw aggregates by volume. Heavy concrete with a minimum strength class of B20 according to TCVN 5574: 2018 is considered to meet this requirement.

[3] Reinforcement shall be fastened steel fibers not less than 2.3 mm in diameter, or a wire mesh with a unit mass not less than 0.48 kg/m$^2$. In the protective concrete layer, the reinforcement distance, in any dimension should not be greater than 150 mm.

[4] Hollow protective layer means that there is a gap between the protective material and the steel. All hollow protective layers for columns shall be effectively inserted at each floor building.

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**Table F.8 – Protected steel beams (beam mass per 1 m long is not less than 30 kg)**

| Protective structures and materials | The smallest thickness, mm, of the protective layer to ensure the fire resistance rate | | | | | |
|---|---|---|---|---|---|---|
| | R 240 | R 180 | R 120 | R 90 | R 60 | R 30 |
| **A. Solid protection layer [1] (no plastering)** | | | | | | |
| 1. Natural aggregate concrete, no poorer than 1:2:4 [2]: | | | | | | |
| a) Concrete does not participate in bearing force, with reinforcement [3] | 75 | 50 | 25 | 25 | 25 | 25 |
| b) Concrete with load-bearing participation and reinforcement (designed according to applicable selection standards) | 75 | 75 | 50 | 50 | 50 | 50 |
| **B. Hollow protection [4]** | | | | | | |
| 1. Wire mesh with: | | | | | | |
| a) Cement-lime plastering layer with thickness | – | – | 38 | 25 | 19 | 12.5 |
| b) Plaster plastering layer with thickness | – | – | 22 | 19 | 16 | 12.5 |

1) Solid protective layer means that an outer shell is fastened to the steel, does not create a gap between the contact surface, and all coupling circuits in that part of the housing are sealed and solid.

2) 1:2:4 ratio is the cement ratio: sand: raw aggregates by volume. Heavy concrete with a minimum strength class of B20 according to TCVN 5574: 2018 is considered to meet this requirement.

3) Reinforcement shall be fastened steel fibers not less than 2.3 mm in diameter, or a wire mesh with a unit mass not less than 0.48 kg/m$^2$. In the protective concrete layer, the reinforcement distance, in any dimension should not be greater than 150 mm.

4) Hollow protective layer means that there is a gap between the protective material and the steel. All hollow protective layers for columns shall be effectively inserted at each floor building.

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## F.6 Floor structure

**Table F.9 – Reinforced concrete floor (silicon or lime stone based aggregate)**

| Floor structure | The minimum value of the parameter, mm, to ensure the fire resistance rate | | | | | |
|---|---|---|---|---|---|---|
| | REI 240 | REI 180 | REI 120 | REI 90 | REI 60 | REI 30 |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1. Solid flooring: | | | | | | |
| a) The average thickness of the load-bearing reinforced protective concrete layer | 25 | 25 | 20 | 20 | 15 | 15 |
| b) Overall height [1)] of cross section | 150 | 150 | 125 | 125 | 100 | 100 |
| 2. The floor has a hollow with a round cross section void or box. The solid cross-section area shall account for not less than 50% of the total horizontal cross-section area of the floor: | | | | | | |
| a) The average thickness of the load-bearing reinforced protective concrete layer | 25 | 25 | 20 | 20 | 15 | 15 |
| b) The thickness of the concrete part under the void | 50 | 40 | 40 | 30 | 25 | 20 |
| c) Overall height [1)] of cross section | 190 | 175 | 160 | 140 | 110 | 100 |
| 3. A hollow sectional floor has one or more vertical box-shaped hollow cavities with a width greater than the height: | | | | | | |
| a) The average thickness of the load-bearing reinforced protective concrete layer | 25 | 25 | 20 | 20 | 15 | 15 |
| b) Thickness of the lower wing plate | 50 | 40 | 40 | 30 | 25 | 20 |
| c) Overall height [1)] of cross section | 230 | 205 | 180 | 155 | 130 | 105 |
| 4. The flank floor has a hollow part inserted with a baked clay block, or an inverted T-beam with a hollow part inserted with a concrete block or baked clay block. If the floor has a solid cross-section area of less than 50% of the total horizontal cross section, it shall be plastered with a layer 15 mm thick on the bottom surface: | | | | | | |
| a) The average thickness of the load-bearing reinforced protective concrete layer | 25 | 25 | 20 | 20 | 15 | 15 |
| b) Width of flank cross section or T-beam, measured at the bottom | 125 | 100 | 90 | 80 | 70 | 50 |
| c) Overall height [1)] of cross section | 190 | 175 | 160 | 140 | 110 | 100 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| 5. T-section: | | | | | | |
| a) The average thickness of the load-bearing reinforced protective concrete layer, measured at the bottom | 65 [2)] | 55 [2)] | 45 [2)] | 35 | 25 | 15 |
| b) The thickness of the reinforced concrete layer, measured on the side | 65 | 55 | 45 | 35 | 25 | 15 |
| c) Width of flank cross section or of girder web | 150 | 140 | 115 | 90 | 75 | 60 |
| d) Wing thickness | 150 | 150 | 125 | 125 | 100 | 90 |
| 6. The inverted U-section floor plate has a radius of curvature at the intersection of the bottom plate with the slope of the floor not greater than the cross section height: | | | | | | |
| a) The average thickness of the load-bearing reinforced protective concrete layer, measured at the bottom | 65 [2)] | 55 [2)] | 45 [2)] | 35 | 25 | 15 |
| b) The thickness of the reinforced protective concrete layer, measured on the side | 40 | 30 | 25 | 20 | 15 | 10 |
| c) The width of the flank or of the U-leg | 75 | 70 | 60 | 45 | 40 | 30 |
| d) Thickness in the upper version | 150 | 150 | 125 | 125 | 100 | 90 |
| 7. An inverted U-section or U-shaped floor plate with a radius of curvature at the intersection of the base plate with the side of the floor is greater than the cross section height: | | | | | | |
| a) The average thickness of the load-bearing reinforced protective concrete layer, measured at the bottom | 65 [2)] | 55 [2)] | 45 [2)] | 35 | 25 | 15 |
| b) The thickness of the reinforced protective concrete layer, measured on the side | 40 | 30 | 25 | 20 | 15 | 10 |
| c) Width of the flank or of the U-leg | 70 | 60 | 50 | 40 | 35 | 25 |
| d) Thickness in the upper version | 150 | 150 | 100 | 100 | 75 | 65 |

[1)] Can add the thickness of the screed layers or finishes with non-combustible materials.

[2)] Additional reinforcement can be added to hold the protective concrete layer if necessary.

NOTE 1: Principle of determining fire resistance rates of members see also section 2.

NOTE 2: The fire resistance rates in the table are for stationary structures only. The super-static structures are calculated for fire resistance according to the applicable standards.

NOTE 3: Parameters of member sections shall be considered simultaneously

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**Table F.10 – Prestressed reinforced concrete floor (silicon or limestone based aggregate)**

| Floor structure | The minimum value of the parameter, mm, to ensure the fire resistance rate | | | | | |
|---|---|---|---|---|---|---|
| | REI 240 | REI 180 | REI 120 | REI 90 | REI 60 | REI 30 |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1. Solid flooring: | | | | | | |
| a) Average thickness of prestressed reinforced concrete layer (rod, cable) | 65 1) | 50 1) | 40 | 30 | 25 | 15 |
| b) Overall height 2) of cross section | 150 | 150 | 125 | 125 | 100 | 100 |
| 2. The floor has a hollow with a round cross section void or box. The solid cross-section area shall account for not less than 50% of the total horizontal cross-section area of the floor: | | | | | | |
| a) Average thickness of prestressed reinforced concrete layer (rod, cable) | 65 1) | 50 1) | 40 | 30 | 25 | 15 |
| b) The thickness of the concrete part under the void | 50 | 40 | 40 | 30 | 25 | 20 |
| c) Overall height 2) of cross section | 190 | 175 | 160 | 140 | 110 | 100 |
| 3. The hollow section floor has one or more vertical box-shaped hollow cavities with a width greater than the height: | | | | | | |
| a) Average thickness of prestressed reinforced concrete layer (rod, cable) | 65 1) | 50 1) | 40 | 30 | 25 | 15 |
| b) Thickness of the lower wing plate | 65 | 50 | 40 | 30 | 25 | 15 |
| c) Overall height 2) of cross section | 230 | 205 | 180 | 155 | 130 | 105 |
| 4. The flank floor has a hollow part inserted with a baked clay block, or an inverted T-beam with a hollow part inserted with a concrete block or baked clay block. If the floor has a solid cross-section area of less than 50% of the total horizontal cross section, it shall be plastered with a layer 15 mm thick on the bottom surface: | | | | | | |
| a) Average thickness of prestressed reinforced concrete layer (rod, cable) | 65 1) | 50 1) | 40 | 30 | 25 | 15 |
| b) Width of flank cross section or T-beam, measured at the bottom | 125 | 100 | 90 | 80 | 70 | 50 |
| c) Overall height 2) of cross section | 190 | 175 | 160 | 140 | 110 | 100 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| 5. T-section: | | | | | | |
| a) The average thickness of the prestressed reinforced concrete layer (rods, cables), measured at the bottom | 100 1) | 85 1) | 65 1) | 50 1) | 40 | 25 |
| b) The thickness of the prestressed reinforced concrete layer (rods, cables), measured on the side | 100 | 85 | 65 | 50 | 40 | 25 |
| c) The width of the flank or of the girder web | 250 | 200 | 150 | 110 | 90 | 60 |
| d) Wing thickness 2) | 150 | 150 | 125 | 125 | 100 | 90 |
| 6. The inverted U-section floor plate has a radius of curvature at the intersection of the bottom plate with the slope of the floor not greater than the cross section height: | | | | | | |
| a) Average thickness of prestressed reinforced concrete layer (rod, cable) measured from bottom | 100 1) | 85 1) | 65 1) | 50 1) | 40 | 25 |
| b) Thickness of prestressed reinforced concrete layer (rod, cable) | 50 | 45 | 35 | 25 | 20 | 15 |
| c) The width of the flank or of the U-leg | 125 | 100 | 75 | 55 | 45 | 30 |
| d) Thickness in the upper version 2) | 150 | 150 | 125 | 125 | 100 | 90 |
| 7. An inverted U-section or U-shaped floor plate with a radius of curvature at the intersection of the base plate with the side of the floor is greater than the cross section height: | | | | | | |
| a) Average thickness of prestressed reinforced concrete layer (rod, cable) measured from bottom | 100 1) | 85 1) | 65 1) | 50 1) | 40 | 25 |
| b) Thickness of prestressed reinforced concrete layer (rod, cable) | 50 | 45 | 35 | 25 | 20 | 15 |
| c) The width of the flank or of the U-leg | 110 | 90 | 70 | 50 | 40 | 30 |
| d) Thickness in the upper version 2) | 150 | 150 | 125 | 125 | 100 | 90 |

1) Additional reinforcement can be added to hold the protective concrete layer if needed.

2) It is possible to add the thickness of the screed layers or finishes made of non-combustible materials.

NOTE 1: Principle of determining fire resistance rates of members see also section 2.

NOTE 2: The fire resistance rates in the table are for stationary structures only. The super-static structures are calculated for fire resistance according to the applicable standards.

NOTE 3: Parameters of member sections shall be considered simultaneously

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# APPENDIX G

(regulations)

## TRAVEL DISTANCE TO MEANS OF EGRESS AND EXIT WIDTH

### G.1 Allowable limited-distance from the furthest position (occupied by human for living and working) to the nearest exit

#### G.1.1 Residential buildings

Allowable limited-distance from the access door of apartments (buildings group F1.3) or habitable rooms (buildings of group F1.2) to the nearest exit (staircases or exit discharge) shall comply to Table G 1.

**Table G.1 – Allowable limited-distance from access doors of apartments or habitable rooms to the nearest exit**

| Fire resistance grade of the building | Fire hazard level of building's structure | Allowable limited-distance from access doors of apartments or habitable rooms to the nearest exit, m | |
|---|---|---|---|
| | | Door located in between the staircases or exit discharge | Door located in dead-end of |
| I. II | S0 | 40 | 25 |
| II | S1 | 30 | 20 |
| III | S0 | 30 | 20 |
| | S1 | 25 | 15 |
| IV | S0 | 25 | 15 |
| | S1. S2 | 20 | 10 |
| V | Not specified | 20 | 10 |

#### G.1.2 Public constructions

**G.1.2.1** Allowable limited-distance for the egress route calculated from the access door of the furthest room (except for toilet, bath room and other service rooms) to the nearest exit (to staircases or outside of the buildings, or to the type 2 staircase for which is permissible for egressing by this Code) is specified in Table G.2a.

NOTE: For floors whose corridors are not enclosed by fire barriers as defined in 3.3.5 or do not comply with the requirements of 3.3.4, the permissible rate distance of the escape route shall be measured from the farthest point of the room on that floor. This note shall not apply to floors with discos and karaoke rooms.

**G.1.2.2** In rooms of different volumes which do not have audience seat, allowable limited-distance from any position to the nearest exit shall be in accordance with Table G.2b. Where there is the joining of all main exits to a common path, the width of the join-path shall not be less than the total width of component paths.

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**Table G.2a - Allowable limited-distance from access door of room to the nearest exit for public building**

| Fire resistance grade of the building | Distance, m, when the egress density is, person/m$^2$ | | | | |
|---|---|---|---|---|---|
| | ≤ 2 | > 2 & ≤ 3 | > 3 & ≤ 4 | > 4 & ≤ 5 | > 5 |
| 1. From rooms whose doors are located in the middle of staircases or exit discharges | | | | | |
| I. II. III | 60 | 50 | 40 | 35 | 20 |
| IV | 40 | 35 | 30 | 25 | 15 |
| V | 30 | 25 | 20 | 15 | 10 |
| 2. From rooms whose doors lead to dead-end corridors or common halls, concourses, lobbies | | | | | |
| I. II. III | 30 | 25 | 20 | 15 | 10 |
| IV | 20 | 15 | 15 | 10 | 7 |
| V | 15 | 10 | 10 | 5 | 5 |

NOTE 1: Egress density is defined by the ratio between the total number of people in need of using egress route and area of such egress route.

NOTE 2: The distance values given in Table G.2a shall be applied as follows: For kindergartens, apply column (6); For schools, vocational schools, colleges and universities, apply column (3); For residential treatment facilities, apply column (5); For hotel, apply column (4); For other type of public building, egress density shall be as specified in specific project.

**Table G.2b - Permissible limited-distance from any position in a public room without audience seat to the nearest exit**

| Room | Fire resistance grade of the building | Allowable limited-distance, m, from any position in the room to the nearest exit, with the room's volume, 1 000 m$^3$ | | |
|---|---|---|---|---|
| | | ≤ 5 | > 5 & ≤ 10 | > 10 |
| (1) | (2) | (3) | (4) | (5) |
| 1. Lounges, ticket selling rooms, exhibition rooms, galleries, dancing rooms, relaxing rooms and similar. | I. II | 30 | 45 | 55 |
| | III. IV | 20 | 30 | See notes |
| | V | 15 | See notes | See notes |
| 2. Dining rooms, reading rooms where the main passage area per capita is not less than 0.2 m$^2$. | I. II | 65 | See notes | See notes |
| | III. IV | 45 | See notes | See notes |
| | V | 30 | See notes | See notes |
| 3. Commercial rooms where the main passage area as a percentage of room area is not less than 25%. | I. II | 50 | 65 | 80 |
| | III. IV | 35 | 45 | See notes |
| | V | 25 | See notes | See notes |
| 4. Commercial rooms where the main passage area as a percentage of room area is less than 25%. | I. II | 25 | 30 | 35 |
| | III. IV | 15 | 20 | See notes |
| | V | 10 | See notes | See notes |

NOTE: This distance limit shall be determined in accordance with a specific technical statement.

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### G.1.3 Manufacturers and warehouses

**G.1.3.1** Permissible limited-distance from the farthest working place in the room to the nearest exit (exit that leads to the outside area or staircase) shall be in accordance with Table G.3. For rooms with area of over 1 000 $m^2$, the distance values provided in Table G.3 includes the length of the path along the corridor that leads to the exit.

**G.1.3.2** Permissible limited-distance given in Table G.3 with intermediate values of the room volume is determined by using linear interpolation.

**G.1.3.3** Permissible limited-distance given in G.3 is set for rooms of up to 6 m height. If the height of the room is over 6 m, this distance shall increase as follows: where the room height is up to 20 m, the distance should increase 20%; where the room's height is up to 18m, the distance should increase 30%; where the room height is up to 24 m, the distance should increase 40%; but should not exceed 140 m for rooms of class A or B and not exceed 240 m for rooms of class C.

**G.1.3.4** Permissible limited-distance from the access door of the farthest manufacture room that have area not greater than 1 000 $m^2$ to the nearest exit (exit that leads to the outside area or staircase) shall comply to table G.4.

**Table G.3 − Permissible limited-distance from the farthest working place in the room to the nearest exit of manufactures**

| **Room's volume,** 1 000 $m^3$ | **Class of the room** | **Fire resistance grade of the building** | **Fire hazard level of building's structure** | **Distance,** m**, when the egress density on common path,** person/$m^2$ | | |
|---|---|---|---|---|---|---|
| | | | | **≤ 1** | **> 1 & ≤ 3** | **> 3 & ≤ 5** |
| ≤ 15 | A, B | I, II, III, IV | S0 | 40 | 25 | 15 |
| | C1, C2, C3 | I, II, III, IV | S0 | 100 | 60 | 40 |
| | | III, IV | S1 | 70 | 40 | 30 |
| | | V | S2. S3 | 50 | 30 | 20 |
| 30 | A, B | I, II, III, IV | S0 | 60 | 35 | 25 |
| | C1, C2, C3 | I, II, III, IV | S0 | 145 | 85 | 60 |
| | | III, IV | S1 | 100 | 60 | 40 |
| 40 | A, B | I, II, III, IV | S0 | 80 | 50 | 35 |
| 40 | C1, C2, C3 | I, II, III, IV | S0 | 160 | 95 | 65 |
| | | III, IV | S1 | 110 | 65 | 45 |
| 50 | A, B | I, II, III, IV | S0 | 120 | 70 | 50 |
| | C1, C2, C3 | I, II, III, IV | S0 | 180 | 105 | 75 |
| | | III, IV | S1 | 160 | 95 | 65 |
| ≥ 60 | A, B | I, II, III, IV | S0 | 140 | 85 | 60 |
| | C1, C2, C3 | I, II, III, IV | S0 | 200 | 110 | 85 |
| | | III, IV | S1 | 180 | 105 | 75 |
| ≥ 80 | C1, C2, C3 | I, II, III, IV | S0 | 240 | 140 | 100 |
| | | III, IV | S1 | 200 | 110 | 85 |
| Does not depend on | C4, D | I, II, III, IV | S0 | No restrictions | No restrictions | No restrictions |

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| | | | | | | |
|---|---|---|---|---|---|---|
| the volume | | III, IV | S1 | 160 | 95 | 65 |
| | | V | Not specified | 120 | 70 | 50 |
| Does not depend on the volume | E | I, II, III, IV | S0, S1 | No restrictions | No restrictions | No restrictions |
| | | IV, V | S2. S3 | 160 | 95 | 65 |
| NOTE: Egress density is defined by the ratio between the total number of people in need of using egress route and area of such egress route. | | | | | | |

**Table G.4 - Allowable limited-distance from the access door of the farthest manufacture room with cover area of up to 1000 m$^2$ to the nearest exit**

| Location of access door | Class of the room | Fire resistance grade of the building | Fire hazard level of building's structure | Distance, m, from room's door to the nearest exit when the egress density on common path, person/m$^2$ | | | |
|---|---|---|---|---|---|---|---|
| | | | | ≤ 2 | > 2 & ≤ 3 | > 3 & ≤ 4 | > 4 & ≤ 5 |
| 1. In between two exits | A, B | I, II, III, IV | S0 | 60 | 50 | 40 | 35 |
| | C1, C2, C3 | I, II, III, IV | S0 | 120 | 95 | 80 | 65 |
| | | III, IV | S1 | 85 | 65 | 55 | 45 |
| | | Not specified | S2, S3 | 60 | 50 | 40 | 35 |
| | C4, D, E | I, II, III, IV | S0 | 180 | 140 | 120 | 100 |
| | | III, IV | S1 | 125 | 100 | 85 | 70 |
| | | Not specified | S2, S3 | 90 | 70 | 60 | 50 |
| 2. Enter the dead-end hallway | Does not depend on class | I, II, III, IV | S0 | 30 | 25 | 20 | 15 |
| | | III, IV | S1 | 20 | 15 | 15 | 10 |
| | | Not specified | S2, S3 | 15 | 10 | 10 | 8 |

## G.2 Width of means of egress

### G.2.1 Public Buildings

**G.2.1.1** The width of a means of egress, from the corridor into the staircase, as well as the width of stair flight shall be determined by the number of people egress through such means of egress and exit and escape rate calculated for 1-meter width of exits (doors). Depending on the fire resistance grade of buildings, this rate shall not exceed the following values:

- Buildings with fire resistance grade I, II: 165 persons/m;
- Buildings with fire resistance grade III, IV: 115 persons/m;
- Buildings with fire resistance grade V: 80 persons/m.

**G.2.1.2** In order to calculate the width of the exits of high schools, boarding schools and boarding areas therein, it is required to determine the largest number of people simultaneously occupied on a storey from the largest number of people of every class, training room and bedroom as well as sports space, conference room, lecture hall located on that storey (see Section G.3, Table G.9).

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**G.2.1.3** The width of doors from the classrooms with more than 15 students, should not be less than 0.9 m.

**G.2.1.4** The width of a means of egress from the room with no seat for audience shall be determined according to the number of people in need of escaping through such exit as specified in Table G.5. The rooms can accommodate more than 50 people, such width shall not be less than 1.2 m.

**Table G.5 - Maximum Number of person per 1 meter of the exit width of rooms with no seat for spectators of public buildings**

| Room | Fire resistance grade of the building | Maximum number of people per 1 meter width of exit in rooms with the volume of, 1000 $m^3$ | | |
|---|---|---|---|---|
| | | ≤ 5 | > 5 & ≤ 10 | > 10 |
| 1. Commercial rooms as the area of the main egress routes is not less than 25% of the area of room; Dining rooms and reading rooms when the density of people in each main entrance does not exceed 5 people/$m^2$. | I, II | 165 | 220 | 275 |
| | III, IV | 115 | 155 | See notes |
| | V | 80 | See notes | See notes |
| 2. Commercial rooms where the area of main exit routes is less than 25% of the room area; and other rooms. | I, II | 75 | 100 | 125 |
| | III, IV | 50 | 70 | See notes |
| | V | 40 | See notes | See notes |
| NOTE: The maximum number of people per 1m width of exit shall be determined based on specific technical statement. | | | | |

**G.2.1.5** The width of the main egress passages in a commercial room shall be not less than:

- 1.4 m – when the commercial area is not larger than 100 $m^2$;

- 1.6 m – when the commercial area is greater than 100 $m^2$ and not greater than 150 $m^2$;

- 2.0 m – when the commercial area is greater than 150 $m^2$ and not greater than 400 $m^2$;

- 2.5 m – when the commercial area is not larger than 400 $m^2$.

**G.2.1.6** The number of persons per 1 m of egress route width from the stands of outdoor sports and performance facilities is specified in Table G.6.

**Table G.6 - Maximum number of people per 1 m width of egress route from the stands of outdoor sports and performance facilities**

| Fire resistance grade of the building | Maximum number of people per 1 m width of egress route | | | |
|---|---|---|---|---|
| | Following the stairs of main paths of stand | | Go through the exit from main paths of stand | |
| | Downward | Upward | Downward | Upward |
| I, II | 600 | 825 | 620 | 1 230 |
| III, IV | 420 | 580 | 435 | 860 |
| V | 300 | 415 | 310 | 615 |
| NOTE: The total number of people egress through a mean of egress shall not exceed 1500 where the stage is under fire resistance grade I, II. If stage is under fire resistance grade III, the total number of people passing through shall be reduced by 30%, and if grade IV or V, the total number shall be reduced by 50%. | | | | |

**G.2.2 Manufacturers and warehouses**

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**G.2.2.1** The width of a mean of egress from a room shall be determined by the number of people in need of escaping through exit and the number of people per 1 meter width of the mean of egress complying with Table G.7, but not less than 0.9 m.

The number of people per 1 meter width of the mean of egress for intermediate values of the building's volume shall be determined by linear interpolation.

The occupant load over 1 m in width of an exit from rooms with a height greater than 6 m is increased as follows:

- Increase to 20% when the fire protection height of the building is 12 m;

- Increase to 30% when the fire protection height of the building is 18 m and increase to 40% when the fire protection height of the building is 24 m.

When the fire protection height of the building is intermediate values, the number of people per 1 m of width of an exit is determined linearly interpolated.

**Table G.7 - Maximum number of person per 1 m width of a mean of egress from a room of a manufacture building**

| **Volume of the room,** 1 000 $m^3$ | **Class of the room** | **Fire resistance grade of the building** | **Fire hazard level of building's structure** | **Maximum number of people per 1 m width of mean of egress from a room,** person |
|---|---|---|---|---|
| ≤ 15 | A, B | I, II, III, IV | S0 | 45 |
| | C1, C2, C3 | I, II, III, IV | S0 | 110 |
| | | III, IV | S1 | 75 |
| | | Not specified | S2, S3 | 55 |
| 30 | A, B | I, II, III, IV | S0 | 65 |
| | C1, C2, C3 | I, II, III, IV | S0 | 155 |
| | | III, IV | S1 | 110 |
| 40 | A, B | I, II, III, IV | S0 | 85 |
| | C1, C2, C3 | I, II, III, IV | S0 | 175 |
| | | III, IV | S1 | 120 |
| 50 | A, B | I, II, III, IV | S0 | 130 |
| | C1, C2, C3 | I, II, III, IV | S0 | 195 |
| | | III, IV | S1 | 135 |
| ≥ 60 | A, B | I, II, III, IV | S0 | 150 |
| | C1, C2, C3 | I, II, III, IV | S0 | 220 |
| | | III, IV | S1 | 155 |
| ≥ 80 | C1, C2, C3 | I, II, III, IV | S0 | 260 |
| | | III, IV | S1 | 220 |
| Does not depend on the volume | C4, D | I, II, III, IV | S0 | 260 |
| | | III, IV | S1 | 180 |
| | | Not specified | S2, S3 | 130 |

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| | | |
|---|---|---|
| Does not depend on the volume | E | Not specified |

**G.2.2.2** The width of exit from corridor to external or staircase shall be determined by the total number of people in need of egress through exit and the rate of number of people per 1 m width of the mean of egress in accordance to Table G.8 but not less than 0.9 m.

**Table G.8 - Maximum number of people per 1 m width of the mean of egress from the corridor of manufacture building**

| **Class of room with the highest fire hazard class whose exit leads to corridor** | **Fire resistance grade of the building** | **Fire hazard level of building's structure** | **Maximum number of people per 1 m width of exit from corridor,** person |
|---|---|---|---|
| A, B | I, II, III, IV | S0 | 85 |
| C1, C2, C3 | I, II, III, IV | S0 | 173 |
| | IV | S1 | 120 |
| | Not specified | S2. S3 | 85 |
| C4, D, E | I, II, III, IV | S0 | 260 |
| | IV | S1 | 180 |
| | Not specified | S2. S3 | 130 |

## G.3 Determination of maximum number of people in the building or part thereof

The maximum number of people in a room, a storey or a building is the maximum number of people as specified in the approved design. If not specified in such design, it shall be determined by dividing the storey space of the room/floor/building by occupant load factor ($m^2$/person) as specified in Table G.9.

NOTE: Within this context, "floor space" does not include space for stair, elevator, toilet room and other auxiliary sections.

**Table G.9 – Occupant load factor [1)]**

| **Occupied area [2), 3)]** | **Occupant load factor,** $m^2$/person |
|---|---|
| 1. Play areas with roofs, halls, crowded places, clubs, discotheques, bars, karaoke and similar areas | 1.0 |
| 2. Halls, atriums, reception areas, lounges, etc | 3.0 |
| 3. Meeting rooms, guest rooms, conference rooms, dining rooms, reading rooms, classrooms, canteens, etc | 1.5 |
| 4. Markets, supermarkets, shopping centers | 3.0 |
| 5. Galleries or studios (film, broadcasting, television, recording) | 1.5 |
| 6. Trading shops and service shops: department stores, barber's shops, laundries, or similar | 3.0 |
| 7. Art galleries, product showrooms, museums or similar areas | 5.0 |
| 8. Office | 6.0 |
| 9. Furniture shops selling things like tables, chairs, rugs, etc. | 7.0 |
| 10. Kitchen or library | 7.0 |
| 11. Bedroom or bedroom combined with classroom | 8.0 |

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| | |
|---|---|
| 12. Living room, entertainment room | 10.0 |
| 13. Warehouse or storage | 30.0 |
| 14. Car garage | 2 persons/parking lot |

1) If not using the values given above, the occupant load factor can be determined by using the experimental data of similar projects. In which case, the data shall reflect average living density at the peak point in a year

2) When an object does not belong to the usage space mentioned above, the appropriate value can be selected from a similar object.

3) If a building area is used for multi-purposes, it is necessary to apply the occupant load factor to calculate the maximum number of people. If the building has many different use areas then each area needs to be calculated with the corresponding space coefficient for that area.

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# APPENDIX H

(regulations)

## FIRE RESISTANCE GRADES AND FIRE SAFETY REQUIREMENTS FOR BUILDINGS, CONSTRUCTIONS AND FIRE COMPARTMENTS

### H.1 Apartment-style buildings and dormitories

The fire resistance grade, structural fire hazard class, the maximum allowable fire protection height of the building and the area of one floor within a fire compartment for apartments and dormitories are specified in Table H.1.

**Table H.1 - Apartment-style buildings and dormitories**

| Fire resistance grade of the building | Fire hazard level of building's structure | Maximum permissible FLS height of building, m | Maximum allowable area of a storey within a fire compartment, $m^2$ |
|---|---|---|---|
| I | S0 | 75 | 2 500 |
| II | S0 | 50 | 2 500 |
| | S1 | 28 | 2 200 |
| III | S0 | 28 | 1 800 |
| | S1 | 15 | 1 800 |
| IV | S0 | 5 | 1 000 |
| | | 3 | 1 400 |
| | S1 | 5 | 800 |
| | | 3 | 1 200 |
| | S2 | 5 | 500 |
| | | 3 | 900 |
| V | Not specified | 5 | 500 |
| | | 3 | 800 |

NOTE 1: Regulations on storey number (permissible FLS height) and fire compartment area of buildings under occupancy fire hazard category F1.3 with the height from above 75 m to 150 m are specified in Appendix A.

NOTE 2: The bearing parts of a two-storey building with refractory grade IV shall have a fire resistance limit not lower than R 30.

### H.2 Public Buildings

#### H.2.1 General regulations

The fire resistance grade, structural fire hazard level, the maximum allowable fire protection height of the building and the area of one floor within a fire compartment for public buildings, including hotels and apartments (except dormitories and apartment-type hotels such as residential buildings) are specified in Table H.2.

Additional regulations in H.2.2 to H.2.12 should be followed for public buildings in their respective

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occupancy fire hazard categories.

**Table H.2 – Public buildings**

| Fire resistance grade of the building | Structural fire hazard class of the building | The maximum allowable fire protection height of the building, m | The largest allowable area of a building floor within a fire compartment, $m^2$, with the number of floors above ground level (excluding the top technical floor) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4, 5 | 6 to 9 | 10 to 16 |
| I | S0 | 50 | 6 000 | 5 000 | 5 000 | 5 000 | 5 000 | 2 500 |
| II | S0 | 50 | 6 000 | 4 000 | 4 000 | 4 000 | 4 000 | 2 200 |
| II | S1 | 28 | 5 000 | 3 000 | 3 000 | 2 000 | 1 200 | – |
| III | S0 | 15 | 3 000 | 2 000 | 2 000 | 1 200 | – | – |
| III | S1 | 12 | 2 000 | 1 400 | 1 200 | 800 | – | – |
| IV | S0 | 9 | 2 000 | 1 400 | – | – | – | – |
| IV | S1 | 6 | 2 000 | 1 400 | – | – | – | – |
| IV | S2, S3 | 6 | 1 200 | 800 | – | – | – | – |
| V | S1, S2, S3 | 6 | 1 200 | 800 | – | – | – | – |

NOTE 1: This table applies to the types of public buildings mentioned in H.2.1, unless otherwise specified in H.2.2 to H.2.12.

NOTE 2: The "–">" in the table means that a building with a corresponding horizontal row of fire resistance grade cannot have a corresponding number of vertical columns.

NOTE 3: In a building with a fire resistance grade IV with a height of 2 floors, the load-bearing structure of the building shall have a fire resistance rate not lower than R 45.

NOTE 4: Regulations on the number of floors (permissible fire protection height), the area of fire compartments of public buildings with fire protection height from over 150 m to 150 m are specified in Appendix A.

### H.2.2 Service facilities (group F3.5)

Fire resistance grade, structural fire hazard class, the maximum allowable fire protection height of the building and the area of one floor within a fire compartment for service facilities (group F3.5) are specified in Table H.3. Additional provisions in H.2.12 shall be complied with.

**Table H.3 Service facilities (group F3.5)**

| Fire resistance grade of the building | Structural fire hazard levels of the building | The maximum allowable fire protection height of the building, m | The largest allowable area of a house floor within a fire compartment, $m^2$ | |
|---|---|---|---|---|
| | | | One-Story Building | Multi-storey buildings (up to 6 floors excluding the top technical floor) |
| I | S0 | 18 | 3 000 | 2 500 |
| II | S0 | 18 | 3 000 | 2 500 |
| II | S1 | 6 | 2 500 | 1 000 |
| III | S0 | 6 | 2 500 | 1 000 |
| III | S1 | 5 | 1 000 | – |
| IV | S0, S1 | 5 | 1 000 | – |
| IV | S2, S3 | 5 | 500 | – |
| V | S1, S2, S3 | 5 | 500 | – |

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NOTE: The "−" means that a building with a corresponding horizontal row of fire resistance grade cannot have a corresponding number of vertical columns.

### H.2.3 Buildings of commercial establishments (category F3.1)

Fire resistance grade, structural fire hazard class, the maximum allowable fire protection height of the building and the area of one floor within a fire compartment for commercial facilities (group F3.1) are specified in Table H.4. Additional provisions in H.2.12 shall be complied with.

**Table H.4 – Buildings of commercial establishments (category F3.1)**

| Fire resistance grade of the building | Structural fire hazard class of the building | The maximum allowable fire protection height of the building, m | The largest allowable area of a house floor within a fire compartment, $m^2$ | | |
|---|---|---|---|---|---|
| | | | 1 floor | 2 floors | 3 to 5 floors |
| I. II | S0 | 28 | 3 500 | 3 000 | 2 500 |
| III | S0, S1 | 8 | 2 000 | 1 000 | − |
| IV | S0 | 3 | 1 000 | – | – |
| IV, V | S1, S2, S3 | 3 | 500 | – | – |

NOTE 1: The "−"means that a building with a corresponding horizontal row of fire resistance grade cannot have a corresponding number of vertical columns.

NOTE 2: In buildings of 1-storey commercial establishments with fire resistance grade III, except for business establishments: paints and varnishes, finishing building materials, spare parts, auto accessories, carpets, furniture; allow doubling the maximum allowable area of a building floor within a fire compartment provided that the sales booth is separated from other rooms by a class 2 fire wall.

NOTE 3: For store buildings with fire resistance grade I and II, it is permissible to increase the height of the building by 1 floor if only warehouses, service rooms, service rooms and technical rooms are provided on the top floor.

NOTE 4: The number of floors is counted equal to number of floors above ground level excluding the top technical floor.

### H.2.4 Kindergarten, preschool

**H.2.4.1** The fire resistance grade, structural fire hazard level, the maximum allowable fire protection height of the building (fire compartment) of the regular kindergarten, preschool (group F1.1) specified in Table H.5 depends on the maximum number of seats in the building. Additional regulations for these group homes and the requirements outlined in H.2.12 should be followed.

**Table H.5 – Kindergarten, preschool**

| Number of seats in the building | Fire resistance grade of the building, not less than | Structural fire hazard class of the building | The maximum allowable fire protection height of the building, m (the number of floors above ground level excluding the top technical |
|---|---|---|---|
| ≤ 50 | Not specified | Not specified | 3 (1) |
| ≤ 100 | III | S0, S1 | 6 (2) |
| ≤ 150 | II | S0, S1 | |
| ≤ 350 | II | S0 | 9 (3) |
| | I | S0 | |

**H.2.4.2** The walls (interiors), partitions, and floor structures of kindergartens, preschools (group F1.1), as well as clubs (group F2.1) in buildings with structural fire hazard level S1 through S3, including the use of wood structures/components, shall have fire hazard class K0.

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**H.2.4.3** Kindergartens, preschools, regardless of the number of seats, shall have a height not to exceed:

- Two floors – for kindergartens, preschools for children with physical and (or) intellectual disabilities;

- One floor – for kindergartens, preschools for visually impaired children.

In 3-storey kindergartens, rooms for children required to be arranged on the 1st floor.

**H.2.4.4** On the 3rd floor of the nursery allows the arrangement of large class rooms, music and physical education rooms, playrooms, service rooms. At that case, rooms with an area of more than 50 $m^2$ shall have one of the exits leading directly to the staircase.

In kindergartens, preschools, corridors connecting staircases should be separated from rooms by fire partitions not lower than class 2. The doors to the rooms shall be tightly sealed.

**H.2.4.5** The appendages of adjoining buildings that are used as playrooms for children in kindergartens and preschools should be designed to have the same level of fire resistance grade and structural fire hazard level as the main building.

### H.2.5 Boarding school buildings (F4.1) and boarding school sleeping quarters (F1.1)

**H.2.5.1** Fire resistance grade, structural fire hazard level and maximum allowable fire protection height of primary, middle school, high school, supplementary building, block building of boarding school (F4.1), boarding school sleeping quarters (F1.1) defined by Table H.6. The largest allowable area of a floor within a fire compartment of these buildings is determined according to Table H.2. Additional regulations for these group homes and the requirements outlined in H.2.12 should be followed.

**Table H.6 – Buildings of high schools (F4.1) and sleeping quarters of boarding schools (F1.1)**

| **Number of students or number of seats in the building** | **Structural fire hazard class of the building** | **Minimum fire resistance grade** | **The maximum allowable fire protection height of the building,** m (number of floors) |
|---|---|---|---|
| ≤ 100 | Not specified | Not specified | 3 (1) |
| ≤ 270 | S1 | III | 3 (1) |
| ≤ 350 | S0 | III | 7 (2) |
| | S1 | II | 7 (2) |
| ≤ 600 | S0 | II | 11 (3) |
| No restrictions | S0 | I | 19 (5) |
| Sleeping quarters | | | |
| ≤ 40 | Not specified | Not specified | 3 (1) |
| ≤ 80 | S1. S2. S3 | IV | 3 (1) |
| ≤ 140 | S0 | IV | 3 (1) |
| ≤ 200 | S1 | III | 3 (1) |
| ≤ 280 | S0 | III | 7 (2) |
| No restrictions | S0 | I. II | 15 (4) |
| NOTE: The number of floors is determined by the number of floors above ground, excluding the top technical floor. | | | |

**H.2.5.2** The fire protection height of school blocks and boarding buildings for children with physical and (or) intellectual disabilities shall not exceed 9 m.

### H.2.6 Building of cultural establishments

**H.2.6.1** The fire resistance grade, structural fire hazard level and maximum allowable fire protection

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height for buildings of F2.1 and F2.2 subcultural facilities (libraries, museums, exhibitions, clubs, theaters, concert halls, cinemas, circuses and buildings with similar use characteristics) determined according to Table H.7 depend on the capacity of the building or room.

**H.2.6.2** Additional regulations for buildings belonging to this category and those in H.2.12 shall be followed.

**H.2.6.3** When determining the capacity of a room, the total number of permanent and temporary spaces should be added.

When the cinema has several cinema rooms, the total capacity of these rooms shall not exceed the value specified in Table H.7.

**H.2.6.4** The load-bearing structure of the roof (trusses, beams and other similar roof support structures) on stages and rooms of theatres, clubs and sports buildings with fire resistance grades I to III should have a fire resistance rate not lower than R 45.

**Table H.7 - Buildings of cultural institutions (categories F2.1 and F2.2) (libraries, museums, exhibitions, clubs, theaters, concert halls, Condominiums; and buildings with similar characteristics of use.**

| **Occupancy fire hazard categories of the building, fire compartment and room** | **Fire resistance grade** | **Structural fire hazard level of the building** | **The maximum allowable fire protection height of the building,** m **(the number of floors above ground level excluding the top technical floor)** | **Capacity of rooms or buildings,** seats |
|---|---|---|---|---|
| F2.1 | I | S0 | 50 | No restrictions |
| | II | S0 | 9 (3) | ≤ 800 |
| | II | S1 | 6 (2) | ≤ 600 |
| | III | S0 | 3 (1) | ≤ 400 |
| | IV, V | S0, S1, S2, S3 | 3 (1) | ≤ 300 |
| F2.2 | I | S0 | 50 | No restrictions |
| | II | S0 | 50 | ≤ 800 |
| | II | S1 | 28 | ≤ 600 |
| | III | S0 | 9 (3) | ≤ 400 |
| | III | S1 | 6 (2) | ≤ 300 |
| | IV, V | S0, S1, S2, S3 | 3 (1) | ≤ 300 |

NOTE 1: In buildings F2.1 the greatest height is allowed to arrange rooms, determined by the height of the floor at the first row position, not exceeding 9 m for rooms with a capacity of more than 600 seats. In buildings with fire resistance grade I and fire hazard level S0 structure allows the placement of rooms with a capacity of up to 300 seats at a height greater than 28 m.

NOTE 2: In F 2.2 buildings, dance floors with a capacity of more than 400 people shall not be provided as well as other functional rooms with a capacity of more than 600 people at a fire protection height of the corresponding floor greater than 9 m. The building has fire danger grade I and structural fire hazard class S0, it is permissible for placement of spaces with a capacity of up to 300 seats at a height greater than 28 m, but shall comply with the requirements in A.2.4.

NOTE 3: When combining year-round cinemas with seasonal cinemas with different fire resistance grades, these theaters shall be separated from each other by class 2 fire blocking walls.

### H.2.7 Sports buildings and constructions

**H.2.7.1** In sports halls, indoor skating rinks, indoor swimming pools (including spectator seating or no seating) as well as in swimming training rooms, indoor shooting training areas (including located under stands or built in other public buildings), if the area of the space is greater than the value specified in

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Table H.2, it is necessary to arrange a fire blocking wall between this and other rooms.

**H.2.7.2** Any capacity stands of group F2.3 buildings shall have fire resistance grade I and structural fire hazard class S0 if space below the stands is used to arrange auxiliary rooms of two floors or more.

**H.2.7.3** The floor below the grandstand shall be a class 2 fire blocking floor.

**H.2.7.4** When the auxiliary rooms have only one floor under the grandstand or when the number of rows of spectator seats in the stands is greater than 20, the load-bearing structure of the stand must have a fire resistance rate not lower than R 45, fire hazard class K0, and the floor below the grandstand must be a class 3 fire blocking floor.

**H.2.7.5** The load-bearing structures of the sports stand (F2.3) that do not use the space under the grandstand and have a number of rows of seats greater than 5 and not more than 20 shall be made from non-combustible materials with a fire resistance rate not lower than R 15, while for a number of rows of seats above 20, they shall have a fire resistance rate not lower than R 45, fire hazard class K0. In that case, it is not allowed to leave flammable substances and combustible materials underneath the stands. In indoor (enclosed) sports facilities, the load-bearing structures of fixed stands with a capacity of more than 600 people shall have a fire resistance rate not lower than R 60, fire hazard class K0; from 300 to 600 people – R 45 and K0; less than 300 people – R 15 and K0 or K1. In that case, the floors under the stands shall be class 2 fire blocking floors when the stands have a capacity of more than 600 people, class 3 with a capacity of 300 people to 600 people and class 4 with a capacity of less than 300 people.

**H.2.7.6** The fire resistance rate of temporary (telescoping) grandstand structures shall be not lower than R 15 regardless of capacity.

**H.2.7.7** The above requirements do not apply to temporary spectator seats arranged on the playing field when the playing field transforms.

### H.2.8 Passenger terminal

**H.2.8.1** In passenger terminals with fire resistance grade I and II and structural fire hazard class S0, instead of dividing the building into fire compartments by class 1 fire blocking walls, it is permissible to divide the fire compartment into fire compartments with the same area as in Table H.2 (with groups of rooms with the same occupancy fire hazard category) by water curtains fire suppression (drencher), or by fire screens with a fire resistance rate not less than E 60. In that case, the above-mentioned fire screens and fire screens shall be installed in the area without fire load on a width not less than 4 m on both sides of the fire screen and the fire curtain.

**H.2.8.2** In airport terminals with fire resistance grade I, the floor area between the fire walls (fire compartments) can be increased to 10 000 $m^2$ when there is no basement or if there is a basement, in the basement (semi-basement) there are no warehouses and other types of rooms containing combustible materials (except for storage booths and employee caps, rooms with fire hazard classes C4 and E). At that time, the passage from the rooms for sanitary ware placed in the basement and semi-basement to the 1st floor can follow the open staircases, if going from the storage booths, you shall follow the separate stairs located in the closed staircase. Lockrooms (except those equipped with automatic storage compartments) and helmet rooms shall be separated from other parts of the basement by Class I fire partitions and equipped with automatic fire extinguishing systems, while dispatch-command stations shall be separated by Class I fire partitions.

**H.2.8.3** In airport terminals and passenger terminals with fire resistance grade class I and structural fire hazard class S0, there is no limit to the floor area between fire blocking walls if equipped with automatic fire extinguishing systems.

### H.2.9 Hospitals

**H.2.9.1** Hospital buildings (F1.1) should be arranged in independent buildings or in separate fire compartments with a fire protection height of not more than 28 m. Hospital buildings with a height of 2 floors or more shall have fire resistance grade I or II and structural fire hazard class S0.

**H.2.9.2** 1-storey hospital buildings are permitted to have fire resistance grade III and a structural fire

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hazard class not less than S1, then the maximum allowable area of a floor within a fire compartment shall not exceed 2 000 $m^2$ for buildings with structural fire hazard class S0 and not more than 1 200 $m^2$ for buildings of level S1. In that case, walls, partitions and floors, including those using wood structures, shall have fire hazard class K0.

**H.2.9.3** Hospital inpatient houses with a height of up to 3 floors should be divided into fire compartments with an area of not more than 1 000 $m^2$ by type 1 fire partitions. Inpatient houses with a height of more than 3 floors and inpatient houses with structural fire hazard class S1 should be divided into fire compartments with an area of not more than 800 $m^2$ by class 1 fire partitions

**H.2.9.4** Hospitals for mental patients and medical stations of health stations have a fire protection height of not more than 9 m, fire resistance grade not lower than II and structural fire hazard level S0.

**H.2.9.5** Nursing homes and health care for people with disabilities should be designed in accordance with the same fire safety requirements as hospitals.

**H.2.10 General clinic (F3.4)**

**H.2.10.1** Fire protection height of the outpatient general clinic (F3.4) is up to 28 m. The fire resistance grade of a building with 2 floors or more shall not be lower than grade II, the structural fire hazard level shall not be lower than S0.

**H.2.10.2** Non-residential medical facilities are permitted to be placed in single-storey buildings with fire resistance grade III and structural fire hazard level not lower than S1, when the maximum permissible area of one floor within a fire compartment is not greater than 3 000 $m^2$ for buildings with grade S0 and not greater than 2 000 $m^2$ for buildings with grade S0 and not greater than 2 000 $m^2$ for buildings with grade S0 S1. Then the walls and the way that separates the corridor, hallway, concourse, vestibule and foyer from adjacent rooms, including the use of wooden structures, shall have fire hazard level K0.

**H.2.10.3** Outpatient general clinic rooms (F3.4) are permitted to be placed in subsections of buildings with fire resistance grade II and structural fire hazard level not lower than S0. These rooms shall not located at a height of more than 28 m.

**H.2.11 Nursing home sleeping quarters**

**H.2.11.1** The sleeping quarters of the nursing home should not be higher than 28 m.

**H.2.11.2** For sleeping quarters of nursing home greater than 2 floors, the fire resistance grade shall not be lower than II, structural fire hazard level S0

**H.2.11.3** The two-storey sleeping quarters of the nursing home shall be permitted to have fire resistance grade III and structural fire hazard level S0.

**H.2.11.4** The number of spaces in the sleeping quarters of nursing homes with fire resistance grade I and II and structural fire hazard level S0 shall not exceed 1 000, grade III and level S0 – not more than 150, the remaining fire resistance grades – not more than 50.

**H.2.11.5** Bedrooms for families with children in the sleeping quarters of the nursing homes should be arranged in independent buildings or separate parts of the building separated by fire partitions of type 1, no more than 6 stories high and have separate emergency exits from other parts of the building. In that case, the bedrooms shall have an emergency exit in accordance with one of the following requirements:

- The exit shall lead to a balcony or loggia with a solid wall not less than 1.2 m from the outer edge of the balcony (loggia) to the window opening (glass doors) or not less than 1.6 m between the glass doors going to the balcony (loggia);

- The exit shall lead to a transitional walkway at least 0.6 m wide leading to another adjacent building;

- The exit shall lead to a balcony or loggia equipped with an external stair connecting the balconies and loggias on each floor.

**H.2.12 Additional provisions for public buildings under H.2**

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**H.2.12.1** In the public buildings mentioned above (H.2.1 to H.2.11) with fire resistance grades I to III, the load-bearing structure of the roofs of the annexes built adjacent to the building (there may be a part located in the main building, partly outside the main building) shall have a fire resistance rate not lower than R 45 and fire hazard level K0.

**H.2.12.2** In buildings with fire resistance grade I and II and structural fire hazard level S0, when the whole building is equipped with an automatic fire extinguishing system, the area of the fire compartment specified in tables from H.2 to H.4 is allowed to increase no more than 2 times.

**H.2.12.3** If within the fire compartment of a 1-storey building in tables from H.2 to H.4 there is a part of a 2-storey building with an area occupying no more than 15% of the construction area of the building, the fire compartment is still considered as a 1-storey building.

**H.2.12.4** Appendages of the main building such as the roof attached to the main building (eaves, roofs covering the area close to the base of the building), sky yards, outer corridors and the like are allowed to take the fire resistance grade that 1 grade lower than the fire resistance grade of the main building. In that case, the structural fire hazard level of these appendages should not be lower than the structural fire hazard level of the main building. In this case, the fire resistance grade of the covered building attached to the main building, the courtyard, the outer corridor is equal to the fire resistance grade of the main building, and the area of one floor within a fire compartment is calculated including the area of these appendages.

**H.2.12.5** In halls, foyers and lounges with an area greater than the value specified in Table H.2, it is permissible to replace the fire partition wall with a class 2 light-piercing fire partition.

**H.2.12.6** The wooden walls, partitions and ceilings of fire resistance grade V buildings used as kindergartens, schools, boarding schools, outpatient examination and treatment facilities, children's health care camps and clubs (except 1-storey clubhouses with stone walls) shall be protected against fire.

**H.2.12.7** In passenger terminals and buildings or rooms with similar functions with large spaces (malls, atriums), if it is infeasible to provide fire blocking walls, it is permissible to replace the fire blocking walls with drencher water curtain generators arranged in 2 strips 0.5 m apart and with a spray intensity of not less than 1 L/s for per meter of water screen length (for all 2 strips). The duration of maintaining the water curtain is at least 1 hour. In addition, there shall be a solution to prevent the spread of smoke between fire compartments.

**H.2.12.8** The librarian shall not exceed 28 m in height.

**H.2.12.9** The largest fire protection height permitted to provide the lecture halls, auditoriums, conference rooms, seminars, sports booths without spectators and other rooms with similar functions in the building with any occupancy specified in Table H.8 including fire resistance grade, structural fire hazard level of the building and capacity of the rooms.

**Table H.8 – The largest fire protection height permitted to provide some rooms**

| **Fire resistance grade of the building** | **Structural fire hazard level of the building** | **Capacity of the room,** seats | **The greatest fire protection height permitted to provide some rooms,** m |
|---|---|---|---|
| I, II | S0 | ≤ 300 | 50 |
| | S0, S1 | ≤ 600 | 12 |
| | S0, S1 | > 600 | 9 |
| III | S0 | ≤ 300 | 9 |
| | S0, S1 | ≤ 600 | 3 |
| IV | S0, S1, S2, S3 | ≤ 100 | 3 |

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NOTE 1: The greatest height permitted to provide room is the height of the floor corresponding to the first row of seats.

NOTE 2: In kindergartens, preschools, nursing and disability care facilities (not apartment-type), hospitals, sleeping quarters of inpatient educational institutions and children's facilities, children's health care facilities (F1.1), it is not allowed to arrange rooms above the 2nd floor, as for schools (F4.1) – not higher than the 3rd floor

NOTE 3: The total capacity of rooms located on the same floor shall not exceed the permissible values in this table (except in the case of rooms located in different fire compartments).

## H.3 Administrative building - auxiliary of production facilities and warehouses

Fire resistance grade, structural fire hazard level, maximum allowable height of the building and one-storey area within a fire compartment for the administrative-auxiliary building of the production facility and warehouse (stand-alone building, adjacent to or located inside the manufacturer or warehouse, under category F4.3) are specified in Table H.2. When determining the fire resistance grade of the building, it is necessary to consider the height to locate of the auditoriums, assembly rooms and conference rooms according to Table H.8.

## H.4 Producer houses and breeders of cattle, poultry and animals

### H.4.1 Producer house

Fire resistance grade, structural fire hazard level, the maximum allowable fire protection height of the building and the area of one floor within a fire compartment for producer house are specified in Table H.9.

The number of floors, the area of one floor within a fire compartment of the producer house determined in accordance to A.2.1, Appendix A and H.6, Appendix H.

When there are technological openings on the floors between floors, the total area of these floors shall not exceed the floor area specified in Table H.9. When equipping automatic fire fighting system thoroughly the producer room, it is permissible to increase 2 times the floor area within a fire compartment specified in Table H.9, except for buildings with fire resistance grade IV and V.

For buildings of fire hazard class C with class C1 rooms with a total area greater than 1/2 of the corresponding floor area, the area of one floor within a fire compartment specified in Table H.9 shall be reduced by 25%.

**Table H.9 – Producer house**

| Fire and explosion hazard class of the building | The maximum allowable FLS height of the building [1)], m | Fire resistance grade of the building | Structural fire hazard class of the building | Maximum allowable area of a storey within a fire compartment, $m^2$ | | |
|---|---|---|---|---|---|---|
| | | | | One-Story Building | 2-Stories Building | Building of 3 or more stories |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| A | 36 | I. II | S0 | No restrictions | 5 200 | 3 500 |
| | 24 | III | S0 | 7 800 | 3 500 | 2 600 |
| | Not specified | IV | S0 | 3 500 | – | – |
| B | 36 | I. II | S0 | No restrictions | 10 400 | 7800 |
| | 24 | III | S0 | 7 800 | 3 500 | 2 600 |
| | Not specified | IV | S0 | 3 500 | – | – |
| | See [2)] | | | | | |

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| | | | | | | |
|---|---|---|---|---|---|---|
| C | 48 | I. II | S0 | No restrictions | 25 000<br>7 800 3) | 10 400<br>5 200 3) |
| | 24 | III | S0. S1 | 25 000 | 10 400<br>5 200 3) | 5 200<br>3 600 3) |
| | 18 | IV | S0. S1 | 25 000 | 10 400 | – |
| | 18 | IV | S2. S3 | 2 600 | 2 000 | – |
| | 12 | V | Not specified | 1 200 | 600 4) | – |
| D | 54 | I. II | S0 | No restrictions | | |
| | 36 | III | S0 | No restrictions | 25 000 | 10 400 |
| | 30 | III | S1 | No restrictions | 10 400 | 7 800 |
| | 24 | IV | S0 | No restrictions | 10 400 | 5200 |
| | 18 | IV | S1 | 6 500 | 5 200 | – |
| E | 54 | I. II | S0 | No restrictions | | |
| | 36 | III | S0 | No restrictions | 50 000 | 15 000 |
| | 30 | III | S1 | No restrictions | 25 000 | 10 400 |
| | 24 | IV | S0. S1 | No restrictions | 25 000 | 7 800 |
| | 18 | IV | S2. S3 | 10 400 | 7 800 | – |
| | 12 | V | Not specified | 2 600 | 1 500 | – |

1) The building height in this table is calculated from the 1st floor floor to the top floor ceiling, including the technical floor; When the ceiling has a variable level, take the average value. When determining the number of floors, only above-ground floors are counted. There is no regulation of the height of a single-storey building with fire hazard levels S0 and S1.

2) In the case of a fire resistance grade I building, grade S0 still cannot meet the requirements of the height or area of the fire compartment in accordance with the production scale, allowing the synchronous application of the latest version NFPA 5000 standard or equivalent standard to determine the maximum allowable height and area of a building floor within a similar fire compartment, in accordance with the fire resistance rates of structures, building components and other conditions. The fire resistance rate of the structure or component of the building in this case shall not less than the provisions of Table 4 for buildings with fire resistance grade I.

3) For woodworking manufacturers.

4) For sawmills with up to 4 frame buildings, preliminary wood processing workshops and wood crushing stations.

NOTE: The “-“sign means that a house with a corresponding horizontal fire resistance grade cannot have a corresponding number of vertical columns.

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### H.4.2 Livestock, poultry and animal breeders (F5.3)

The fire resistance grade, structural fire hazard level, the maximum allowable building height of the building and the area of one floor within a fire compartment for cattle, poultry and animal houses depend on the fire hazard class specified in Table H.10, and for Grade D buildings – in Table H.9.

**Table H.10 – Livestock, poultry and animal breeders**

| Fire and explosion hazard class of the building | The maximum allowable fire protection height of the building [1)], m | Fire resistance grade of the building | Structural fire hazard level of the building | Maximum allowable area of a storey within a fire compartment, $m^2$ | | |
|---|---|---|---|---|---|---|
| | | | | One-Story Building | 2-Stories Building | Building of 3 or more stories |
| C | 36 | I. II | S0 | No restrictions | 25 000 | 10 400 |
| | 18 | III | S0 | 25 000 | 10 400 | 5 200 |
| | 12 | IV | S0, S1 | 25 000 | 10 400 | – |
| | 12 | IV | S2, S3 | 2 600 | 2 000 | – |
| | 8 | V | Not specified | 1 200 | – | – |
| E | 36 | I. II | S0 | No restrictions | | |
| | 18 | III | S0 | No restrictions | 50 000 | 15 000 |
| | 18 | III | S1 | No restrictions | 25 000 | 10 400 |
| | 12 | IV | S0, S1 | No restrictions | 25 000 | 7 800 |
| | 12 | IV | S2, S3 | 10 400 | 7 800 | – |
| | 8 | V | Not specified | 2 600 | 1 500 | – |

[1)] The building height in this table is calculated from the 1st floor to the top floor ceiling, including the technical floor; When the ceiling has a variable level, take the average value. When determining the number of floors, only above-ground floors are counted. There is no regulation of the height of a single-storey building with fire hazard levels S0 and S1.

NOTE 1: It is permissible to increase up to 1 800 $m^2$ for the area of the bird and sheep aquifer between the fire blocking walls of a single-storey building with fire resistance grade V and class C.

NOTE 2: The sign "–"means that a building with a corresponding horizontal level of fire resistance grade cannot have a corresponding number of floors according to the corresponding vertical column.

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## H.5 Warehouse

**H.5.1** Fire resistance grade, structural fire hazard level, the maximum allowable fire protection height of the building and the area of one floor within a fire compartment for warehouse (F5.2) are specified in Table H.11.

**Table H.11 – Warehouse**

| Fire and explosion hazard class of the building | The maximum allowable fire protection height of the building [1], m | Fire resistance grade of the building | Structural fire hazard class of the building | Maximum allowable area of a storey within a fire compartment, $m^2$ | | |
|---|---|---|---|---|---|---|
| | | | | One-Story Building | 2-Stories Building | Building of 3 or more stories |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| A | Not specified | I, II | S0 | 5 200 | – | – |
| | Not specified | III | S0 | 4 400 | – | – |
| | Not specified | IV | S0 | 3 600 | – | – |
| | Not specified | IV | S2, S3 | 75 [2] | – | – |
| B | 18 | I, II | S0 | 7 800 | 5 200 | 3 500 |
| | Not specified | III | S0 | 6 500 | – | – |
| | Not specified | IV | S0 | 5 200 | – | – |
| | Not specified | IV | S2, S3 | 75 [2] | – | – |
| C | 36 | I, II | S0 | 10 400 | 7 800 | 5 200 |
| | 24 | III | S0 | 10 400 | 5 200 | 2 600 |
| | Not specified | IV | S0, S1 | 7 800 | – | – |
| | Not specified | IV | S2, S3 | 2 600 | – | – |
| | Not specified | V | No restrictions | 1 200 | – | – |
| E | No restrictions | I, II | S0 | No restrictions | 10 400 | 7 800 |
| | 36 | III | S0, S1 | No restrictions | 7 800 | 5 200 |
| | 12 | IV | S0, S1 | No restrictions | 2 200 | – |
| | Not specified | IV | S2, S3 | 5 200 | – | – |
| | 9 | V | Not specified | 2 200 | 1 200 | – |

1) The building height in this table is calculated from the 1st floor floor to the top floor ceiling, including the technical floor; When the ceiling has a variable level, take the average value. When determining the number of floors, only above-ground floors are counted. There is no regulation of the height of a single-storey building with fire hazard levels S0 and S1. The height of a single-storey building with fire resistance grade IV and fire hazard level S0, S1 shall not be greater than 25 m, for levels S2, S3 – not greater than 18 m (from the floor to the lower edge of the roof bearing structure at the support cushion position).

2) Movable building

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NOTE 1: The "-" sign means that a house with a corresponding horizontal fire resistance grade cannot have a corresponding number of vertical columns.

NOTE 2: For class C and E warehouses, in the case of a fire resistance grade I building, grade S0 still cannot meet the requirements of the height or area of the fire compartment in accordance with the necessary scale, allowing the synchronous application of the latest version NFPA 5000 standard or equivalent standard to determine the maximum allowable height and area of a building floor within a similar fire compartment, in accordance with the fire resistance rates of structures, building components and other conditions. The fire resistance rate of the structure or component of the building in this case shall not less than the provisions of Table 4 for buildings with fire resistance grade I.

**H.5.2** For warehouses with working floors, rack frames, mezzanine floors, the number of floors and floor area within a defined fire compartment is similar to that specified by the producer house specified in H.4.1. When there are openings on the floors between floors, the total area of these floors shall not exceed the values specified in Table H.10.

**H.5.3** When equipping automatic fire fighting system thoroughly the warehouses, it is permissible to increase maximum 2 times the floor area within a fire compartment specified in Table H.11, except for buildings with fire resistance grade IV and V.

When arranging warehouses in manufacturers, the floor area of warehouses within a fire chamber and their height (number of floors) shall not exceed the values specified in Table H.11.

**H.5.4** The largest allowable area within a fire compartment for the 1st floor of a multi-storey warehouse is permitted to be determined according to the regulations of a single-storey building, if the floor of the 2nd floor is a class 1 fire blocking floor.

**H.5.5** The storage house should not be higher than 28 m.

**H.5.6** Warehouses containing finished wood can only be 1 floor, minimum fire resistance grade IV and structural fire hazard level S0 and S1.

Fire resistance grade, structural fire hazard level and one-story area within a fire compartment for finished wood warehouses specified in Table H.12.

When equipping a warehouse with automatic fire extinguishing for finished wood, it is allowed to increase up to 2 times the value of the area of one floor within the scope of a fire compartment specified in Table H.12, except for buildings with fire resistance grade IV with any structural fire hazard level and buildings with fire resistance grade V. In this case, the intensity and area for calculating the amount of water consumed or foaming need to increase by 10 %.

**Table H.12 – Warehouses for finished wood products**

| Building class | Fire resistance grade of the building | Structural fire hazard class of the building | Maximum allowable area of a storey within a fire compartment, $m^2$ |
|---|---|---|---|
| C | I. II. III | S0 | 9 600 |
| | IV | S0, S1 | 4 800 |
| | IV | S2, S3 | 2 400 |
| | V | Not specified | 1 200 |

## H.6 Calculate the area of the fire compartment

**H.6.1** The selection of building sizes and fire compartments should be suitable for their fire resistance grade, structural fire hazard level and occupancy fire hazard category, fire hazard of technological processes in the building or fire compartment.

**H.6.2** The area of the fire compartment is the largest area of a floor within the scope of a fire compartment.

A single-storey area within a fire compartment is the floor area bounded by the walls of a building and (or) class 1 fire walls. This area is determined with the following additional requirements:

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- The area of a house within a fire compartment is determined according to the perimeter inside the wall of the floor excluding the area of the staircases, except in special cases that are specifically required. When there is no part or all of the wall, the above area is equal to the floor area;

- The area of one floor within a fire compartment of buildings connected by a closed walkway, tunnel or closed corridor should be calculated as the sum of the areas of the connected floors and the area of the closed walkway, tunnel or closed corridor;

- In manufacturers and warehouses (F5.1, F5.2 and F5.3), when there are openings in the story floor, the area of one floor within a fire compartment is the sum of the areas of the stories connected through the opening;

- In closed car garages with undivided ramps, the area of one floor within a fire compartment is the total area of floors connected by undivided ramps;

- For buildings under the occupancy fire hazard category F1.1, F1.2, F2 to F4, when determining the area of one floor within a fire compartment, it is necessary to mention the area of the roofs, courtyards and corridors attached to the building, if they are not separated from the main building by class 1 fire walls;

- In buildings under the occupancy fire hazard category F1.1, F1.2, F2 to F4 with floor openings for the arrangement of open stairs, escalators, atriums, voids and other occupancies, the area of a floor within a fire compartment is the total area of the bottom floor of the voids, atriums and of the corridors, The walkways and rooms of all upper floors of the void, atrium within the space are separated by class 1 fire partitions. When there is no class 1 fire partition separating the void space from the corridors and rooms adjacent to this space (including in the case of alternative solutions such as fire curtains, drencher curtains and other similar fire protection equipment), the area of one floor within a fire compartment is the total area of the corresponding floors.

In the case of combining the above requirements, the floor area and height of the building are taken according to the most unfavorable requirements for buildings with corresponding structural fire hazard levels.

In case that the fire resistance grade and structural fire hazard level of the building are not determined, it is permissible to take the fire resistance grade e V and the structural fire hazard level S3 to determine other fire safety requirements (determination of fire protection distance and other requirements).

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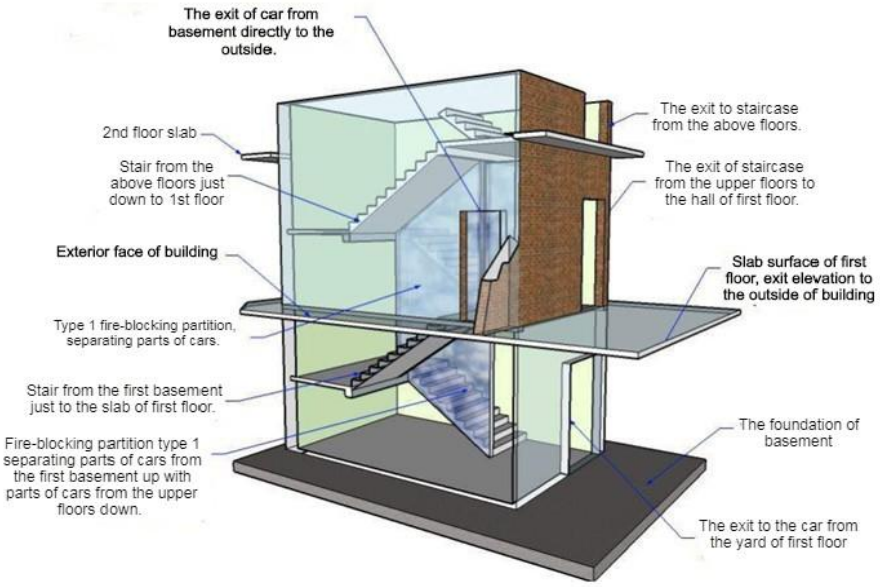
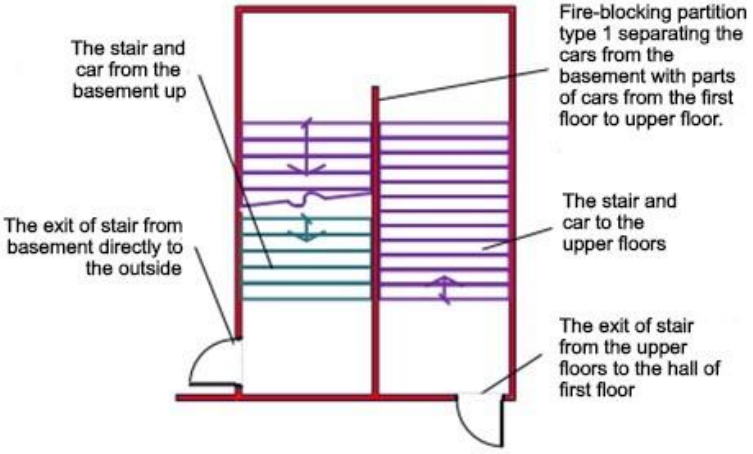
# APPENDIX I
(reference)
**ILLUSTRATIONS**

## I.1 Some illustrations for contents of regulations separate mean of egress of basement with means of egress of stories when they are arranged in the same staircase (see 3.2.2)




(a)

**a) General image**




(b)

**b) layout**

**Figure I.1- The exit from basement is arranged to escape directly to the outside**

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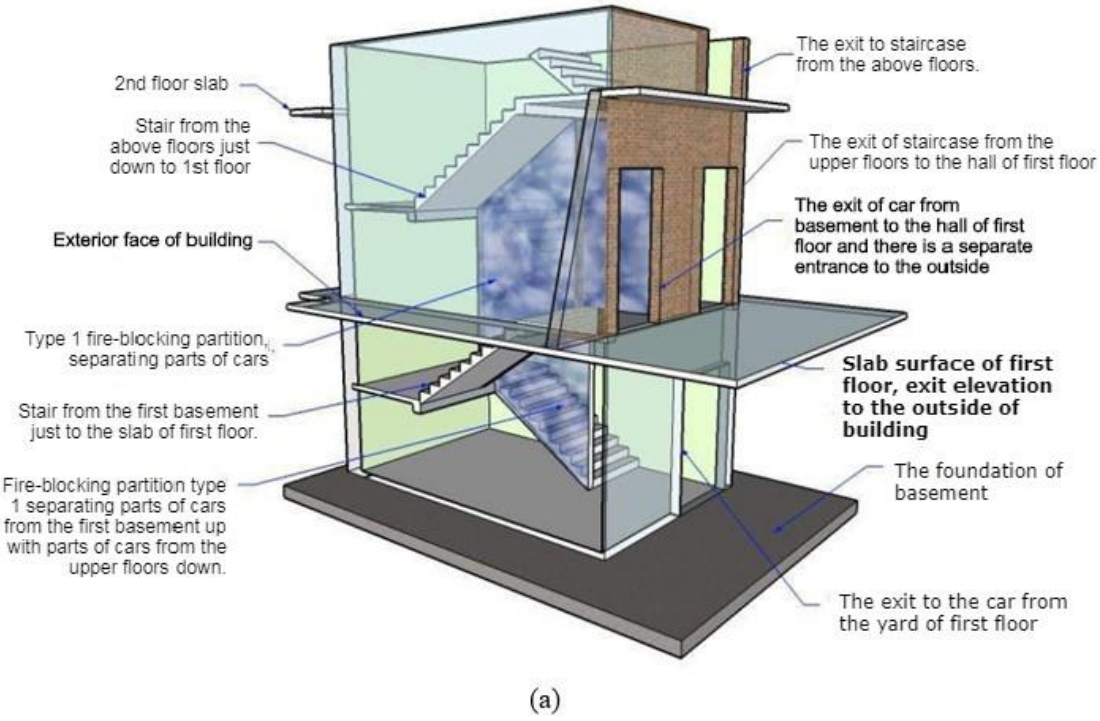
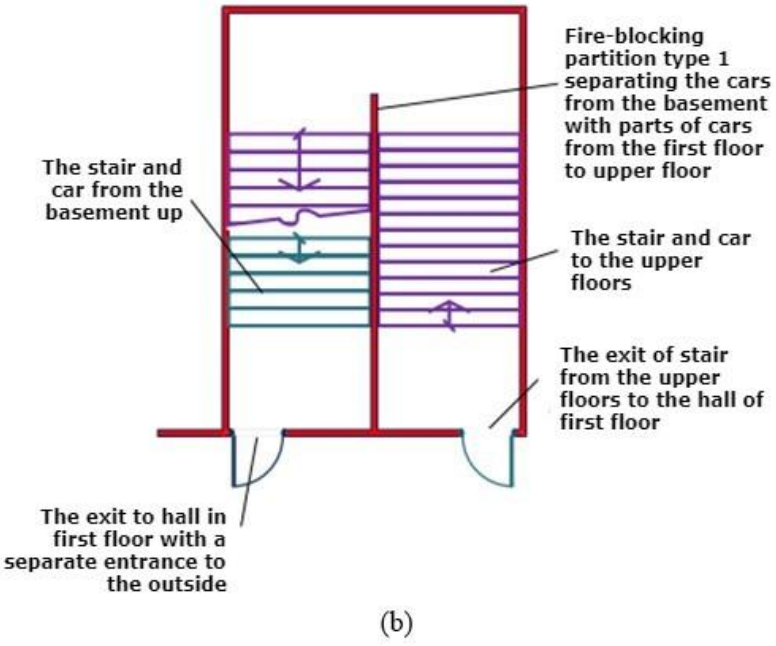



**a) general image**




**b) layout**

**Figure I.2 - The exit from basement is arranged to the hall of first floor, then there is a separate means of egress to the outside**

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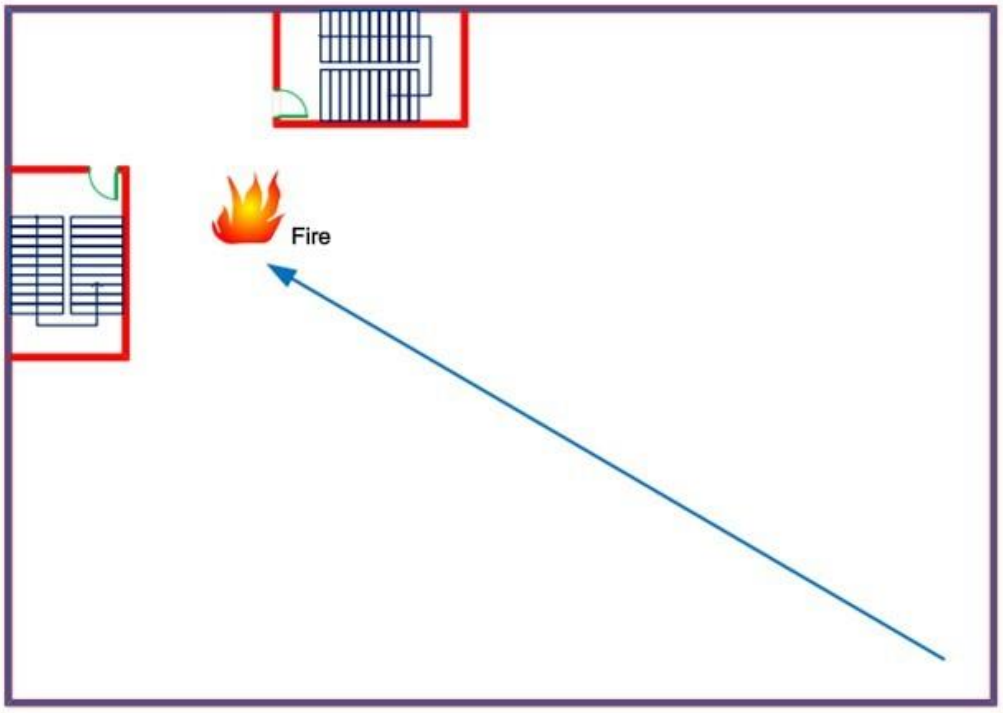
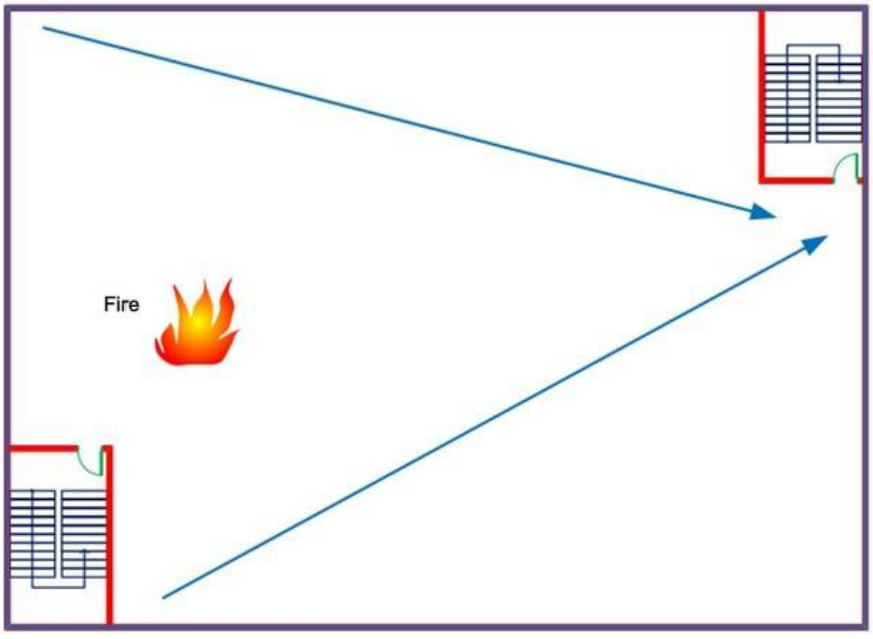
**I.2 Dispersion arrangement of the exit (see 3.2.8)**




**a) Two staircases is arranged next to each other, therefore, it does not ensure the exit if any fire in adjacent areas.**




**b) two staircases are arranged far from each other, when there is any fire in adjacent area of either of two staircases, it is possible to exit through the remaining staircase. (comply to principle)**

**Figure I.3: Illustration of dispersion of exit staircase**

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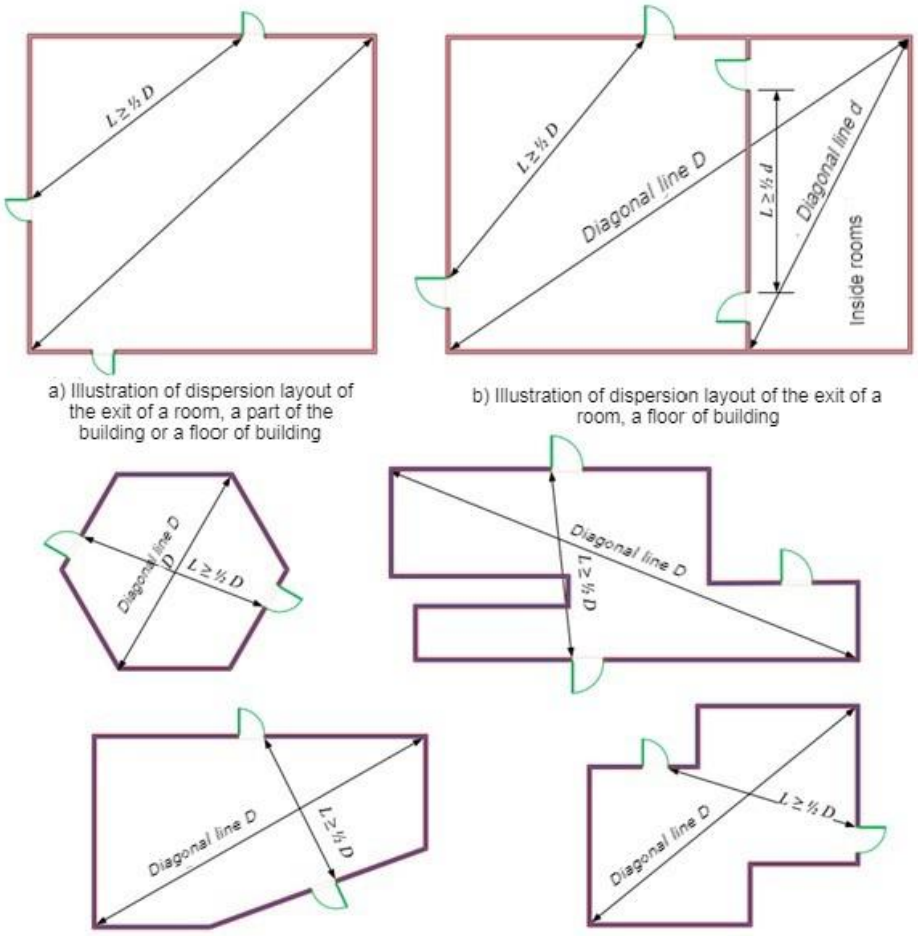
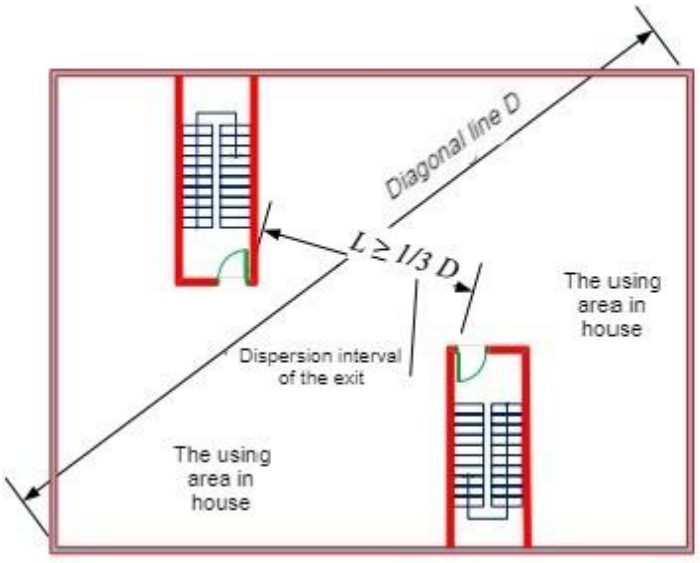



a) Illustration of dispersion layout of the exit of a room, a part of the building or a floor of building

b) Illustration of dispersion layout of the exit of a room, a floor of building

**c) Determination of dispersion distance of the exit in some unusal premises**




**d) In case the whole building is protected by sprinkler system, it can reduce dispersion interval of the exit L≥ 1/3 D**

**Figure I.4- The principle of half diagonal line of layout when arranging dispersion of the exit**

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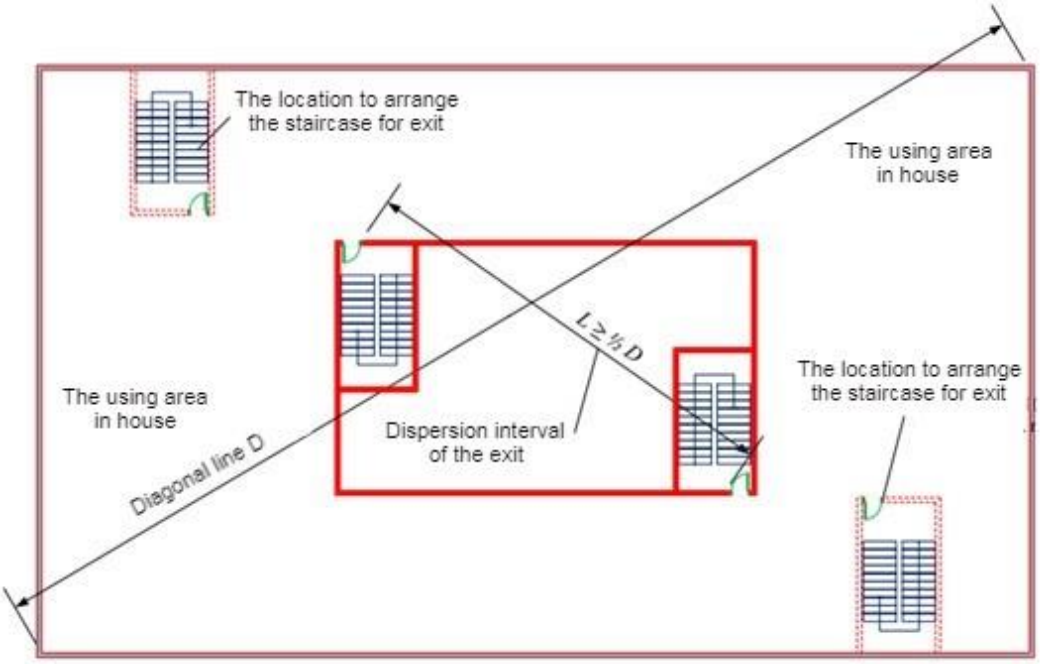
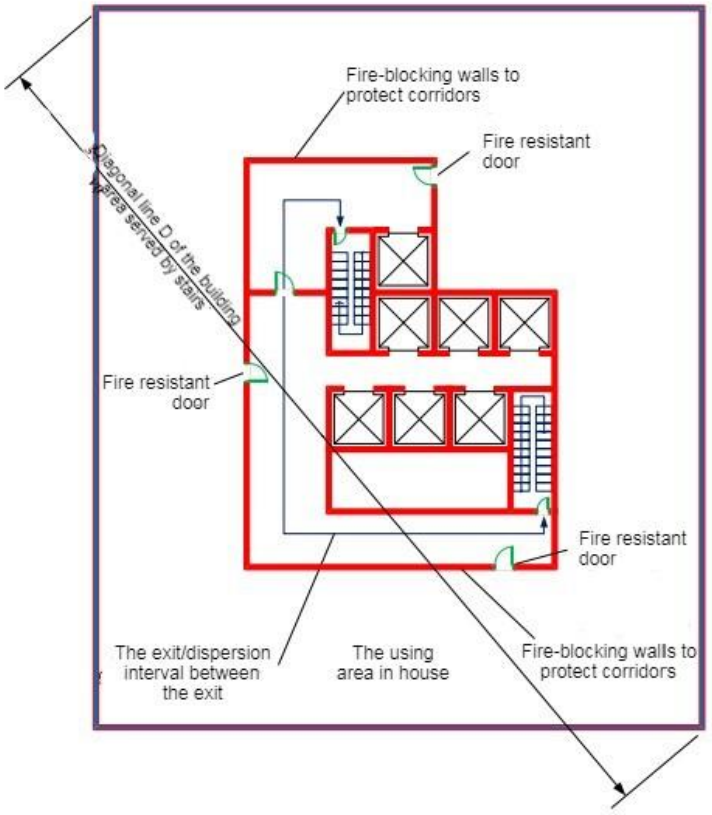



**a) If dispersion interval of the exit L ≤ ½ D and the building is not protected through out by sprinkler, it is considered as there are two exits.**




**b) If the exit is a corridor protected by fire blocking components according to regulations, the dispersion of the exit can be measured along this corridor**

**Figure I.5- Illustration on the principle to ensure dispersion interval of the exit to the premise of a building's floor**

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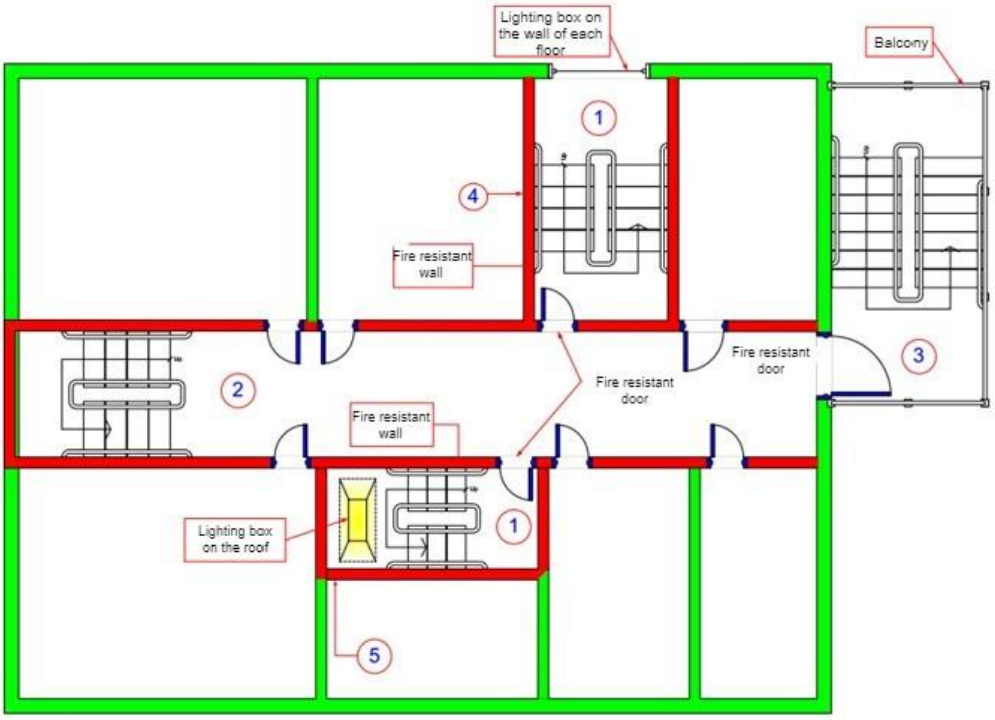
## I.3 Staircase and stair on the egress route

**I.3.1** Types of normal stair and staircase (see 2.4.2)




NOTE:
1-Type 1 staircase (indoor, closed staircase): the indoor stair is enclosed by staircase structure and the door is fire-rated (fire blocking). The outer wall might have openings.
2- Type 2 staircase (open, indoor staircase): The indoor staircase is not enclosed by structure of staircase, space of stair through the other rooms of building
3- Type 3 staircase (open, outdoor staircase): The stair is located outside the building without staircase
4- L1 Type staircase: the structure encloses the stair in the building, with fire resistance limit (fire blocking), with opening for light at the outer wall on each floor.
5- Type L2 staircase: the structure encloses the indoor stair with fire resistance limit (fire blocking) with opening for light from the roof of staircase.

**Figure I.6- Illustration of normal staircase and stair**

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### I.3.2 Some N1 smoke-stop staircases

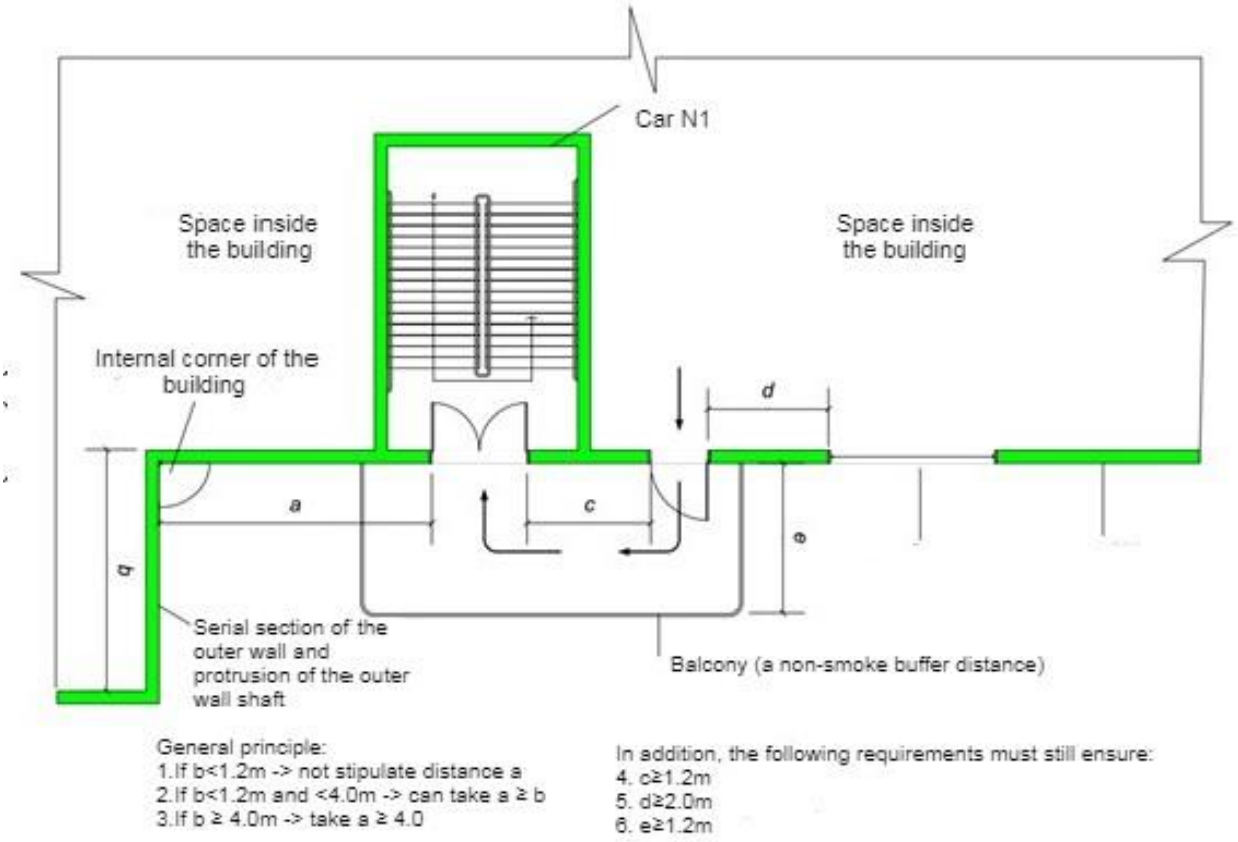


**Figure I.7- Layout of type N1 staircase (see 3.4.10a))**

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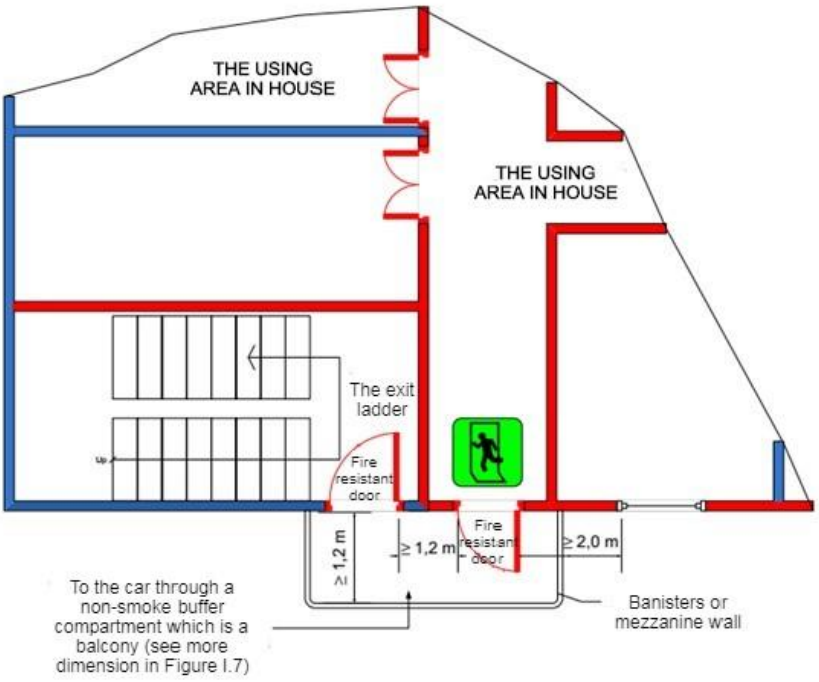
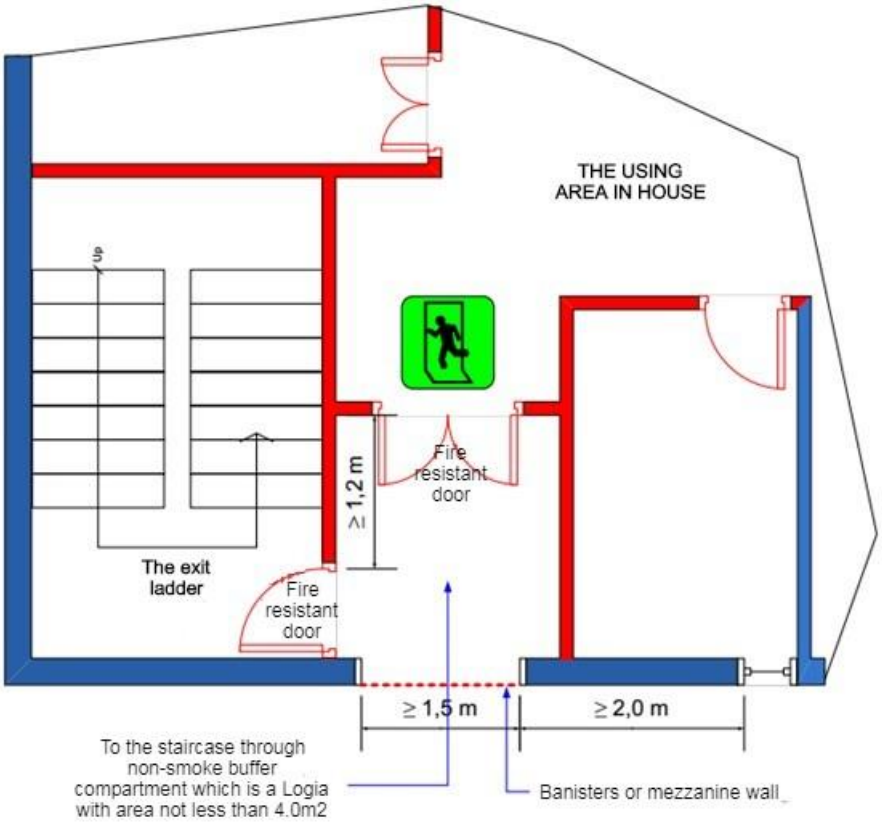



a)




b)

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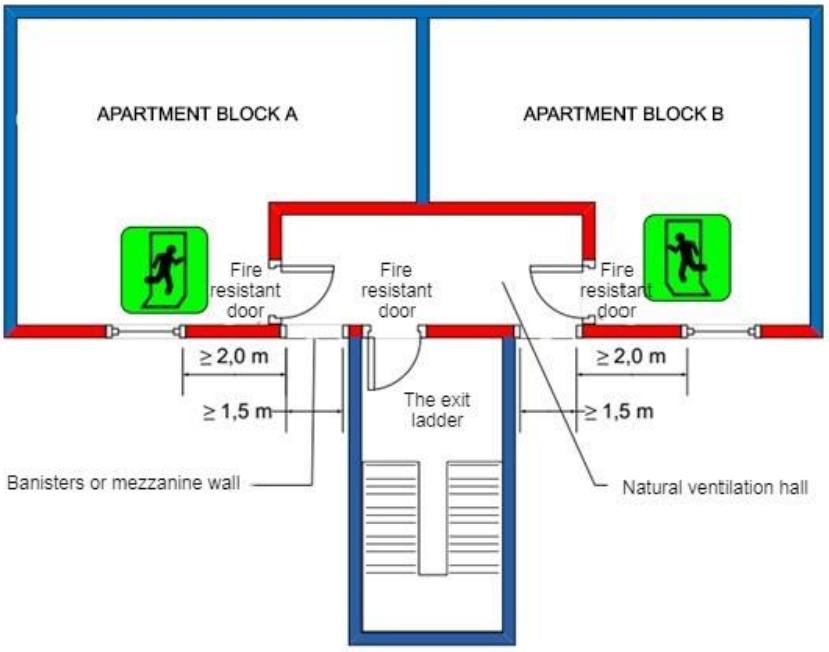
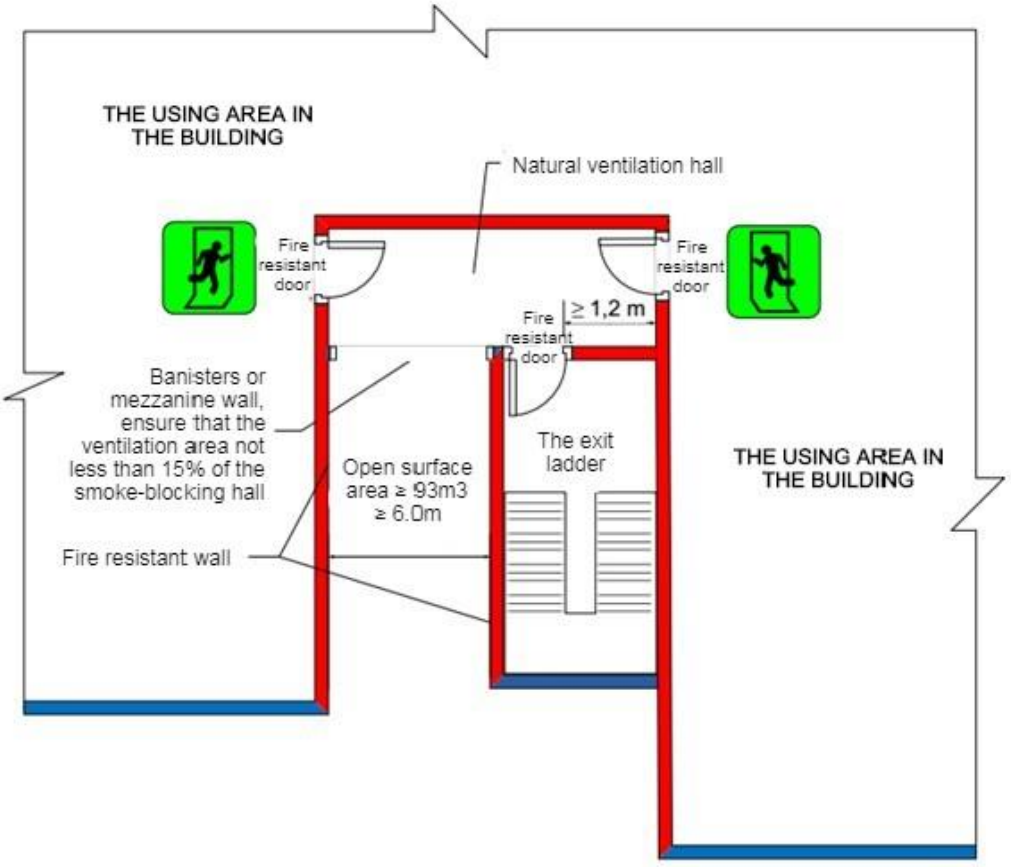



c)




d)

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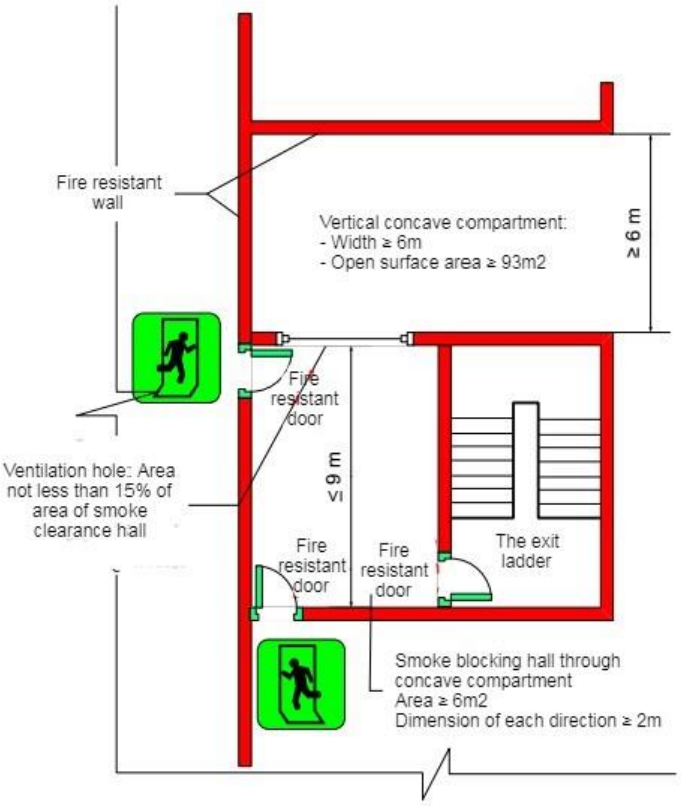
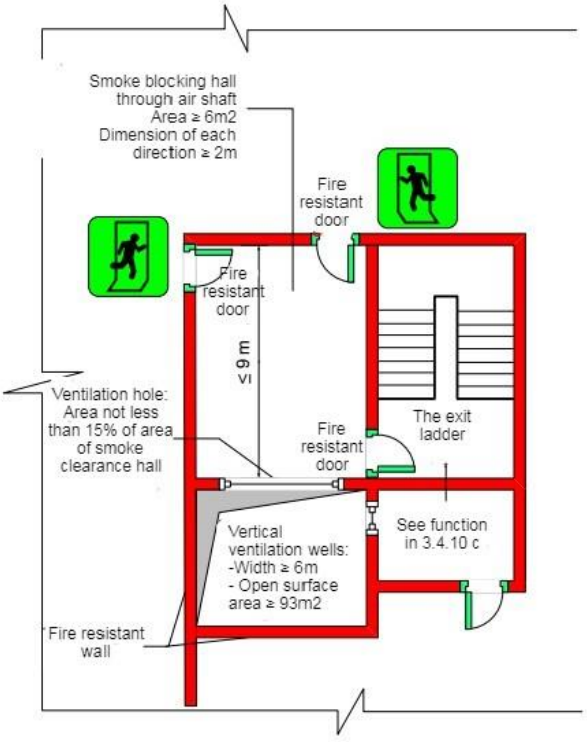



(e)




(f)

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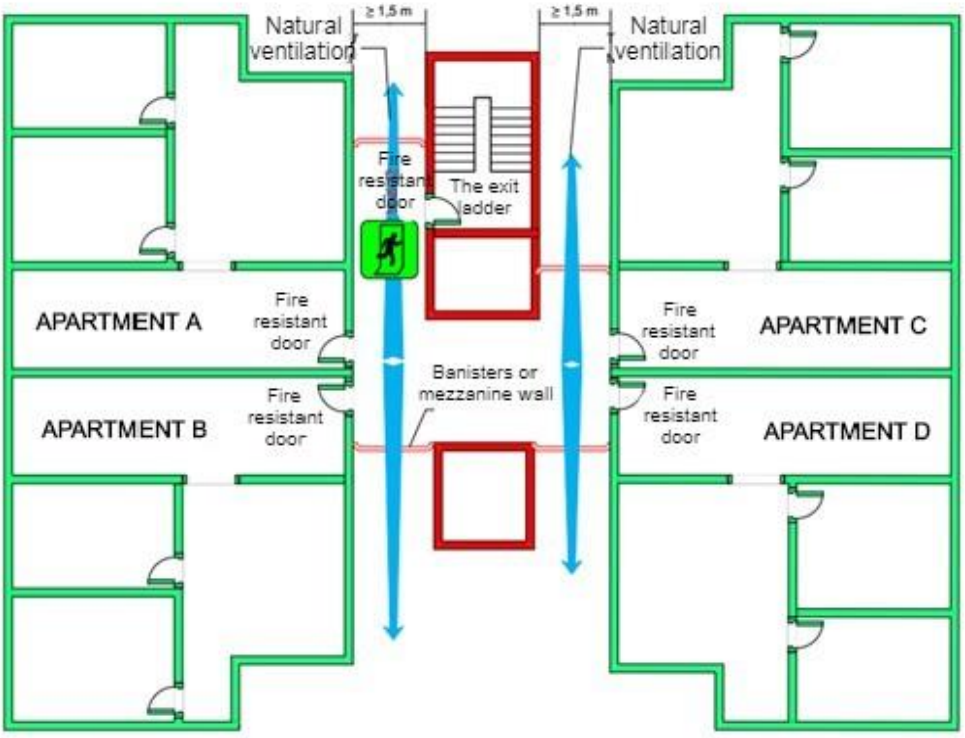
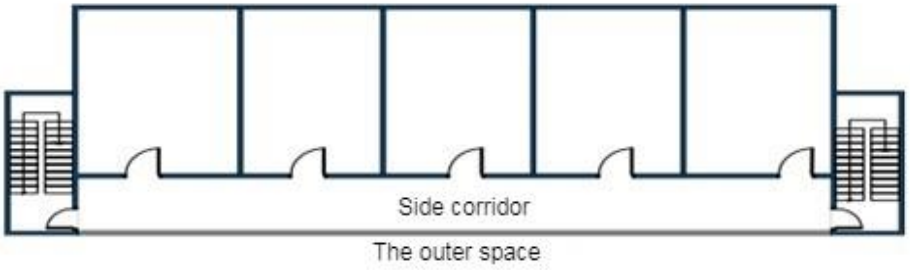



g)




h)

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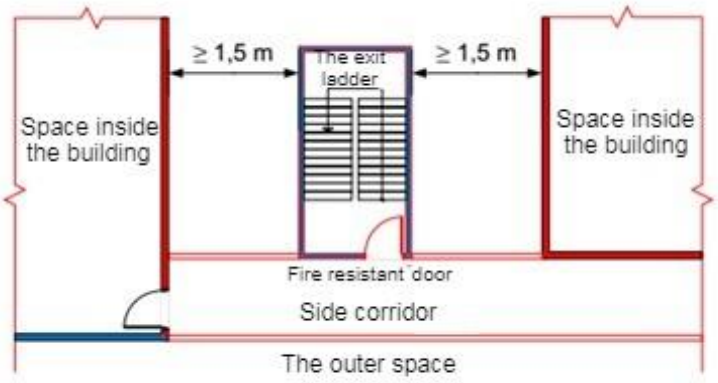
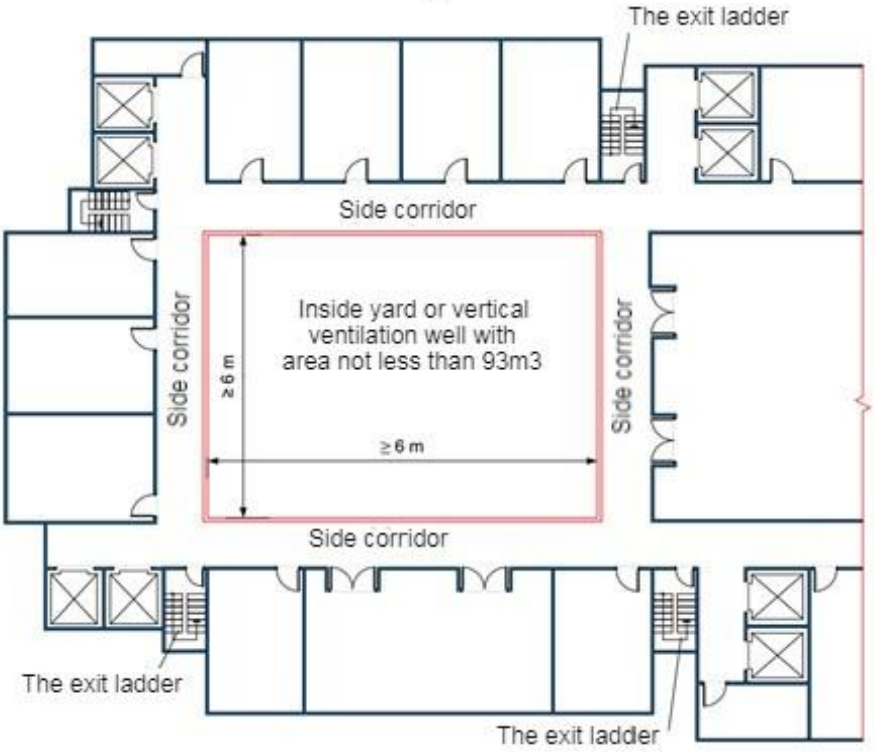



i)




k)

NOTES:

a) Smoke-stop vestibule is a balcony.
b) Smoke-stop vestibule is a loggia.
c) Smoke-stop vestibule is a common lobby on the edge of the building that ensures the requirements on natural ventilation.
d) Smoke-stop vestibule is a common hall located deeply in the premise, but has enough space to ensure requirements on natural ventilation.
e) Smoke-stop vestibule is a hall with natural ventilation with concave cavity.
f) Smoke-stop vestibule is a smoke-blocking hall with natural ventilation through a vertical shaft.
g) Smoke-stop vestibule is a common hall located between building blocks and ensures air circulation through the hall thanks to apertures on two opposite walls.
h), i), k) Smoke-stop vestibule follows side corridor.

**Figure I.8 - Illustration about smoke-stop vestibule to staircase type N1**

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### I.3.3 Smoke stop staircases types N2 and N3

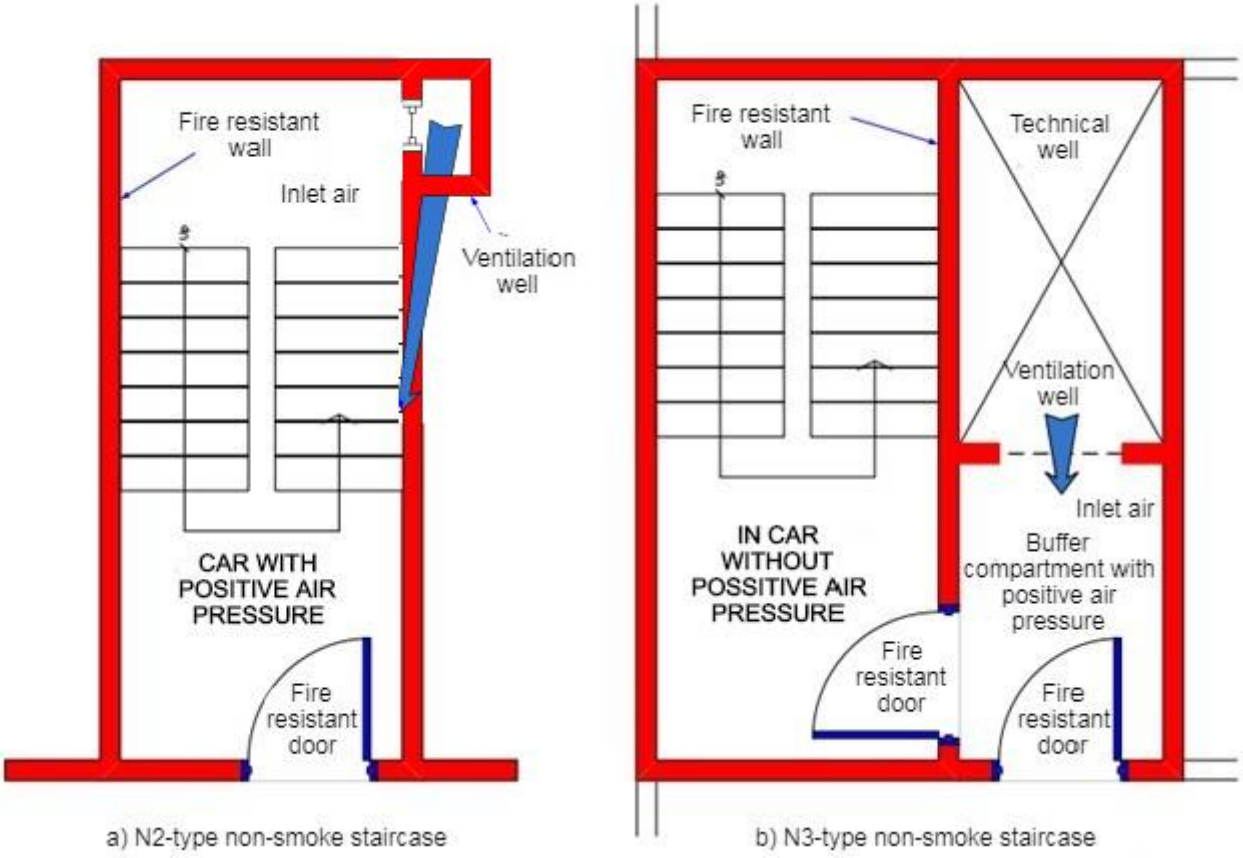


**Figure I.9 - Illustration about smoke-stop staircase type N2 and N3**