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FIRE PROTECTION OF BUILDING-DESIGN REQUIREMENTS

(This English version is for reference only)

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Foreword

TCVN 2622: 1995 replaces TCVN 2622: 1987.

TCVN 2622: 1995 was prepared by Institute of Construction Standardization in coordination with the Fire Protection Bureau - Ministry of Internal Affairs and published by Ministry of Construction.

This standard is mandatorily applied.

Fire protection of buildings – Design requirements

1. Scope

This standard specifies basic requirements of fire protection when designing, constructing or repairing buildings as well as when appraising the designation and approving buildings into using.

When designing buildings, besides complying with the regulations of this standard, constructors must comply with regulations related to other current standards.

Specialized buildings require fire protection, especially their own fire protection regulations. For example depots for combustible, explosive substances, depots for hazardous chemicals. The above buildings apply some appropriate regulations of this standard.

Temporary buildings with time of using less than 5 years, only apply the escape route section and refer to other sections of this standard.

2. General requirements

2.1 Design buildings, building parks, including ones designed, invested by foreigners, shall apply regulations for fire protection and come to an agreement about this content with fire protection agencies.

2.2 Buildings are classified into five types of fire resisting construction I, II, III, IV, V. The types of fire resisting construction of buildings are specified based on the fire resistance levels of their constructional elements. See table 2.

2.3 Industrial manufacture buildings are classified into six production classes according to the danger levels in combustion and explosion of manufacture technologies and properties of substances and materials put in them on table 1.

Table 1

Production Class	Character of substances, materials in manufacture process
A Explosive and combustive danger	Substances when burning are accumulated to lower explosive limit, less than or equal to 10% of the volume of the air and liquids whose inflammable temperature is lower than 28^0C, if these gases and liquids can combine into combustible mixture with the volume larger than 5% of the volume of the air in the room; these substances can explode and burn when they act with each other, with water or oxygen in the air.
B Explosive and combustive danger	Combustible gases are accumulated to lower explosive limit, higher than 10% of the volume of the air and liquids whose inflammable temperature is from 28^0C to 61^0C, the liquids are heated in manufacture conditions to the temperature which is higher than or equal to inflammable temperature, ignitable dust or fiber are accumulated to lower explosive limit, less than or equal to 65g/m^3, if liquids, gases and dust or fibers mentioned above can combine to combustible mixture with the volume larger than 5% of the volume of the air in the room.
C Combustive danger	Liquids hose inflammable temperature is higher than 61^0C, combustible dust or fibers are higher than 65g/m^3; solid substances and materials can be burned. Substances that may combust when interact with water, air or with each other.
D Not perform the dangerous properties of the manufacture	Incombustible substances and materials in the hot, red hot, or fusing conditions, but handling process is accompanied to the generating of heat radiation, the emission of sparks and flames; solids, liquids, and gases are burnt or used as fuel.
E Not perform the dangerous properties of the manufacture	Substances and materials are incombustible in cool condition.
F Explosive danger	Combustible gases which are not liquidized, dangerous combustible dust on the number of which create explosive mixture with the volume larger than 5% of the volume of the air in the room in which according to technological process conditions can be exploded (without combustion). Explosive substances (without combustion) when interact with each other or with water, with oxygen of the air.

Note:

1) Production buildings in corresponsive production classes are looked up in Annex A.

2) Depots may be as the case of the properties of the explosive and combustive danger of goods and materials contained in them, specify how to manufacture accordingly with the regulations in table 1;

3) Technology manufactures using fuels for burning are liquids, gases and steam or naked fire are all not in production classes A, B, C.

2.4 Materials and constructional elements are classified into three groups according to degree of combustion: incombustible, uninflammable, and combustible. See Annex A.

3. Term - Definition

(According to TCVN 5303 – 90. Fire safety. Terms and definitions)

Term	Definition
1. Combustible substance	Substances under the influence of fire or high temperature fire up, smolder or are carbonized and continue smoldering or being carbonized after being isolated from the fire source.
2. Uninflammable substance	Substances under the influence of fire or high temperature fire up, smolder or are carbonized and continue firing, smoldering or being carbonized when having a fire source. However, after being isolated from the fire source, they stop firing or smoldering.
3. Incombustible substance	Substances under the influence of fire or high temperature do not fire up, smolder or are not carbonized.
4. Fire resistance	The properties of elements and constructional structures keep the fire resistance as well as the resistance for the forming of cavities and the heat to the critical temperature and spread the flame.
5. Fire resistance level	Time (hour or minute calculus) from when starting to test the fire resistance according to the standards of samples to when appearing one of limit conditions of elements and structures.
6. Type of fire resisting construction of a building	The characters of fire resistance according to the standards of buildings specified by the fire resistance levels of major constructional structures.

7. Inflammable temperature	The lowest temperature of combustible substances at which when the combustible substances is acted on by a flame source, they will burn with a fire and continue to burn after when the flame source disappears.
8. Limited concentration of inflammable	The lower limit or higher limit of combustible substances (steams, gases, combustible dust) in their mixtures with oxygenated substances can fire up when having actions of a flame sources.
9. Limited temperature of inflammation	The lower limit or higher limit of combustible substances relative to the lower limit or the higher limit of inflammation concentration.
10. Fire spreading speed	The spreading distance of the flame in horizontal or vertical direction in a time unit.
11. Firing source burning	The energy source bringing to the combustion of matter.
12. Burning	The oxidizing reaction, heat emission, and luminescence
13. Flame	The appearance showing the combustion in gases or dust cloud forms.
14. Spark	The incandescence element of matter being ejected or discharging in the air
15. Incandescence	The heat condition of solids, characterized by heat emission or luminescence.
16. Smolder	The burning without a flame of organic solids, often appears when lacking oxygen and creates smoke.
17. Carbonization	The creation of carbon and ash due to the thermal degradation or the uncompleted combustion and creates smoke.
18. Combustion	The burning intentionally and controllably
19. Fire	The burning uncontrollably can damage human, assets.
20. Fire cause	Conditions and/or direct statuses bringing about fire.
21. Threat of fire	The condition characterized by direct possibility of bringing about fire
22. Fire hazard	The possibility of generating and developing fire available in matter, in certain environment conditions or processes.

23. Fire safety	The conditions or properties of products, methods, production facilities and areas ensuring to avoid the possibility of bringing about fire and to restrict the consequence when fire appears by organizational measures, technical and technological solutions
24. Evacuation	The evacuation people from dangerous combustion area passing exits to safe areas.
25. Evacuation plan	The documents showing escape routes, security doors, and regulating the behaviors of people, the liabilities of response authorities when organizing to evacuate from fire.
26. Fire prevention system	Summing up all the requirements, methods, measures, and solutions in order to prevent fire, to restrict the spread, to ensure to stamp out the fire, to prevent dangerous and hazardous factors for human, to limit as much as possible the damage of assets.
28. Fire fighting operations	The activities of people and fire fighting facilities with the application of measures in order to prevent the spread and to stamp out the fire
29. Fire extinguishing agent	The agents by their physical, chemical properties creating conditions for stopping the combustion and stamping out the fire.
30. Fire fighting water supply	Summing up all the methods and facilities, equipment to reserve and deliver water used for fire fighting
31. Method of fire fighting	The method using extinguishing agents with required equipment and other facilities to prevent the spread and to stamp out the fire.
32. Fire liquidation	The activities of people and fire fighting facilities with the application of measures in order to stamp out the fire completely and to avoid the possibility of burning again.

4. Normative references

1. TCVN 2622-78. Fire protection for buildings – Design requirements
2. TCVN 3503-90. Fire safety. Terms and definitions
3. TCVN 4513-88. Inside water supply.
4. TCVN 5760-1993: Fire fighting system, general requirements for designing, installing and using.

5. TCVN 5738-1993. Fire alarm system – Design requirements

5. Fire resistance of materials, constructional elements of buildings

5.1 The minimum fire resistance level and the degree of combustion of major constructional elements relative to types of fire resisting construction of buildings regulated in table 2.

Table 2

Type of fire resisting construction of a building	Fire resistance level, in min					
	Bearing pendant post, cage wall	Landing joist, and other elements of staircase	Outside non-bearing wall	Inside non-bearing wall (diaphragm)	Sheeting and other bearing elements of the floor	Sheeting and other bearing elements of the roof
1	2	3	4	5	6	7
I	150	60	30	30	60	30
II	120	60	15	15	45	15
III	120	60	15	15	45	Not specified
IV	30	15	15	15	15	Not specified
V	Not specified					

Note:

1) In the building, whose type of fire resisting construction is III, the 1st floor and upper floors shall be made of uninflammable materials, the floor of basement or pedestal floor shall be made of incombustible materials whose fire resistance levels are not less than 60 minutes.

2) In the buildings of which the types of fire resisting construction are IV, V, the floor of basements or pedestal floors shall be made of uninflammable materials whose fire resistance levels are less than 45 minutes.

3) In rooms where combustible liquids are produced, used, or proceeded, under floor shall be made of incombustible materials.

4) For buildings that have attics of which bearing structures are incombustible materials, combustible materials can be used for roofing without depending on the types of fire resisting construction of the buildings.

5) For buildings that are far from railways, water steam engines less than 30m, combustible materials cannot be used for roofing.

5.2 The augmentation for the fire resistance levels of some constructional elements is not regarded as lifting up the types of fire resisting construction of buildings.

5.3 For the types of fire resisting construction of buildings which are I, and II, allow not complying with the fire resistance levels regulated in table 2 when:

a) Using steel structures without security in one storey production buildings, not depending on working out the fire danger of production classes there.

b) Using steel structure without security in multi-storey production buildings when production classes D and E are set.

c) Using steel structures in multi- storey production buildings if production classes A, B, C are set there with the condition that steel structures must be protected by fire resisting materials which have fire resistance level not less than 45 minutes in every storey except the uppermost one.

d) Using steel structures for covering roofs, basements, decks and floors in public buildings of which types of fire resisting construction are I, II and these structures are protected by incombustible or fire resisting paint, with the fire resistance levels not less than 45 minutes. For public buildings, which have 10 storeys and over, structures must be protected by fire resisting materials, with the fire resistance levels not less than 60 minutes.

5.4 The fire resistance levels (minute) of major wooden elements in one storey buildings of agricultural buildings, public buildings, depots, production buildings with types of fire resistance regulated in table 3.

Table 3

Type of fire resisting construction of a building	Major wooden elements				
	Pillar	Hanging panel wall	Roof		Inside bearing wall (partition)
II	2	30	30	45	15

Note:

1) For production buildings, public buildings, depots and production class B, elements mentioned in table 3 shall be fire resisting treated.

2) Not allow using wooden elements mentioned above for production buildings, depots of which production classes are A and B.

5.5 The minimum fire resistance level (minute) of fire arresters in buildings in all five fire resistance levels is regulated as follow:

Name of fire arresters	Minimum fire resistance level (minute)
1. Fire wall	150
2. Door, window, gate in fire wall	1.2
3. Fire resisting cell	45
4. Door, window and fire resisting cell, fire resisting door in antechamber in production buildings class A, B, C, entrance to ceiling cellar, fire resisting dormer.	40
5. Fire-resisting floor (floors between storeys, floor of ceiling cellar, floor of entresol) in buildings of which type of fire resisting construction is I.	60
6. Fire-resisting floor (floors between storeys, floor of ceiling cellar, upper floor of basement, floor of entresol) in buildings of which type of fire resisting construction is II, III, or IV.	45

Fire arresters are made of incombustible materials.

5.6 Doors; windows; dormers; floor surface; half-diaphragm; ceiling, wall ornaments in buildings of all fire resistance levels allowed being made of combustible materials except parts, elements mentioned in clause 5.5.

5.7 Fire arresters of staircases in buildings of which types of fire resisting construction are I, II, III (girders, landing joists, stair pillars, and stairs) shall be made of incombustible materials with fire resistance level at least 60 minutes.

In two-storey apartments, wooden stairs, landing joists are allowed.

5.8 Walls, diaphragms, and floors of lift cabins and lift engine cabins set in the buildings depend on any types of fire resisting constructions must be made of incombustible materials with the fire resistance levels at least 60 minutes. If the lift is set outside the building, it must not be lower than 30 minutes.

5.9 In the roof of buildings of which types of fire resisting construction are I and II, heat insulating combustible materials can be used on the surface of concrete panels, concrete beams, and fibro-cement

panels. Heat insulating layers in metal or iron sheet roofs shall be made of uninflammable or incombustible materials.

In one and two storey production buildings of which the types of fire resisting construction are I and II, 1-storey depots of which the type of fire resisting construction is II with constructional elements made of steel, fibro cement plates as well as empty panels. For production buildings, depots that are production class A, B, C can use automatic water cooling system. Combustible synthesis materials are not allowed using for insulating heat in these buildings.

5.10 Outside walls of one or two storey buildings of which the types of fire resisting construction are II, III are made of steel plates or fibro cements then heat-insulating layers must use uninflammable materials.

5.11 In apartments that have three storeys and over, diaphragms between sections shall be made of incombustible materials with the fire resistance levels at least 60 minutes. Diaphragms between apartments shall be made of incombustible materials with the fire resistance levels at least 40 minutes. In houses of which the types of fire resisting construction are II, III lower than 6 storeys, partitions between rooms in one apartment can be made of uninflammable materials with the fire resistance levels at least 15 minutes.

5.12 Partitions covering middle corridor of the buildings of which the type of fire resisting construction is I must be made of incombustible materials with the fire resistance levels at least 30 minutes. Particularly for buildings having the type of fire resisting construction II of production classes D, E, corridors can be covered by short glass wall.

5.13 In buildings of which the types of fire resisting construction are I, II, III, the ceiling and the floor of basements, pedestal floors shall be made of incombustible materials with the fire resistance levels at least 90 minutes.

5.14 In buildings of which the types of fire resisting construction are I, II, III, having 3 storeys and over, the floor of stair cabins, lobbies that have a way from the stair to the outside must have the fire resistance levels at least 60 minutes.

Note:

1) Buildings of which the type of fire resisting construction is III lower than or equal to three storeys allows floors, stair doors, and lobbies to have fire resistance level at least 45 minutes if having a direct exit;

2) In cinemas, clubs, culture centres, halls of which the type of fire resisting construction is II, the floor of audience's halls, waiting rooms shall be made of incombustible materials with the fire resistance level at least 60 minutes.

3) The floor and the ceiling of stage equipment's depots shall be made of incombustible with the fire resistance level at least 60 minutes.

4) In hospitals, clinics, maternity hospitals, cinemas, clubs, culture centres, gas shops where have rooms setting boilers and combustible gases, the floors and ceilings of these rooms shall be made of incombustible materials with the fire resistance levels at least 90 minutes for the buildings of which the types of fire resisting construction are II, and III , and for buildings of which the types of fire resisting construction are IV and V, the fire resistance levels must be at least 60 minutes;

5) In buildings of which the types of fire resisting construction are IV and V if having basements and pedestal floors then the floor above these storeys shall be made of incombustible materials, with the fire resistance levels at least 60 minutes.

6) In halls, audience halls, meeting rooms, if having attics then the floor of the attics shall be made of incombustible materials, with the fire resistance levels at least 60 minutes.

5.15 The cage of the suspended ceiling shall be made of incombustible materials. Sheetings, suspended ceilings allow using combustible materials except ceiling plate in common corridors, staircases, stair cabins, lobbies, waiting rooms, recreation rooms of the buildings of which the types of fire resisting construction are from I to IV.

In the distance between the suspended ceiling and the roof, there is no channel, pipeline of gas, mix dust, liquid, and combustible materials.

5.16 Structures creating the floor slope in rooms must be suitable for the types of fire resisting construction of plates, pavements, and fire resisting elements of the floor regulated in table 2.

5.17 In production rooms which use or process combustible liquids products made from incombustible materials.

In buildings of all types of fire resisting construction, except type V, do not allow finishing the lining work for walls, doors of main corridors, stair cabins, lobbies, waiting rooms, living rooms with combustible materials. In buildings of which the types of fire resisting construction are from I to III, do not allow using combustible and uninflammable materials for finishing outside wall faces.

Doors of wall cupboards used for setting fire cocks can be made of combustible materials.

5.18 In industrial areas, buildings of any production classes when starting manufacture, auxiliary houses made of combustible materials should not be allowed using.

6. Fire arresters

6.1 Fire arresters of a building include walls, fire bulkheads, fire isolated floors, fire isolated sections, fire isolated boxes, fire isolated apertures and doors, isolating valves.

6.2 Fire arresters must be made of incombustible materials. Doors, windows, apertures and constructional structures set in fire arresters shall be made of incombustible or uninflammable matters with the regulated fire resistance levels.

6.3 Fire walls must be built from foundations or foundation girders to the end of the building's height, crossing through all structures and all floors. Allow putting fire walls directly on frame constructions made of incombustible materials of the buildings with the condition that the fire resistance levels of the frames, which border the fire walls, is not lower than the fire resistance levels of the fire walls.

6.4 Fire walls must be taller than the up-stream decks 60 cm if the roof or one of the roof and the attic's parts made of combustible materials, and not less than 30cm if they are made of uninflammable materials.

Allow constructing fire walls not higher than the roof if all parts of the roof and the attic are made of incombustible materials.

Note:

- Fire walls or fire bulkheads, in rooms having suspended ceilings, false ceilings, must partition all the space above the ceilings.

6.5 In buildings having outside walls made of uninflammable or combustible materials, fire walls shall cross these walls and stick out the wall face not less than 30 cm. Allow fire walls not sticking out if the outside wall is made of incombustible materials.

6.6 Apertures setting on the wall face bordering the fire isolated wall shall be apart from the crossing between these two walls horizontally at least 4 cm and the door must have the type of fire resisting construction at least 45 minutes.

6.7 In fire walls, allow setting smoke pipelines, air ventilating pipelines, borders between walls and pipelines must be clogged by mortars and the fire resistance level of the walls at the place where the pipelines are set is not less than 150 minutes.

6.8 Designing fire walls should consider to warranty the withstand when damages from one side because of the combustion of floors, roofs, or other structures appear.

6.9 Fire isolated floors shall be sealed with outside walls by incombustible materials. When outside walls of the building possibly spread fire or are glazed, fire isolated floors must cross through these walls and glazed parts.

6.10 In every case, allow replacing fire walls with fire isolated sections with the width not smaller than 12 m. The fire isolated section is the packing space that splits the building along the width (length) and the height.

Rooms in fire isolated sections are not allowed using or maintaining combustible gases, liquids, and materials as pit as processes can produce combustible matters. The fire resistance level of elements and parts of the building in the fire isolated section must ensure that:

- 45 minutes for the isolating wall between fire isolated sections and other sections.
- 15 minutes for fire bulkheads.
- 150 minutes for pillars
- 45 minutes for floors, roofs, and outside walls

Note:

In one storey buildings of which the types of fire resisting construction are III, IV, and V that do not use, process combustible gases, liquids as pit as processes which produce combustible dust, allow replacing fire walls with fire isolated sections with the width not smaller than 6 m.

6.11 On the boundary between fire isolated sections with other sections, there are fire walls with the fire resistance level not less than 15 minutes and vertical partition panels made of incombustible materials within the height limitation of fire resistance structures of the roof but not smaller than 1.5 m.

6.12 Structural solutions of fire isolated sections in buildings according to the design must guarantee functions of fire isolated sections when structures linking to them are destroyed one side because of fire.

6.13 In fire isolated sections, allow setting doors, windows, gates, blocking apertures, and valves with the conditions that these ports and valves are fire isolating or have fire isolated parking spaces. The general square of ports and apertures in a fire isolated part is not allowed to be larger than 25% of the square of this part, fire doors and ports must be close automatic, fire isolated windows must be open automatic.

6.14 Walls, floors, gates of parking spaces must be fire isolating. In the parking space, glazed doors can be made of combustible materials with the width not less than 4 cm if these doors enter rooms in which combustible materials and substances are not used, maintained as pit as there is not process related to the production of combustible dust.

6.15 Do not allow setting pipelines, pit channels for transporting gaseous, fluidal, solid combustible substances as pit as combustible dust and materials to cross fire walls, floors, and sections.

6.16 Pipelines, channels, pits (except water, water steam pipelines) used in transporting substances and materials that are different from those mentioned in clause 15, when crossing through fire walls, floors, and sections shall set up equipment to automatically preventing the spread of combustible products in pit channels and pipelines when fire.

6.17 Structures surrounding staircase pits and machine rooms of lifts, channels, pits, alcoves used for setting pipelines must meet the requirements of fire walls, floors, and cells with the fire resistance level not less than 100 minutes.

Note:

- When there is not possible to set up fire doors on the enclosing walls of elevator pits, it shall set parking spaces with fire bulkheads with fire resistance level equal to 45 minutes.

7. Escape routes

7.1 The escape route must ensure that every body in rooms, buildings, can escape safely, not be covered by smoke, in needed period to evacuate when fire.

7.2 Exits are regarded as to evacuate if they meet one of following conditions:

a) Leading from rooms of the first storey to outdoors directly of through corridors, lobbies, stair cabins.

b) Leading from rooms of any storey, exclusive of the first one, to corridors leading to stair cabins, including passing through tambours. At that time, stair cabins must have direct exits or crossing lobbies insulated from corridors by door partitions;

c) Leading to rooms in a same storey which has exits like ones mentioned in article a and b.

When setting escape routes from two stair cabins passing through the common lobby then one of these two stair cabins must have direct exits other than lobby accesses.

Exits can be set through storm door cells.

Exits from basements, pedestal floors must lead directly to outdoors.

7.3 Exits can be doors, corridors, or ways leading to inside or outside staircases to verandas leading to streets or roofs, or safe areas. Exits also include crossing ways leading to the next buildings at the same height.

7.4 Lifts and other man transporting facilities are not regarded as escape routes.

7.5 Exits should be easily recognized and ways leading to the exit must be marked clearly by guide symbols.

7.6 Mirrors are not accepted beside the exit.

7.7 The number of exits from the building is not less than two; exits must be arranged scatteredly. The longest distance from places concentrating people to the nearest escape route is regulated in table 4, 5.

Table 4

Longest distance from working area to nearest exits in production buildings

Production class	Type of fire resisting construction	Longest accepted distance in buildings, m		
		One floor	Multi-storey buildings	
			Two floors	Over two floors
A	I and II	50	40	40
B	I and II	100	75	75
C	III	80	60	60
	IV	50	30	-
	V	50	-	-
D	I and II		Not specified	
	III	100	60	60
	IV	60	40	-
	V	50	-	-
E	I and II	Not specified		
	III	100	5	75
	IV	50	50	75
	V	50	40	75
F	Major constructional elements of the building (walls, pillars, floors must be incombustible materials)	100	80	75

Note:

1) The distances regulated in this table can be applied for the first floor of multi-storey buildings like for one storey buildings.

2) The distances regulated in this table is allowed increasing by 5% if the medium square of a working area of the most crowed working shift larger than 75 m^2;

3) For rooms having accesses to cul-de-sac corridors, the shortest distances from the doors of the rooms to the direct escape routes, to lobbies or stair cabins are not longer than 25m.

4) The distances regulated in this table is included the length of the middle corridor if the middle corridor is seen as escape.

5) In one storey buildings, the types of fire resisting construction are I and II with the production class C, the regulations in table 5 are not applied then the escape routes must be set around the perimeter of the buildings and the distance is not longer than 75 m.

Table 5

Longest distance from places concentrating people to nearest escapes routes in civil buildings

Allowed longest distance, m							
Type of fire resisting construction	From rooms between two escape routes					From rooms having accesses to middle corridors or side corridors	
	Auxiliary houses of industrial buildings	Kinder-gartens, nursery schools	Hospi-tals	Public build-ings	Collec-tive houses	Buildings men-tioned in column 2, 3, 4, 5	Collec-tive apart-ments
1	2	3	4	5	6	7	8
I	50	20	30	40	40	25	25
II	50	20	30	40	40	25	25
III	30	15	25	30	30	15	20
IV	25	12	20	25	25	12	15
V	20	10	15	20	20	10	10

Note:

1) In the buildings having audiences, the distances regulated in table 5 shall be calculated from the farthest place to the nearest escape route;

2) The distances from doors to auxiliary bays in production buildings to the nearest exits or stair cabins is not over the regulated distances from the farthest working area to the escape route in one floor production buildings of which the types of fire resisting construction are regulated in table 4.

7.8 For rooms with the square reaching 300 m^2 in basements or pedestal floors, one exit is accepted if the number of people who are often in the rooms is not more than five. When the number is from 6 to

15, allow setting the second exit through the port, which has the dimension not smaller than 0.6 x 0.8 m, having vertical staircases, or through the port, which has the dimension not smaller than 0.75 x 1.5 m.

7.9 Balusters or cofferdams shall be set on the roofs of buildings with the following conditions:

Roof slope, %	Height from ground to top of outside wall or eaves, m
12	10
12	7

Balusters shall be set along with cofferdams of terrace roofs (when roofs are used), balconies, exits to outside corridors, outdoor staircases, landing joists.

7.10 For buildings whose height from the ground to the cornice or the outside coping (parapet) is 10m and over, the opening to the roof shall be set from stair cabins (directly or attics, or outdoor fire escape ladder).

For houses, public buildings, administrative-serving buildings having attics, the opening to the roof shall be set every 100 m along the buildings, where do not have attics, an exit shall be set every about $100m^2$.

For production buildings, depots, every 200m along the perimeter of the roof, a fire escape shall be set. Allow not setting fire escapes in front of the building principal side if the width of the buildings is smaller than 150m and in front of the buildings, there are fire extinction water pipelines. When calculating the number of needed exits to the roof, allow including other outside staircases, which have accesses to the roof.

In attics of the buildings, there shall be set accesses to the roof having fixed ladders through doors, apertures or windows with the dimension not smaller than 0.6m x 0.8m. Allow not setting accesses to the roof of one storey buildings, which have roofs smaller than 100 m^2.

7.11 In exits from stair cabins to roofs or attics, landing joists shall be set on stairs.

In houses, public buildings, administrative-serving buildings which have five floors or less, allow setting exits to attics or roofs from stair cabins through fire resisting apertures with the fire resistance level of 0.6 hour, dimension of 0.6m x 0.8m with fixed concatenating stairs.

7.12 On the roof, not depending on the height of the building, in places where the differences in level are more than 1m (including accesses to skylight roofs) opening fire escapes shall be set.

7.13 Fire escapes must be set on easy-seeing, easy-coming places; the lowest stairs must far from the ground 2m. Counted from the floor.

If the height reaches 20m then vertical steel ladders shall have the width of 0.7m. From the height of 10m, there shall be set 0.35m radius protecting arches with the center 0.45m far from the ladders, 0.7m apart from each other, and shall have landing joists where roofs stick out and around the landing joist, there are balusters with the height at least 0.6m.

If the height is over 20m then using tilting steel ladders with the slope not more than 80^0, the width of 0.7m, landing joists are set apart not more than 8m and having hand rails.

7.14 In the case of using outside fire escapes as the second escape route, the ladder must be 0.7m in width; the slope is not more than 60^0 and has balusters.

7.15 In production buildings and public buildings (including auxiliary houses of the buildings), the total number of escape routes of flight stairs or accesses on the escape route must be calculated in accordance with the number of people in the most crowed storey (exclusive of the first storey) according to the smallest width as followed:

a) For one or two storey buildings: count 0.8m for 100 people

b) For 3 and over storey buildings: count 1m for 100 people

c) For audience halls (theatres, cinemas, circus, meeting halls…): count 0.55m for 100 people.

Note:

- In audience halls of which the types of fire resisting construction are III, IV, V, the total width of doors, flight stairs or accesses on escape routes must be counted 0.8m for 100 people.

7.16 When the doors of rooms open to the common corridor, the calculated width of the escape route is taken as followed:

When opening one side of the corridor: equal to the result of the width of the corridor minuses a half of the door's width.

When opening two sides of the corridor: equal to the result of the corridor's width minuses the door's width.

7.17 The smallest clearance width accepted for escape routes is regulated as followed:

Escape route	Allowed minimum width
Access	1
Corridor	1.4
Door	0.8
Flight stair	1.05

Note:

1) The width of the access to isolating working areas is allowed being reduced to 0.7m. The width of flight stairs in the landing joist to basements, attics and fire escapes for not more than 60 people is allowed being reduced to 0.90m;

2) The width of indoor corridors can be reduced to 1.20m when the length of straight corridors is not longer than 40m.

   In hotels, schools, the width of middle corridors is at least 1.60m

3) The width of stair landing joists shall not be less than the width of flight stairs. The width of landing joists in front of the entrance to crossing gate lifts is not less than 1.60m. The width of stair landing joists in buildings for prophylaxis and treatment, maternity buildings is not smaller than 1.90m.

   It is necessary to have a slot of at least 50mm.

7.18 The clearance height of doors in escape routes is not smaller than 2m. The height of ports and accesses leading to rooms where do not often have people as well as to basements, pedestal floors, and technical floors is allowed being reduced to 1.90m. The height of accesses leading to attics (when not having attics) is allowed being reduced to 1.50m.

7.19 In common corridors, do not allow setting wall cupboards except technical ones and boxes for fire cocks.

Do not allow setting winding stairs, blading stairs, accordion doors, sliding doors, follicle doors, revolving doors above escape routes.

7.20 In stair cabins used for escape, there are no rooms with any functions. No part is set sticking out wall faces at the height of 2.2m from treads and landing joists.

7.21 In buildings of which the types of fire resisting construction are I and II, allow setting opening inside staircases (without cells to make stair cabins) from lobbies to the 2^{nd} storey if the lobbies are isolated from corridors and the next rooms by fire resisting diaphragms with the fire resistance level equal to 45 minutes.

7.22 Opening outside staircases intending to be used as emergency escape routes, must be made of incombustible materials and unchoked rooms through landing joists or balconies at the same height with escape routes. The right staircases have the slope not more than 45^0 and the width not smaller than 0.7m. Doors, gates of this kind cannot have outside locks or pawls.

7.23 Do not allow setting apertures (except door apertures) on inside walls of staircases. In skylight apertures of staircases where glass plates can be set, it must be set opening frames whose squares are not smaller than $1.2m^2$ per storey.

7.24 Doors on escape routes must open direct to the outside of the buildings.

Doors open to balconies, yards, landing joists of outdoor staircases used for escape, doors of rooms where often have not more than 15 people, doors of depots whose squares are not larger than 200 m^2, doors of medical aid stations, W.C can be designed to open to the inside.

7.25 In buildings which have 10 storeys and over, stair cabins must be designed to ensure that smoke cannot aggregate when fire. In the first storey, stair cabins must have direct exits.

7.26 In buildings that have 10 storeys and over, corridors must be partitioned to length that is not longer than 60m by fire resisting cells with the fire resistance level at least 15 minutes. Corridors, antechambers, lobbies must have air ventilation systems and automatic valves to escape in case of fire.

8. Requirements for transportation and fire protection distances

8.1 Requirements for fire protection distances among buildings as well as transportation routes serving fire extinction must be solved associatively with the requirements of the planning areas where the buildings are.

8.2 Fire protection distance among buildings is the clearance distance between outside walls or outside structures of the buildings.

In the case that the building has structures sticking out outer wall face more than 1 m and is made of combustible materials then the fire protection distance is the distance between outer edges of the structures.

8.3 For houses, civil buildings, fire protection distances among buildings are regulated in table 6.

Table 6

Type of fire resisting construction of the 1st buildings	**Distance to the 2nd buildings with type of fire resisting construction, m**			
	I and II	III	IV	V
I and II	6	8	10	10
III	8	8	10	10
IV	10	10	12	15
V	10	10	15	15

Note:

1) Fire resisting distances between spire gables are not regulated if revetments of the highest buildings are fire arresting walls;

2) For two storey buildings, structuring frame types and fitting panels with the type of fire resisting construction V then the distance regulated in the table shall increase by 20%;

3) For mountainous areas, locals that have hot and dry wind (South West wind in constructional subregions IIB in design requirements TCXD 49-72), distances from buildings with any types of fire resisting construction to buildings of IV or V types must increase by 25%.

4) When facing outer walls of 2 buildings without apertures then the fire protection distance regulated in table 6 is allowed reducing 20%.

8.4 Main streets, local streets shall be apart from the wall of houses and public buildings not less than 5m on the side where has accesses to the buildings.

8.5 Distances between local streets passing through or interposing among buildings must ensure not to be more than 180m.

8.6 One lane dead-end roads must not be longer than 150m, at the end of the road, there shall be U-turn spaces with the square of:

- Equilateral triangle shape, sides are not smaller than 7m.

- Square shape, sides are not smaller than 12 x 12m

- Round shape, diameter is not smaller than 10m.

8.7 Local transporting ways passing through buildings, gates or corridors, must ensure:

Clearance width is not smaller than 3.5m

Clearance height is not smaller than 4.25m

8.8 For industrial buildings, fire protection distances between buildings are regulated in table 7

Table 7

Type of fire resisting construction of a buildings	**Distances between buildings, m**		
	Type of fire resisting construction of the next buildings		
	I + II	III	IV + V
1	2	3	4
I + II	Not specified for buildings with production class D or E (for buildings with production class A, B and C)	9	12
III	9	12	15
IV + V	12	15	18

Note:

- For buildings of which the types of fire resisting construction are I and II for production classes A, B, C regulated in table 7, the distance among buildings reduces from 9m to 6m if there is one of following conditions:

  a) Fixed automatic fire alarm systems are set;

  b) When the weight of combustible substances which are often present in the buildings is 10 kg/m^2 floor and under.

8.9 In industrial buildings, transportation roads arrangement to each buildings must coordinate with requirements of technology and roads for outer vehicles.

8.10 Roads for outer fire trucks must ensure:

Along one side of the buildings when the width of the buildings is smaller than 18m;

Along two sides of the buildings when the width of the buildings is equal to or longer than 18m.

8.11 Transportation roads for fire trucks must ensure:

- The width is not smaller than 3.5 m.
- Bracing pavements must guarantee the surface natural drainage.

8.12 Distances from walls to bank-lines of roads for fire trucks operating are not larger than 25m.

Note:

1) Dead-end roads can be set for fire trucks when at the end of the roads there are U-turn spaces as requirements mentioned in clause 8.6;

2) Pipelines to water sources for fighting fire (lakes, ponds, rivers, pools…) must be set. In the place where water is taken, there are U-turn spaces as requirements mentioned in clause 8.6;

8.13 Minimum distances from open air depots where contain combustible materials to buildings are regulated in table 8

Table 8

Depot	Distance from depot to buildings, m		
1	2	3	4
Coal with weight from 1000 tons to under 100.000 tons	6	6	12
Under 1000 tons	Not specified		
Bran peat coal with weight from 1000 tons to under 100.000 tons	25	30	36
Under 1000 tons	18	24	30
Clot peat coal with weight from 1000 tons to under 100.000 tons	18	18	24
Under 1000 tons	12	15	18
Firewood (logs, lumbers) from 1000 m^3 to under 10.000 m^3	15	24	30
Wood chip, sawdust from 1.000 m^3 to 5.000 m^3	13	13	24
Combustible liquids from 1.000 m^3 to under 2000 m^3	30	30	36
From 600 m^3 to under 1.000 m^3	24	24	30
Under 600 m^3	18	18	24
Combustible liquids from 5.000 m^3 to under 10.000 m^3	30	30	36
From 3.000 m^3 to under 5.000 m^3	24	24	30
Under 3.000 m^3	28	28	24
Under 1.000 m^3	12	15	18

Note:

1) Not regulating the distance from buildings to following depots:

- Coal depot under 100 tons;

- Combustible liquid depots, with the capacity under 100 m^3 or depots of coal or bran peat coal, clot peat coal with the capacity under 1.000 tons and the wall on the side of these depots are fire resisting wall;

2) For depots of wood, coal, when laying coal, wood to the height over 2.5m, the minimum distance guided in table 8 for buildings of which the type of fire resisting construction IV and V shall increase to 28%.

3) Distances in table 8 from depots of bran peat coal, clot peat coal, wood, combustible liquids to buildings with production classes A and B as well as public buildings shall increase to 2%;

4) Distances from fuel gas distributing stations to the next buildings, applied in point 6 of the table.

9. Structural solutions, technology and equipment

9.1 Number of storeys with limit length, maximum construction area in accordance with type of fire resisting construction of civil buildings is regulated in table 9.

Table 9

Type of fire resisting construction	Number of storeys	Maximum length of buildings, m		Accepted maximum constructional square, m^2	
		With fire wall	Without fire wall	With fire wall	Without fire wall
I + II	Not specified	Not specified	110	Not specified	2 200
III	1-5	Not specified	90	Not specified	1.800
IV	1	140	70	2.800	1.400
IV	2	100	50	2.000	1.000
V	1	100	50	2.000	1.000
V	2	80	40	1.600	800

Note:

Single residential buildings of which the types of fire resisting construction are I and II whose roofs' fire resisting construction are incombustible, allow not building fire walls.

9.2 Required types of fire resisting construction and the limit number of storeys of kindergartens, nursery schools, maternity houses, schools, shops, meeting halls, culture centers, clubs, cinemas according to the scale of buildings and regulated in table 10.

Table 10

Name and scale of buildings	Type of fire resisting construction of buildings	Limit number of storeys
Kindergartens and nursery schools		
a) Under 50 kids	V-IV	1 storey
b) Over 50 kids	III-II	2 storeys
Hospitals, maternity houses		
a) Under 50 beds	V-IV	1 storey
b) Over 50 beds	III	2 storeys
c) Not depend on number of beds	II	Not specified
Schools		
a) Under 360 seats	V-IV	1 storey
b) From 360 to 720 seats	III	2 storeys
c) Over 720 seats	II	4 storeys
Audience buildings (cinemas, theatres..)		
a) Under 800 seats	III	2 storeys
b) Over 800 seats	II	Not specified
Meeting halls, culture centers		
a) Under 300 seats	V-IV	1 storey
b) From 300 to 800 seats	III	3 storeys
c) Over 800 seats	II	Not specified
Commercial buildings (department stores, food) not depending on scales	V IV III II	1 storey 2 storeys 3 storeys Not specified

9.3 In houses, when arranging public rooms (shops, common rooms, kindergartens, nursery schools), these rooms shall be insulated from dwelling rooms with incombustible walls and floors, with the fire resistance level not less than 45 minutes.

9.4 Accepted maximum number of storeys, required type of fire resisting construction of buildings and accepted maximum area between fire walls in accordance with production classes must follow regulations in table 11.

Table 11

Production class	Accepted maximum number of storeys	Type of fire resisting construction of the building	Maximum square between fire walls		
			One storey buildings	2 storey buildings	Over 2 storey buildings
1. A and B	6	I	Not specified		
2. A and B (in case of not produce chemicals and process oil gases)	6	II			
3. A (produce chemicals and process oil gases)	6	II	Not specified	5 200	3 500
4. B (produce chemicals and process oil gases)	6	II		10 400	7 800
5. C	Not specified	I + II	Not specified		
	3 1 1	III IV V	5 200 2 600 1 200	3 500	2 600
6. D	Not specified	I + II	Not specified		
	3 1 1	III IV V	6 500 3 500 1 500	2 500	3 500
7. E	Not specified	I + II	Not specified		
	3 1 1	III IV V	7 800 3 500 2 600	6 500	3 500
8. F		See clause 2.18			

Note:

1) Production compartments have automatic fire extinguishing equipment (like water screen or flushing types) floor square between fire walls are allowed increasing by 100% compared with standards regulated in table 11;

2) When production rooms or compartments are installed with automatic fire alarm equipment then floor area between fire walls are allowed increasing by 25% compared with standards regulated in table 11;

3) Floor area of the first storey between fire walls of multi-storey buildings, follow standards of one storey buildings when the ceilings of the first storey have fire resistance level equal to 150 minutes;

4) For buildings of which the type of fire resisting construction is II, in which related to wood production and processing, floor areas between fire walls are not regulated for one storey buildings. For two storey buildings, floor areas between two fire walls are 7 800 m^2 maximum; and for over two storey buildings, floor areas between 2 fire walls are 5 200 m^2 maximum.

5) In one floor production buildings of which the types of fire resisting construction are I and II, allow not designing fire walls. This regulation is not applied for buildings of which the type of fire resisting construction is II and chemical is produced, oil gases are processed there, or depots of combustible materials or products; buildings for producing and processing wood.

6) In one storey buildings of which the types of fire resisting construction are II, IV, and V due to technical requirements, it can design fire sections instead of fire walls. At that time, floor areas between 2 fire sections are followed standards as ones between 2 fire walls regulated in table 11.

9.5 In case that there are many production classes set in a same buildings, or a part of the building limited in 2 fire walls, the type of fire resisting construction as well as accepted number of storeys of the building shall be specified according to the production class which is dangerous most in explosives set there.

Note:

- When squares and bulks of rooms whose the highest danger level in fire, explosion is not more than 5% compared with the squares and bulks of the whole buildings or a part of the buildings which is between 2 fire walls, it does not comply with this regulation. In this case, it shall have particular fire resisting methods (locally venting to prevent the possibility of

9.6 Do not allow setting any production classes, or depots for combustible cellular and synthesis materials in basements. In special cases, due to technological lines Allow setting production classes C, D, E in basements and pedestal floors. At that time, it must be comply with the regulations in clause 7.13 of the standards.

9.7 Rooms have the production classes A and B, if technological requirements allow, should be set near exterior walls if the buildings are one storey or on the top storey if the buildings are multi-storeys.

9.8 In rooms, which are of production classes A and B, it must design unfixable elements outdoor. The squares of these unfixable elements are specified through calculation. When calculating data are lack then the squares of the unfixable elements are not smaller than 0.05 m^2 for each cubic meter of rooms,

which are of production class A, and not smaller than 0.03 m^2 for each cubic meter of rooms, which are of production class B.

Note:

1) Free hole glass windows are regarded as unfixable elements when the thicknesses of the glasses are 3,4 and 5 mm and the respective areas are not lower than 0.8, 1 and 1.5 m^2. Reinforcing glass windows are not regarded as unfixable elements.

2) Unfixable elements of the roof must be divided into cells of which the area of each cell is not larger than 180 m^2.

3) Estimated load of unfixable elements is not more than 700 N/m^2.

9.9 Floor parts where machines are set, technological equipment using combustible liquids, toxic substances must contain walls made of incombustible substances or trays. The height of the walls and the areas between walls or the areas of trays shall be indicated in the technological design.

9.10 When setting in a same room with the production classes of different explosive and combustive dangers, it must design solutions for explosion-proof and locally spreading fire (closely covering equipment, locally fire extinguishing, screening equipment…).

When setting production classes A, B, and C in private rooms of the buildings of which the types of fire resisting construction are I and II, these rooms should be isolated from the next ones with fire bulkheads of which the fire resistance level is at least 45 minutes; doors on this fire walls must have the fire resistance level at least 40 minutes.

9.11 When designing ports on fire walls and fire bulkheads, it is possible to install fire ports between rooms which have production classes C, D, and E, these ports shall be designed having antechambers which is not less than 4m, installed automatic fire equipment with the required water flow of 11/s for each m^2 of antechamber's floor. Antechambers' fire bulkheads must have the fire resistance level not less than 45 minutes.

9.12 In one storey buildings of which the type of fire resisting construction is IV, allow setting rooms, which have the production classes A, and B with the general area not more than 300 m^2. In this case, rooms mentioned above shall be insulated with fire bulkheads. Enclosing walls of these rooms must be made of incombustible or uninflammable materials.

9.13 Basements where set rooms having production classes C, D, E, depots for combustible materials and uninflammable materials covered in combustible packs must install automatic fire equipment and be

insulated with fire bulkheads into parts with the squares not larger than 3 000 m^2 each part and the width of each part (including the border) is not longer than 30 m. In these rooms, it is necessary to design windows with the width not less than 0.7 m and the height not less than 1.2 m. The total area of the windows is not smaller than 2% of the floor area. In rooms of which the squares are more than 1 000 m^2, it shall design 2 windows and over. The ceiling of the basement must have the fire resistance level not less than 45 minutes.

Corridors shall be 2 m and over in width, have straight paths to outside or through stair cabins. Cells for dividing the corridors from rooms are fire bulkheads.

9.14 Buildings, opencast equipment of which manufacture processes irradiate gases, dust and smoke in danger of explosion and combustion, as well as depots for oil gases, products of petroleum, depots for combustible materials, depots for toxic substances are not set in front of prevailing wind direction to other buildings.

9.15 Rooms where use or contain gaseous or fluidal substances as well as processes irradiating combustible dust shall not be set under rooms often have 50 people.

9.16 Boilers of which the pressures are higher than 0.7 at or the temperatures of the water are higher than 115^0C shall not be set in residential buildings or public buildings.

Boilers run with gas shall not be set under compartments where often have 50 people.

In cases that the buildings need boilers then they shall be set in dedicated compartments to guarantee requirements for fire protection.

9.17 Combustible gas pipelines are not allowed to be set under buildings.

9.18 In tunnels where few people pass by, allow setting gas pipelines when the pressure is under 6.10^5 N/m^2 (6 kg/cm^2) with other pipelines and communication cables, with the conditions that there are wind ventilating and lighting equipment.

9.19 Do not allow setting combinatively in a same tunnel:

- Gas pipelines with electricity cables and lighting equipment.
- Heat pipes with combustible liquid pipelines and cooling manifolds.
- Fire fighting water conduits and combustible liquid and gas pipelines or electricity cables.

- Combustible liquid pipelines or electricity cables and the network of water supply and drainage.

- Oxygen pipelines and combustible gas pipelines or toxic substance pipelines and electricity cables.

9.20 Do not allow setting gas pipelines, combustible, explosive or polluting substance pipelines on the ground.

9.21 Combustible liquid pipelines, if setting underground, it must guarantee to set them apart from the floor at least 30 cm and divide them into segments not longer than 60 cm, every segments must be insulated from each other with fire berms surrounding the pipelines with incombustible materials.

Note:

- Toxic substance pipelines as well as gas pipelines with the pressure higher than 1 at shall not be set thorough the tunnels for pedestrians.

9.22 Combustible liquid pipelines which are set high must be apart from the walls with apertures at least 3 m and from the walls without apertures at least 0.5 m.

Do not allow setting high in following cases:

a) Combustible liquid, gas pipelines on dry bridges, pylons and piers made of combustible materials or on combustible walls and roofs.

b) Mixed pipelines can cause fire and detonation with combustible gas and liquid pipelines setting on the neighbor corridors.

c) Combustible gas pipelines

- The face sides of the roofs and the walls of buildings where contain dangerous explosive materials.

- Passing through sloping buildings and works without demands of gas supply.

- On the combustible materials depots.

- On electric transmission lines.

9.23 Flyovers, ways for setting technical conduits including combustible liquid pipelines shall be made of incombustible materials.

Note:

1) Do not allow setting in a same flyover or transmission line for the gases and liquids whose mixture can combust, detonate, or make toxication.

2) Flyovers and transmission lines in which set technical conduits for combustible gases, liquids when allowed setting paths serving these conduits in the same flyover or transmission lines.

9.24 Flyovers, allowed transporting, in which setting equipment for transporting incombustible and combustible materials in the form of pieces (coals, peat coals, firewood, chips…) or transmission lines for incombustible liquids as well as conveyor belts or flyovers for walking but not be escape routes can be made of combustible materials.

In the case of flyovers, the conveyor belts are set above the building must be made of incombustible materials.

9.25 Flyovers or conveyor belts, which are made of combustible or incombustible materials, all shall guarantee following conditions:

a) Flyovers or conveyor belts are divided into segments, which are not longer than 100 m; every segment shall be apart from each other with fire spaces, which is at least 5m in length.

b) Flyovers or conveyor belts cross each other, whether in the same or different height the crossing points shall be fire spaces, which are at least 5m in length.

c) Corridors and flyover made of combustible materials must guarantee:

- Apart from buildings of which the type of fire resisting construction is III at least 8m
- Apart from buildings of which the types of fire resisting construction are IV, V at least 1 m.

If corridors, flyovers, which have distances smaller than those in regulations above, must be made of incombustible materials. The distances mentioned above are not applied when corridors, flyovers border with fire walls or closing walls without doors.

9.26 Allow combining flyovers, haulage planes with walkways in following cases:

a) Transported goods must be made of incombustible, inexplosive materials.

b) Transportation facilities must be safe for the pedestrians.

9.27 In rooms where have gas vapour, use or preserve gas; combustible, explosive liquids or dust it is necessary to design air ventilating methods in order to avoid the possibility of combustion, detonation in these rooms. Do not allow setting heat pipes crossing through these rooms. In case of setting heat pipes crossing through, these pipes shall be insulated from surrounding environment with incombustible materials. If in the rooms without dangers in combustion and detonation, the heat conductors shall be insulated with uninflammable materials.

9.28 Gas pipelines, gas containing rooms, air filtration sections and other sections of air ventilating systems, to transmit gas at the temperature higher than 30^0C; to transmit combustible or explosive gases, liquids, and dust as well as combustible scraps (saw dust, chips, wool, cotton…) must be made of incombustible materials.

In rooms with dangers in combustion and detonation, all gas pipelines must be made of incombustible materials.

In other cases, parts of air ventilating system can be made of uninflammable materials.

Note:

1) If in the air ventilating system, there is air whose temperature is under 80^0C then the parts hereinafter can be made of combustible materials:

a) Air filtrating parts, filtrating rooms have cells made of uninflammable materials.

b) In special technical conditions, gas pipes could not be made of incombustible or uninflammable materials or rust (if these pipes do not cross through flat roofs);

2) Between elements which are made of combustible and uninflammable materials and air, gas pipelines which have the temperatures are higher than 80^0C and combustible scrap conduits must be cells made of incombustible and heat-insulating materials.

9.29 Conduits shall be orthotropic and air pipelines to production rooms class A, B, C shall be set for each individual storeys, except multi-storey buildings where have floor holes used for technical purposes.

In the case that main air conduits have fire arresters, allow transmitting air to production rooms class A, B, and C, by orthotropic horizontal pipes.

Individual orthotropic conduits (exhaust pipes and feed pipes) in each storeys, in which production classes D, E, and F are set, can connect to main air conduits, if equipment is made of incombustible materials.

Condensable vapor conduits, conduits of dust and other substances which can make toxic, combustible or explosive mixtures cannot connect to common exhaust equipment due to physico-mechanical or chemical reasons.

9.30 In rooms where do not have sky windows for ventilating wind, if production classes A, B, and C are set, it must design manual on-off or automatic control air exhaust pipes and smoke stacks when fire. The cross sections of these exhaust pipes have the square not smaller than 0.2% of rooms' floor squares (if the rooms do not have attics) and not smaller than 0.15% (if the rooms do have attics).

Exhaust pipes should be allocated regularly and made of incombustible or uninflammable materials; the cross section of each pipe is not larger than 2 m^2.

Note:

1. Rooms with spans less than 30 m and border with outside walls that have apertures do not apply this regulation.

2. Smoke discharge tube is used to replace air exhaust pipes.

9.31 For public buildings, which have five storeys and over, allow setting common air exhaust pipes orthotropically with the condition that orthotropic pipes from each storey through two storeys are installed on the main conduits. Allow setting combinatively one concentrative main conduit connecting to exhaust pipes from four to five storeys.

In cases having separately insulating rooms where contain combustible materials, these rooms must set individual exhaust pipes to conduct smoke to the outside.

9.32 It forbids perforating holes for setting air exhaust pipes on fire walls and floors made of incombustible materials (including other fire isolated parts).

In the case that setting air exhaust pipes through fire arresters is obligated, it shall have flame isolated equipment (and fire isolated equipment…) in air exhaust pipes and these pipes there must be made of incombustible materials.

Note:

- Allow setting vent flues and chimney flues in fire walls of buildings and auxiliary houses when the minimum thicknesses of fire walls (exclusive of pipe cross sections) there are not less than 25 cm, and the thicknesses of sections between vent flues and chimney flues are at least 12 cm.

- The openings for setting water lines in fire arresters must be mortared blindly.

9.33 Allow setting common air exhaust conduits for gases, vapors of liquids and dust, if the chemical mixture of these substances is not combustible, flammable or explosive.

9.34 In rooms where generate combustible, explosive substances to the air, the parts of air ventilating machines and the control equipment of vent flues must be designed not to possibly induce sparks. In the filtration parts of systems for exhausting dust and combustible, explosive substances, it should have automatic, continuous dedust methods and avoid the possibility of spark irradiation.

In production rooms where can detonate, the electric engines of air exhaust systems put in the rooms with air blowers must be antiknock engines.

Note:

1) For production rooms, when the automatic dedusting has economic uselessness, allow periodically dedusting manually if the power of filtrating sections is about 15,000m^3/ hour.

2) If used electric engines are normal then the engines shall be put insulatedly from fan machine rooms.

3) For production classes A, B, and C, insulating enclosures of aeration sections must be made of incombustible materials.

9.35 When designing and executing parts of electricity, water supply, air ventilation, heating, lightning resistance of the building, it must comply with regulations in the relevant governmental standards.

9.36 When designing fire alarm systems for buildings, it must comply with TCVN 5738 – 93 “Fire alarm system, technical requirements” and relevant standards. According to designing requirements and regulations of standards, solutions of automatic fire alarm, semi-automatic alarm or through prevailing communication system shall be chosen.

9.37 Besides water extinguishing systems, in buildings, it must set other specific fire extinguishing facilities, equipment. Locations, quantities, types depend on the regulations in Vietnam Standards 5760 – 93 and the guidelines of fire protection agencies.

9.38 The designing of automatic fire extinguishing systems and other special fire extinguishing systems must be comply with Vietnam Standards 5760 – 93 Fire extinguishing systems, general designing requirements, “installation and using” and relevant standards.

10. Fire extinguishing water supply

10.1 Must design fire extinguishing water supply systems for civil buildings, warehouses, industrial buildings.

- Fire extinguishing water supply systems include fire extinguishing water supply systems inside and outside.

Allow designing individual fire extinguishing water supply systems when the association with domestic or industrial water supply systems has economic uselessness.

10.2 Fire extinguishing water supply pipelines can be high pressure or low pressure pipelines.

In high pressure fire extinguishing water supply pipelines, the required pressure for extinguishing fire is brought about by fix fire extinguishing pumps.

In low pressure fire extinguishing water supply pipelines, the required pressure for extinguishing fire is brought about by portable fire extinguishing pumps or fire extinguishing filling vehicles taking water from fire hydrant risers put outside of the buildings.

10.3 In civil zones, outside fire extinguishing water flows of fire extinguishing water supply systems and the number of fires in the same time are regulated in table 12.

Table 12

Number of the resident in zone (1000 persons)	Number of fires in the same time	Water flows for a fire (liter/second)			
		1 and 2-storey buildings with type of fire resisting construction		Mix buildings, types of storeys not depending on type of fire resisting construction	Buildings with 3 storeys and over not depending on type of fire resisting construction
		I, II, and III	IV and V		
1	2	3	4	5	6

To 5	1	3	4	5	6
To 10	1	5	5	10	10
To 25	2	10	10	15	15
To 50	2	15	20	20	25
To 100	2	20	25	20	25
To 200	3	20		30	40
To 300	3			40	55
To 400	3			50	75
To 500	3			60	80
To 600	3				85
To 700	3				90
To 800	3				95
To 1000	3				100

Note:

1) In building zones consisting of different one, two storey buildings and multi-storey buildings, it shall specify each type of buildings taking account of the number of people there.

The water discharge estimated for the whole buildings is the total water discharge estimated for each type of buildings in those zones.

2) The water discharge and the number of fires in the same time for civil zones, which have more than 1000 people, are specified according to particular demands.

3) The number of fires, in the same time in urban areas or locals shall include the number of fires in industrial buildings, sites, suit for require fire extinguishing water discharge but not under the standards regulated in table 12.

10.4 In industrial zones, the number of fires in the same time are estimated as follows:

a) If the square of the ground is smaller than 150 hectare then count as one fire.

b) If the square of the ground is 150 hectare and over then count as two fires and fire extinguishing water flows are estimated for the two buildings that need fire extinguishing water discharges much.

10.5 In industrial buildings, outside fire extinguishing water flows are taken from fire hydrant risers, estimated for the buildings that need most fire resisting water discharges regulated in table 13.

Table 13

Type of fire resisting construction	Production class	Water flows for a fire (liter/day) with bulks of buildings, 1,000 m^3				
		To 3	From 3 – 5	From 5-20	From 20-50	Over 50
I and II	D, E, F	5	5	10	10	15
I and II	A, B, C	10	10	15	20	30
III	D, E	5	10	15	25	35
IV	C	10	15	20	30	40
IV and V	E, F	10	15	20	30	
IV and V	C	15	20	25		

Note:

- For buildings with fire resistant walls then count for the part of the buildings that requires the largest fire extinguishing water discharge.

10.6 The water discharges used for extinguishing fire outside schools, hospitals, culture houses, administrative agencies, auxiliary houses of industrial buildings are estimated according to the regulations in table 13 and the buildings are supposedly production class C.

10.7 For industrial zones or industrial buildings, in which production classes C, D, E and the squares are not larger than 200000 m^2, the water flows used for extinguishing fires outside the buildings are not more than 20 litres/second and for residential areas which have not more than 8000 people, it is not necessary to design outdoor fire extinguishing water supply line systems but also fire extinguishing

pumps or filling vehicles can be used for taking water from natural water sources such as rivers, lakes, or water basins, artificial basins to extinguish fires with the conditions that:

a) Having enough fire extinguishing water reservoir in seasons as regulations.

b) The water depth is not more than 4 m from the ground to the water surface and the water level is not under 0.5 m.

c) There must have spaces for fire extinguishing pumps or filling vehicles to come to take water.

10.8 Outside fire extinguishing water supply systems must be designed as ring grids. When the outside fire extinguishing water supply pipes are not longer than 200 m, allow designing dead-end pipelines but should prepare to be ring grids. Allow putting dead-end branch pipes to irrigate fire extinguishing water to individual buildings, if the length of these dead-end pipelines is not longer than 200 m but it should have fire extinguishing basins or water reservoirs and prepare to be ring grids.

Note:

1) At the beginning period of setting plumbings, it can set fire extinguishing water dead-end branch pipes but not limit the length if having the agreement of authorized fire protection agencies;

2) In civil zones, if the number of people is not more than 10,000 people then Allow setting dead-end branch pipes;

3) The diameter of the outside fire extinguishing water pipes is at least 100 mm.

10.9 Outdoor fire hydrant risers must be allocated along the traffic ways; the distances between risers are not more than 150m. Outdoor fire hydrant risers must be allocated apart from the way at least 5 m and should be allocated on intersections or crossings. If allocating risers along 2 sides of driveways, it should not allocate them more than 2.5m apart from edges of the roads. The fire extinguishing pipelines shall be divided into parts and estimated so that the number of fire hydrant risers on each part is not more than 5.

Note:

- In industrial buildings, urban areas or civil zones where outside fire extinguishing water flows are not more than 20 litres/second, the distances between two outdoor fire hydrant risers are not longer than 120 m.

10.10 The valves close water from dead-end branch pipes as well as big valves close water from enclosed pipelines must be allocated so that each part of pipelines close at most 5 fire cocks in a same storey.

10.11 Required free pressures in low pressure fire extinguishing water supply pipes from the ground must not be under 10 m of water columns. In high pressure fire extinguishing water supply pipes, the free pressures at nozzle opening of fire cocks set on the farthest place of the highest buildings must guarantee that the water columns are not shorter than 10 m.

10.12 It shall design the indoor fire extinguishing water supply pipes in following cases:

a) In production buildings except the regulations in clause 10.13 of the standards.

b) In family houses which have 3 storeys and over and collective houses, hotels, restaurants which have 5 storeys and over.

c) In administrative agencies which have 6 storeys and over, schools which have 3 storeys and over;

d) In stations, depots, other public buildings, auxiliary houses for industrial buildings when the bulks of the buildings are 5,000 m^3 and over.

e) In theatres, cinemas, meeting halls, clubs which have 300 seats and over.

Note:

1) In buildings if in conditions (b), (c) have different heights, then it shall design fire extinguishing water supply pipes for the parts of the buildings which have the height regulated in this section;

2) In production buildings of which the types of fire resisting construction are I and II, production classes D, E, the fire extinguishing water supply pipe systems should be set only in the parts of the buildings where contain or produce combustible materials.

10.13 Do not design indoor fire extinguishing water supply pipes in following cases:

a) In production buildings where use or maintain substances can combust, detonate, spread fire when contacting with water.

b) In production buildings of which the types of fire resisting construction are I, II and have inside equipment made of incombustible materials;

c) In production buildings classes D, E which have the types of fire resisting construction III, IV, V and the bulks are not larger than 1000 m^3;

d) In public bathrooms and washing houses;

e) In depots made of incombustible materials, containing incombustible goods;

g) In pump stations, filtration stations of dirty water drainage systems;

h) In production buildings and auxiliary houses of industrial buildings, without domestic or industrial water supply pipe systems and the outdoor fire extinguishing water supply taking from rivers, lakes, ponds, or water reservoirs.

10.14 The number of fire cocks for each indoor point and the water discharges of each cock are regulated in the table 14.

Table 14

Type of buildings	Number of fire cocks	Water discharges for each cock (liter/second)
1	2	3
1. Administrative buildings with 6 to 12 storeys, with bulks of up to 25.000 m^3	1	2.5
2. Residential houses with 4 storeys and over, hotels and collective houses, public houses have 5 storeys and over with bulks of up to 25.000 m^3. Sectional residential buildings have up to 16 storeys	1	2.5
3. Hospitals, prophylaxis agencies, kindergartens, nursery schools, shops, stations, auxiliary houses of industrial buildings with bulks of from 5.000 m^3 to 25.000 m^3.	1	2.5
4. Rooms allocated under the stage of stadiums with bulk of from 5.000 m^3 to 25.000 m^3 and gymnastic rooms have bulks of 25.000 m^3 and under	1	2.5
5. Sanatoriums, summer houses, museums, libraries, offices designed to have bulks of from 7.500 m^3 to 25.000 m^3. Galleries have exhibition squares less than 500 m^2.	1	2.5
6. Meeting halls, audience halls equipped with fixed projectors, with the capacity of from 300 to 800 seats.	1	2.5
7. All types of houses with 12 -16 storeys	2	2.5

8. Administrative buildings which have 6-12 storeys with bulks of over 25.000^3	2	2.5
9. Hotels, collective houses, sanatoriums, rest houses, hospitals, , kindergartens, nursery, museums, libraries, all types of exhibitions, restaurants, stations, schools with bulks of over 25.000 m^3	2	2.5
10. Auxiliary houses of industrial buildings with bulks of over 25.000 m^3	2	2.5
11. Rooms allocated under the stage of and gymnastic rooms stadiums with bulk of over 25.000 m^3	2	2.5
12. Theatres, cinemas, clubs, culture centers, circuses, concert halls have over 800 seats, science research institutes	2	2.5
13. Production buildings except the articles regulated in clause 1.6	2	2.5
14. Depots which have bulks of 5.000 m^3 and over containing combustible materials or flameproof materials maintained in combustible packs	2	2.5

10.15 Required pressures of indoor fire cocks must guarantee to have dense water jets with necessary height regulated in table 15.

Table 15

Characters of buildings	Necessary height of dense water column, m
Public buildings, auxiliary houses have the types of fire resisting construction I, II	6
Public buildings, auxiliary houses, and production buildings have the types of fire resisting construction I, and II in production processes use materials which are combustible and easily cause fire	Necessary height at which water can be atomizated to the highest and farthest point of the building but not less than 6 m.

10.16 When in buildings there are more than 12 fire cocks or automatic fire extinguishing systems are installed, the indoor fire extinguishing water supply systems, whether individually or associatively designed, must be designed at least 2 water pipelines into the buildings and they must be connected to ring grids.

10.17 Allocating indoor fire cocks must guarantee that each point of the room to have the amount of fie cocks as the regulations in table 14. In buildings with bulks of from 1000m^3 and under having production class C, class D and E do not depend on bulks in sales rooms or goods depots less than 25000 m^3.

10.18 Indoor fire cocks must be allocated beside gangplanks, on stair cabin landing joists, on lobbies, corridors and locations where are easily seen, used.

10.19 The centers of fire cocks must be set at the height of 1.25 m against the ground.

10.20 Each indoor fire cocks must set closure valves, water spraying nozzle, and flexible bundles that are long enough as estimated.

In each building, the diameters of pipes, the lengths of flexible adjutage bundles, the diameters of nozzle shall use one type.

10.21 Estimate water supply networks shall base on: pressure of necessary water discharges, amount of fires in a same time, time to extinguish a fire.

10.22 In the case that it cannot take water directly from water sources or take directly from urban water supply pipes but not ensure the flow and the pressure then it should have solutions to reserve water for fire extinguishment. The necessary water discharges used for fire extinguishment shall be calculated based on the largest fire extinguishing water discharge in 3 hours.

Calculating necessary water discharges used for fire extinguishment shall at the same time ensure water discharges for manufacture and living but not including water used for watering trees, ways, cleaning the floor, machines. Particularly water used for bathing, washing is counted as 15% of estimated water discharges.

Note:

- In the case that fire extinguishing water supply pipes have low pressure, allow taking a part (not exceeding 50%) of water used for manufacture to extinguish fires if the manufacture would not be restrained.

10.23 Recovery terms of reserve fire extinguishing water are regulated as followed:

1) In civil zones, civil buildings and industrial buildings with production classes A, B, C, are not more than 24 hours.

2) Technological buildings of classes D, E, F, are not more than 36 hours.

Note:

- Industrial buildings, which outdoor fire extinguishing water flows are less than 25 liters/second, allow prolonging water recovery terms;
- For production class C, are 36 hours;
- For production class E, are 48 hours;

10.24 Pumps used for supplying domestic, industrial and fire extinguishing water whether individual or associative, also have preparatory pumps which have powers equivalent to main pumps'.

The amount of preparatory pumps is regulated as followed:

a) When the amount of pumps operating as estimated is from one to three, one preparatory pump is needed;

b) When the amount of pumps operating as estimated is four and over, two preparatory pump are needed. Main fire extinguishing pumps must connect to 2 individual power sources, or preparatory power sources in electric power stations, or preparatory engines in pump houses. Allow using pumps for supplying fire extinguishing water without preparatory pumps and main fire extinguishing pumps, only connecting to one power source when the outside fire extinguishing water discharges are less than 20 liters/second or in enterprises of production classes E, D and the buildings have the types of fire resisting construction I, II or in production buildings, when the outside fire extinguishing water discharges are not more than 20 liters/second.

10.25 Pumps supplying fire extinguishing water can be controlled manually on the spot or automatically remote controlled.

Note:

1. When the outdoor fire extinguishing water flows are 25 liters/second and over, it is essential for fire extinguishing pumps to have remote control devices. In that case, allocate manual control devices at the same time.

2. The control devices of the fire extinguishing pumps must ensure that the pumps run not later than 3 minutes after having fire alarms.

10.26 For buildings where water pressures are usually not enough for supplying water for fire cocks, it shall have pump remote control devices allocated in the fire cocks.

10.27 When fire extinguishing water discharges are 1,000 m^3 and over, they should be divided to 2 basins.

Note:

1. Can design fire extinguishing reserve water together domestic, industrial water but must have solutions to control the use of fire extinguishing reserve water in other purposes.

2. When calculating the volume of fire extinguishing reserve water basins, allow counting water discharges supplemented continuously to the basins, even in 3 hours of the duration when extinguishing fires.

3. In cases that outdoor fire extinguishing water is taken from water reservoirs, or pillar hydrants and in buildings where need domestic and fire extinguishing water supply pipe systems, then the volumes of water reserve basins must guarantee the water discharge used in one hour, for one fire cock and other water demands.

10.28 Pressure tanks and water basins having booster pumps used for fire extinguishment must reserve a water discharge as followed:

a) For industrial buildings, fire extinguishing reserve water discharges are estimated based on water discharges necessary for indoor fire cocks and automatic sprinklers in the first 10 minutes after fire appears.

b) For civil zones, reserve water must guarantee to supply for fire extinguishment for one indoor fire and one outdoor one in 10 minutes with the largest necessary water flow, at the same time endure the largest domestic water volume.

10.29 Elevated water tanks using pressure compressive air, then beside operating compressors, it shall have preparatory compressors.

10.30 Water basins having pressure and elevated water tanks for fire extinguishment, must be installed with water gauges, water alarm devices for pump houses or communicate to water distribution installations.

If the elevated water tanks connect to booster fire extinguishing pumps then control devices are designed to be able to stop automatically water to the elevated tanks when the fire extinguishing pumps operate.

Note:

1) If fire extinguishing pumps automatically pump when the water levels in elevated tanks are lowered, then the reserve water mass in the elevated tanks can be counted as 50% of water discharges regulated in clause 7.28;

2) When having water supply pipe systems for the whole enterprises, factories and worker zones, then the reserve water masses in the elevated tanks for fire extinguishment, are based on the operation of fire cocks in the enterprises, factories but not including worker zones.

10.31 Serving locations and radii of reserve water basins are specified based on fire extinguishing facilities.

a) If using fire extinguishing vehicles then the serving radius is 200 m.

b) If having flexible pumps, depending on the types of pumps then the serving radii are from 100 m to 150 m.

Distances from fire extinguishing water basins to buildings which have the types of fire resisting construction III, IV, V or to open air depots made of combustible materials, at least 20 m, and to buildings which have the types of fire resisting construction I, II, must be at least 10 m.

Annex A

Material groups according to fire levels

1. Materials of incombustible group include natural or artificial inorganic materials, metal, gypsum plates or fibre gypsum when the organic content is up to 8% of its mass, synthetic or natural mineral cotton plates or mineral cotton plates or in the form of bituminous bound with organic content up to 6% of its mass.

2. Materials of uninflammable group include the mixture of incombustible and combustible substances, Example: Asphalt concrete, asbestos cement, gypsum materials and types of concrete with organic content over 8% of mass, mineral cotton in the form of bituminous bound with organic content from 7% to 15% of mass. Types of straw mixed clay materials when its volumetric mass is at least 900 kg/m^3, incombustible-solution dipped felt plate, incombustible-chemicals dipped wood, fiber boards, cement, uninflammable polymers.

3. Combustible materials include organic substances without soaking in anti-combustion matter.

Annex B (normative)

Production groups classified according to production class

Production Class	Production characteristics	Name of production
1	2	3
A	Explosive and combustible danger	Shops used for production and use of sodium and potassium; artificial fibre, rubber producing shops, hydro producing bases; chemical shops of artificial silk factories; petroleum producing workshop; hydrogenation workshop used for distillation and partition of gases, workshops for producing artificial liquid fuels, collecting and distilling organic soluble liquids which have the inflammable temperatures of water vapor equal to or less than 25^{o}C, gas tank depot, petroleum depot, rooms for storing acid and alkali battery of power plants, station for pumping liquid which have the inflammable temperatures of water vapor equal to or less than 28^{o}C.
B	Explosive and combustible danger	Coal dust, saw dust producing and transporting shops, stations for cleaning tanks of oil fuel and other liquids that have the inflammable temperatures of water vapor from 28^{0}C to 61^{0}C. Rooms for crushing and grinding solid matters, artificial rubber processing shops, sugar producing shops, peat crushing equipments, oil fuel storing depot of power plants, station for pumping liquid which have the inflammable temperatures of water vapor from 28^{o}C to 61^{o}C.
C	Combustible danger	Wood cutting shops, wooden art object shops, model making shops, wooden case making shops, knitting and textiles factories. Shops of knit and paper industries with the process of dry manufacture, enterprises where process preliminarily cotton yards, enterprises where process preliminarily yards made of jute and other materials, departments for screening, winnowing in husking mills and grain depots. Enterprises where recycle lubricant oil, enterprises where remelt lubricant and distill asphalt, depots for combustible materials and lubricant oil, open air depots for oil and equipment containing lubricant oil of power plants, equipment which distributes electricity

		having circuit-breakers and electric equipment with the volume of lubricant oil more than 60 kg per equipment unit, chutes and corridors for transporting coals, peat coals, indoor storages containing coals, mix depots, liquid pump houses which have the inflammable temperatures of water vapor higher than 61^0C
D	Not exhibit dangerous properties of manufacture	Casting and metallurgical shops, furnace departments of gas production bases, blacksmiths 'shops, autogenously healing shops, maintenance shops for locomotive depots which run with vapor and explosion engines, shops where metals are hot-rolled, bases where explosion engines are tested, rooms where internal combustion engines, shops where metals are soaked, main buildings of power plants (means buildings consist of boiler houses and turbine houses, etc…), equipment which distribute electricity with the volume of lubricant oil higher than 60kg per equipment unit, high tension power laboratories, boiler plants, etc…
E	Not exhibit dangerous proper-ties of manufacture	Mechanical shops where metals are cold worked, (except the magnesium alloys), yards containing ores, shops where sodas are produced (except furnace departments), aeration bases, compressor bases for air and other incombustible gases, shops where acids are recycled, maintenance shops for electric cars and locomotive electric cars, shops where metals are hollowed and cold atomized, bases where exploit and cold-work minerals, amianthus ores, salts and other incombustible materials, shops of the knitting industry and the paper industry which have wet manufacturing processes, shops process food: fish, meat, and milk, electric control boards, water purifying towers (deposition, filtration, cleaning, etc…), water pump and aspirating houses of power plants, sections containing carbonic acid and chlorine, cooling towers, incombustible liquid pump houses, etc…
F	Explosive danger	…

Note:

- The productions in which fuels used for burning are liquids, gases, and steams or can use round flames are not of the production classes A, B, C.

Annex C

Fire resisting levels and fire group of constructional materials and elements

List of elements	Minimum length or dimension of structural section, m	Fire resistance limit, minute	Fire group
1	2	3	4
1. Wall and partition Walls and partitions made of silicate brick, common brick and hollow clay brick	6.0 11 22	145 150 330	Incombustible
2. Walls made of natural stone, light concrete and glazed terra-cotta block, light-concrete aggregated light block, uninflammable or incombustible insulation materials	33 6 11 22 33	660 30 90 240 420	Incombustible
3. Wall and partition Concrete, reinforced concrete, or rubble concrete as well as panel wall or concrete block and reinforced concrete (See Note 1).	2.5 5 6 11 15 17 22	18 36 45 150 222 270 360	Incombustible
4. Panel wall with solid section made of			Incombustible

List of elements	Minimum length or dimension of structural section, m	Fire resistance limit, minute	Fire group
1	2	3	4
light-weight cellular concrete include: a) Haydite concrete or granulated slag concrete with volumetric mass of 1500 – 1800 kg/m^3 (See Note 1). b) Cellular concrete or light concrete with volumetric mass of 900 – 1200 kg/m^3 (See Note 1). c) As above mentioned concretes with volumetric mass from 700 to 900 kg/m^3 (See Note 1).	 12 20 20	 270 360 360	
5. Block walls having vertical section made from cell concrete having volumetric mass of 900 – 1200 kg/m^3.	30 40	480 660	Incombustible
6. Baked brick panel walls, calcium-silicate brick and clay brick (See notes).	16	222	Incombustible
7. 3-layer panel walls include edged reinforcement concrete sheet and incombustible or uninflammable conditioning layer made of mineral cotton or fibrolite sheet.			
a) For panel wall b) For load-bearing wall	15 + 22 25	Not less than 60 Not less than	Incombustible Incombustible

List of elements	Minimum length or dimension of structural section, m	Fire resistance limit, minute	Fire group
1	2	3	4
When the thickness of inner concrete is 10cm equal to the thickness of concrete Grade 200 and having compressive stress of 25 kg 1/cm^2 or less (See Note 15). c) The same materials mentioned above with the thickness of 14cm equal to the thickness of concrete grade 300 and compressive stress of 100 kg 1/cm^3 or less (See Note 15).	27	150 150	Incombustible
8. Three-layer panel wall, with the frame made of cement and it is clothed two side with asbestos cement is bolted by a steel screw when the conditioning layer made from: a) Uninflammable or incombustible mineral cotton sheet. b) Expanded plastic.	12	45 30	Incombustible Uninflammable
9. Three-layer panel wall, with the wood frame and it is clothed two side with asbestos cement, the inner sheet is bolted by a small screw and the aluminium shaping outer sheet with conditioning layer made from: a) Uninflammable and incombustible		60	Uninflammable

List of elements	Minimum length or dimension of structural section, m	Fire resistance limit, minute	Fire group
1	2	3	4
mineral cotton sheet or glass concrete. b) Expanded plastic.		30	Uninflammable
10. Wall and separating wall made from asbestos cement sheet or steel sheets (plain or corrugated), steel frame.		15	Incombustible
11. Roof shielding wall and brick separating wall made of brick, concrete block or natural stone block with steel frame. a) Without protection coat. b) Put in the most thick wall without protection layer at wall slot or divide the wall from frame choke c) Protection plastering layer having thickness of 2 cm above the steel coating. d) Be hollow brick when the thickness of the hollow are: 6.5 cm 12 cm		15 45 60 150 360	Incombustible Incombustible Incombustible Incombustible
12. The separating wall made of gypsum, gypsum slag, and fibre gypsum when the organic content is 8% of its mass.	5 8 10 11	78 132 162 180	Uninflammable

List of elements	Minimum length or dimension of structural section, m	Fire resistance limit, minute	Fire group
1	2	3	4
13. The separation wall made from hollow glass block masonry	6 10	15 15	Uninflammable
14. The separation wall made from hollow haydite masonry	3.5 4 6.5 8	30 60 90 120	Uninflammable
15. The wall and separation wall by fibrolite or gypsum slag with 2-side plastered wood frame	10 10	45 36	Uninflammable
16. The wall and separation wall plastered 2-side, when the plastering thickness is 2 cm.	15 20 25	45 60 75	Uninflammable
17. The wall and separation wall with wood frame plastered 2 face with dry gypsum mortar or fibrolite cement with aggregate made: a) From combustible substances b) From incombustible substances for column and pillar		 30 45	
18. Bricks, sections (cm)			

List of elements	Minimum length or dimension of structural section, m	Fire resistance limit, minute	Fire group
1	2	3	4
22 x 22		150	
22 x 33		180	
33 x 33		270	Incombustible
33 x 45		315	
45 x 45		390	
19. Concrete and reinforced concrete having hard aggregate with load:			
a) not exceed 75% specified section (cm)			
20 x 20			
20 x 30	25	75	Incombustible
b) not exceed 75% specified section (cm)	-	150	
20 x 20	-	75	Incombustible
20 x 30	-	105	
20 x 40	-	150	
20 x 30 and 20 x 50	-	180	
30 x 50	-	210	
40 x 40	-	210	
20. Steel without protection when the			

List of elements	Minimum length or dimension of structural section, m	Fire resistance limit, minute	Fire group
1	2	3	4
minimum thickness of member is :			
to 12 (mm)	-	15	Incombustible
from 13 to 20 (mm)	-	18	
from 21 to 30 (mm)	-	20	
from 31 to 50 (mm)	-	24	
21. Steel with protection:	2.5	45	Incombustible
a) Plastering on the net surface or thick concrete sheets.	5	120	
	6	150	
	7	180	
b) Normal brick or thick calcium-silicate brick	6	120	Incombustible
	11	315	
c) Thick multi-hole brick	3	60	Incombustible
	6	24	Incombustible
	8	228	
d) Thick gypsum	4	66	
	5	90	
	7	120	

List of elements	Minimum length or dimension of structural section, m	Fire resistance limit, minute	Fire group
1	2	3	4
	8	150	
22. Solid timber pillar having section of not less than 20 x 20 cm, protected by a plastering layer of 2 cm	10 -	192 60	Uninflammable
Floor and roof 23. Floor and roof made from solid section assembly reinforced concrete when concrete layer's thickness calculated from the lowest side to stretch bearing concrete (See note 9) is: 20mm 30mm 40mm 50mm	 10 - - -	 64-78 78-114 108-174 114-222	 Incombustible
24. Floor and roof made from assembled reinforcement concrete (panel plate) with vertical load bearing wood "below" as well as horizontal beam, vertical girder when the concrete layer's thickness calculated from the lowest side or edge to vertical-stretch bearing reinforcement plate (See note 10) is: 20 mm	 6.5	 30	 Incombustible

List of elements	Minimum length or dimension of structural section, m	Fire resistance limit, minute	Fire group
1	2	3	4
35 mm	6.5	36-42	
20 mm	10	36-42	
35 mm	10	42-48	
50 mm and over	10	48-54	
20 mm	16	42-54	
30mm	16	48-72	
50mm	16	66-84	
20 mm	20 and greater	48-60	
30mm	20	66-78	
40mm	20	84-108	
50mm	20	102-108	
60mm	20	132-144	
25. Floor and roof on horizontal steel girder (vertical girder) when the plates are incombustible. a) When horizontal beam, vertical girder are not protected. b) When horizontal beam of the floor above the net (frame-work) is protected with a thick layer of concrete or plastering:		15	

List of elements	Minimum length or dimension of structural section, m	Fire resistance limit, minute	Fire group
1	2	3	4
35 mm 10 mm 20 mm 30 mm	65 - - -	36 45 90 150	Incombustible
26. Timber floor with floor lining board or lining plate are plastered with the plastering thickness of 20 mm.		45	Incombustible
27. Floor on timber beam with gypsum floor boards when it is protected under the beam with a layer of gypsum or plastering of: 20 mm 30 mm		 60 90	Incombustible
28. Roof made from asbestos cement or non-protected corrugated iron sheets placed on horizontal steel beam (vertical girder).		15	
29. Roof made form 3-layer panel with asbestos cement frame of 10 cm, fixed steel screw with conditioning layer made from expanded plastic.	14	30	Uninflammable
30. Steel net cement roof with lower side is not protected.	2	36	Incombustible

List of elements	Minimum length or dimension of structural section, m	Fire resistance limit, minute	Fire group
1	2	3	4
31. Steel stairs structures: stair beam, horizontal beam protected by a plastering of 1 cm. Fit apertures of door, windows, dormer windows, cellar doors.		90	Incombustible
32. Fit aperture of door with large glass blocks when build with cement mortar and put the horizontal reinforcement on the thickness of the block.	6 10	90 120	Incombustible
33. Fit aperture of door with one-layer steel wing or reinforced concrete with the glass having clapping column made of reinforcement, rivet or clamp.	10	45	Incombustible
34. The same as 33 with the 2-layer wing.	-	72	Incombustible
35. Fit aperture of door with one-layer steel wing or reinforced concrete with the glass clamping pin made of steel nails.			
36. Fit aperture of door with one-layer steel wing or reinforced concrete wing having glass fixed pin, glass clamp made of cleaving reinforcement or steel rivet.	-	15	
Door, hatch, gate 37. With hollow steel sheets (having thin air	-	30	Incombustible

List of elements	Minimum length or dimension of structural section, m	Fire resistance limit, minute	Fire group
1	2	3	4
layer).			
38. The same as 37 when the thin layer made of mineral fiber or mineral cotton.	8	78	Incombustible
39. With timber plate coated by asbestos millboard of at least 5 mm thick, with sheet iron put overlap.	3 4 5	72 78 90	Uninflammable
40. Doors with timber wing with 2 faces made of plywood soaked for fire protection.	4 6	36 60	Uninflammable

Note:

1. The fire resisting levels of load-bearing wall and bearing wall, having panel put on the bedding mortar are specified according to numeric values in Item 3, 4, 6 with calculation coefficient taken according to average stress in vertical standard load.

a) The wall according to Item 3 with thickness greater than 10cm when the stress is:

Equal to or less than 50 kg/1 cm^3 - coefficient 1

70 kg/1 cm^3 - coefficient 0.7

Greater than 70 kg/1cm^3 as experimental result.

When determining fire resisting levels of monolithic reinforced concrete wall having thickness greater than 10 cm, the higher indication coefficient shall increase by 20%. When fire resisting limits shall be taken not greater than those shown in Item 3.

b) The wall according to Item 4a, when the stress is:

10 kg/1 cm^3 or less - coefficient = 1

20 kg/1 cm^3 or less - coefficient = 0.6

Greater than 20 kg/1cm^3 as experimental result

c) The wall according to Item 4b, when the stress is:

10 kg/1 cm^3 or less - coefficient = 0.5

Greater than 20 kg/1 cm^3 as experimental result

d) The wall according to Item 6, when the stress is:

30 kg/1 cm^3 or less - coefficient = 1

40 kg/1 cm^3 or less - coefficient = 0.7

Greater than 40 kg/1 cm^3 as experimental result

2) Protecting consolidation ends of the structure must ensure their strength all time by ensuring required fire resisting levels of the structure; the fire resistance of un-protected steel specified according to structure forecast shall be 30 minutes.

3) The slit seals at adjacent positions of anchor wall and self-supporting wall with building parts shall have fire resistance equal to fire resistance of the wall.

4) When the separation wall made from hollow gypsum masonry, the fire resistance instructed in Item 12 shall be reduced to 30%.

5) The thickness of separation wall made from hollow all haydite masonry, instructed in Item 14, is specified as total thickness of wall masonry.

6) The fire resisting level of light concrete having volumetric mass of 1200 kg/m^3 and greater, as well as the structure of bending opening made of silicate concrete, shall be taken as for reinforced concrete structure;

7) The fire resisting level of light concrete having volumetric mass of less than 1200 kg/m^3, and cellular concrete, shall be taken as for reinforced concrete with coefficient of 1.3;

8) The fire resisting level of panel plate and multi-hole concrete with upside edge, shall be taken as Items 2, 3 with coefficient of 0.9;

9) The fire resisting level of panel plate in accordance with Item 2, 3 depends on design scheme of points of support should take:

a) When supporting freely at 2 opposite directions – with the coefficient of 1.

b) When look up the border – in all directions

1:1 with the coefficient of 2.5

1:1.5 with the coefficient of 1.3

1:1.5 with the coefficient of 0.3

c) When overlap in two opposite direction as well as passion, when the thickness of the plate are:

8 cm and less - with the coefficient of 1.6

9 cm and less - with the coefficient of 1.8

10 cm and less - with the coefficient of 2

11 cm and less - with the coefficient of 2.8

8 cm and less - with the coefficient of 4

10) The fire resisting level of mechanical erection concrete at lower side as well as transfer beam, cross scale and vertical girder shall be taken as Item 2.4, depends on design scheme of points of support:

d) When supporting freely – with the coefficient of 1.

e) When overlapping and relate it to the section area of reinforcement at bearing support sidelook and openings of:

0.25 :1 with the coefficient of 1.22

0.50:1 with the coefficient of 1.25

1:1 with the coefficient of 1.5

1:1 with the coefficient of 2.5

11) The thickness of wooden part of panel doors and gates in accordance with Item 3.9

Asbestos millboards are used for coating panel wing, door, cover door and gates, allow to replace with fire wood soaked into 15 mm thick clay grout, when the fire resisting levels as those given in Table 38 in reduced to 15%.

12) The thicknesses of coat of incombustible plaster, and alternation coat on the floor as well as the thickness of the structure.

13) The fire resisting limits of separation walls do not depend on their apertures.

14) The fire resisting limits in Item 9a for walls whose wooden panel frame adjacent to their incombustible parts are protected from direct effect of fire.

15) Fire resisting limits and fire groups shown in item 7 a, b, c are according to the wall with or without apertures of door that is considered as window and door in the condition that conditioning coat is combustible, protected with two sides of the door aperture near them which is wood box with the thickness of not less than 40 mm.

Fire resistance limit shown in item 7b and c, when put up the sheets of floor and panel section higher than enceinte wall on fire resistance concrete inside panel, which is shorter than the enceinte wall.

Annex D

Construction features of buildings structure components are classified according to fire resistant level

Buildings structure components	Fire resistant level of the buildings				
	I	II	III	IV	V
1	2	3	4	5	6
Load bearing walls and staircase walls	Natural or artificial stones, concrete, reinforced concrete with fire resisting levels of at least 150 minutes	Natural or artificial stones, concrete or reinforced concrete with fire resisting levels of at least 120 minutes	Natural or artificial stones or rubble concrete or reinforced concrete with fire resisting levels of at least 120 minutes	Log walls, frame or sheet with two 2-face protection coats made of asbestos cement with fire resisting levels of at least 30 minutes	Log walls, frame or sheet without protection coat made of incombustible substances
Walls assembled to building frame and non-bearing walls	Bricks, slag, coal concrete glazed terra-cotta, reinforced concrete and foam concrete with steel net aggregate or reinforced foam concrete with fire	Bricks, slag, coal concrete glazed terra-cotta, foam reinforcement concrete silicate block or steel-net aggregated silicate block. For one-storey	Bricks, slag, coal concrete glazed terra-cotta, foam reinforcement concrete silicate block, steel-net reinforcement concrete or foam silicate with	Wooden structures coated with mortar or asbestos cement with fire resisting levels of at least 15 minutes.	Wall is made of wood or put among columns unprotected with incombustible materials.

Buildings structure components	Fire resistant level of the buildings				
	I	II	III	IV	V
1	2	3	4	5	6
	resisting levels of at least 30 minutes	buildings it is permitted to use asbestos cement and corrugated sheet iron with fire resisting levels of at least 15 minutes	corrugated fibro-cement fabric reinforcement with fire resisting levels of at least 15 minutes		
Post	Brick, concrete, reinforced concrete as well as the steel having fire protective coat with fire resisting levels of at least 150 minutes	Brick, concrete, reinforced concrete having fire protective coat with fire resisting levels of at least 120 minutes. For one-storey and multi-storey buildings Class D and E not store combustible	Brick, concrete, reinforced concrete as well as the steel having fire protective coat with fire resisting levels of at least 120 minutes	Wood coated with protection mortar with fire resisting levels of at least 30 minutes	Wood is not protected with incombustible materials.

Buildings structure components	Fire resistant level of the buildings				
	I	II	III	IV	V
1	2	3	4	5	6
		liquids, the use of steel without protective coat and having fire resisting levels of at least 2 hours is acceptable.			
Floors and attic floor	Brick arch. Reinforced concrete structure for precast floors and pour in situ structure for steel truss or reinforced concrete truss having fire protection coat fire resisting levels of at least 90 minutes	Brick arch. Reinforced concrete structure for precast floors or pour in-situ structure with steel beam or reinforced concrete beam having fire protection coat fire resisting levels of at least 45 minutes. For one storey as well as multi-	Mortar timber floor with fire resisting levels of at least 45 minutes as well as timber floor put onto steel beam with fire resisting levels of at least 45 minutes.	Timber floor coated by mortar or asbestos cement with fire resisting levels of at least 15 minutes.	Timber floor without protection coat made of incombustible materials.

Buildings structure components	Fire resistant level of the buildings				
	I	II	III	IV	V
1	2	3	4	5	6
		store buildings classes D and E in case of not store combustible liquid, The use of steel structure without protection coat with fire resisting levels of at least 15 minutes is acceptable.			
Roof without attic floor	Reinforced concrete structure with fire resistance limit of at least 90 minutes	Steel structure without protection coat as well as prestress concrete beam with fire resistance limit of at least 15	Wooden structure without any protection coat.	Wooden structure without any protection coat.	Wooden structure without any protection coat.

Buildings structure components	Fire resistant level of the buildings				
	I	II	III	IV	V
1	2	3	4	5	6
		minutes			
Separation walls	Incombustible materials with fire resisting levels of at least 30 minutes.	Incombustible materials with fire resisting levels of at least 15 minutes.	Wooden separation walls with fire resisting levels of at least 15 minutes.	Wooden separation walls with fire resisting levels of at least 15 minutes.	Wooden separation walls without protection layer made of incombustible materials.
Ceiling	Incombustible materials with fire resisting levels of at least 45 minutes.	Incombustible materials with fire resisting levels of at least 15 minutes.	Uninflammable materials with fire resisting levels of at least 15 minutes.	Combustible materials.	Combustible materials.
Fire retaining wall	Natural or artificial materials, concrete, reinforced concrete with minimum fire resistance limit.				