THE SOCIALIST REPUBLIC OF VIETNAM

QCVN 08: 2009/BXD

Vietnam Building Code for Urban underground Structures

Part 2: The Parkings

(This translation is for reference only)

HANOI – 2009

Foreword

QCVN 08: 2009/BXD was prepared by Vietnam Institute for Buildings Science and Technology, submitted by the Institute for Environmental Science and Technology and published by the Ministry of Construction under the Decree No. …/2009/TT-BXD dated …..2009.

QCVN 08:2009/BXD includes the parts:

Part 1: The underground

Part 2: The Parkings

1. **Scope**

This regulation includes mandatory provisions in the formulation, appraisal and approval of investment projects in house, construction and car storage room (referred to as garages) which does not depend on the form of ownership.

This regulation specifies the contents and the key requirements on the solution of space planning, structure, technical equipment of the garage and their arrangement in residential areas.

This regulation does not apply to houses, buildings and garages used to transport explosives, poisons, infectious substances and radioactive materials.

2. Interpretation

The terms used in this regulation shall be construed as follows:

2.1 Garage - Houses, constructions (or parts of buildings and constructions) or open dumps used exclusively to store cars

2.2 Closed garage on ground – garage with covering wall outside

2.3 Open garage - Garage hasn't covering wall outside wall. Garages are also considered open if the buildings have two longest opposite sides to open. Side to be considered is open if the area total of openings along the edges to account no less than 50% of its surface area on each floor.

2.4 Garage with ramp - Garage uses the range of steadily elevated platforms (or steadily lowered) or the range of ramps between the floors to allow cars up and down the ground.

2.5 Mechanical Garage - Garages where the cars shipped to the storage location are done by specialized mechanical devices (without the participation of the driver).

3. Arranging the garage

3.1 The layout of the garages in the urban population, land size for them and distances from them to the houses and the other buildings are specified in Annex A.

3.2 Garages in accordance with the requirements of this regulation are permitted building on the ground or underground, partly underground, partly on the ground; adjacent to or inside the houses with other functions, in which the garage can be located under the house in the ground floor, basement, half basement, or the downstairs of the floors above the ground, as well as on the open areas with specialized equipment.

Floor is considered as the underground if rooms of this floor have floor elevations lower than the ground elevation (as planned) more than a half the height of the room.

The underground garages are permitted building including under walkways, streets, squares, gardens, lawns, etc. ...

3.3 Allow to arrange the garages adjacent to the houses with other function, except for the houses in group of fire hazard as follows: F1.1, F 4.1 and the manufacturers of group F5 Grade A and B are specified in Annex B.

3.4 Garages are arranged in the houses with other function of refractory grade I and II, components are made from anti-fire materials and refractory except the houses in group F 1.1, F 4.1 and the manufacturers of group F5 Grade A and B (Appendix B). In the F 1.4 group is permitted to arrange the garages not independent on their fire resistance level. In the F 1.3 group only allowed to arrange the garages for the car with the fixed seat (no separate partition) to the vehicle owner.

Under the houses in group F 1.1, F 4.1 aren't allow to arrange the garages.

3.5 Not allowed to arrange the enclosed garages for cars with engines powered by compressed natural gas and liquefied petroleum gas in buildings with other functions or adjacent to them, or underground.

3.6 Distance of fire protection from the open area (even if covered) to keep the car to the houses and the works of the enterprise (car maintenance service , industrial, agricultural, etc ...) are taken as follows:

a) To the houses and the factory:

- There are the fire resistance levels I, II, and III of the group S0:

+ From the wall without openings - not specified;

+ From the wall with openings - no less than 9 m.

- There is the fire resistance level IV of the group S0 and S1

+ From the wall without openings - no less than 6m;

+ From the wall with openings - no less than 12m.

- There are the fire resistance levels and other fire hazard groups (Appendix B) - no less than 15 m.

b) Go to the administration and services of the enterprise:

- There are the fire resistance levels I, II and III of the group S0 - no less than 9 m;

- There are the fire resistance levels and other fire hazard groups - no less than 15 m;

- Distance from the parkings to works with fire resistance levels I, II of the group S0 in the area of technical service station for cars under 15 seats from the wall without openings - not specified.

3.7 Cars which transport fuels and lubricants are only stored in the open parkings or in houses with a separate floor with the fire resistance level no less than grade II of the group S0. Allow above garages

are located adjacent to the solid firewall of type 1 or 2 of manufacturers with fire resistance levels I, II of the group S0 (except the houses with grade A and B) when keeping the cars with a capacity total of fuel and lubricants of not less than 30 m^3.

On the open parkings, keeping trucks which transport fuel and lubricant must be divided by group with the quantity not more than 50 vehicles and a capacity total of above contain not more than 600 m^3. The distance between the vehicle groups, as well as the distance to the other parkings shall not be less than 12 m.

Distance from the areas where store the cars transport fuel and lubricants to the house, works, factories are taken according to Table 1, and the distance to the administration and services of these factories – no less than 50 m.

Table 1

Storage of flammable liquids, m^3	**Distance from the garage to the houses and works and the distance between the garages , m**		
	House and fire resistance level		
	I,II	III	IV,V
1	2	3	4
Over 1000 to 2000	30	30	36
From 600 to 1000	24	24	30
Less than 600	18	18	24
By 300	18	18	24
Less than 300	12	12	18

4. The solution for space planning and structural

General requirements

4.1 The garages on the ground permitted building with height not more than 9 floors, and underground garages - not more than 5 floors.

4.2 The layout of cars are implemented:

- When having participation of driver- by the ramps or use of load lifts;

- When haven't participation of the driver - with mechanical devices.

4.3 In the garages are allowed to arrange: the office for service personnel and duty (check station and ticket sales, guard), the technical function rooms (for layout of technical equipment), the toilets, the guest's baggage storage, rooms for the disabled, as well as public telephone stations and passenger elevators. The necessary, components and their area are designed depending on the size and characteristics of the garage operators.

The size of the cabin of a passenger elevator should be ensured to move the disabled with wheelchair.

4.4 Explosion hazard level and fire of the rooms and the garages are defined in Appendix B.

The rooms to store the cars are allowed to take the equivalent of grade C1÷C4, the car garage - equivalent to Grade C (except the cars powered by compressed or liquefied petroleum gas).

4.5 The garages adjacent to the other function houses should be isolated from the houses by the bulkhead of type 1.

The garages are built in the other function houses must have the fire resistance level no less than the fire resistance level of the house and should be isolated from the rooms (floor) of the house by the firewalls and fire resistive floorings of type 1.

The garages that build in the houses with group F1.3 are isolated by the fire bulkhead with type 2. Then, the floor must be isolated with the garage by an uninhabited floor (eg, technical infrastructure).

No regulations to divide the garage with a car of home owner in the houses of group1a with the fire bulkhead.

The doorways above of the garages are built inside or adjacent to the other functions houses (except the F 1.4 group) must be arranged with the eaves made of anti-fire material. The width of the eave is not less than 1m and the distance from the eave edge to the bottom edge of the window opening of the houses no less than 4m or the door should be made by anti-fire material.

4.6 If the garages (by design tasks) should have the service room (car service stations, vehicle examination, car washing, etc ...), they must be arranged into a private house, a room or group of rooms for this purpose. The room can be arranged in the garage (expect the open garage and put in the house) but must be separated with the garage by the fire bulkheads with type 2 and the fire resistive flooring with type 3. The entrance and exit of this room must be separated from the entrance and exit of the garage.

The composition and size of the rooms to make one or engineering services for car regularly determined in accordance with the requirements of technology.

4.7 The noise level in the room of the houses with garage must be in accordance with current regulations on sanitation

4.8 For the garages are built in other function houses, not allowed to arrange inside the common staircases and common elevator pits. To ensure the functional relationship of the garage and the other function houses, the exit from the staircases and elevator pits of the garage must be arranged into the hall with the main exit of the house, simultaneously on the floor of the garage, it is necessary to install the tambour with type 1 (Appendix B) which blown when burning. When needed link between the garage with all floors of the other function houses, it is necessary to protect against smoke for the elevator pits and staircases in accordance with 5.15.

The contact of car storage rooms on the floor with the other functions room (except the rooms referred to in 4.3) or adjacent combustion chamber allowed to pass the tambour which blown the air when burning or water screen above the openings from the garage.

4.9 Do not allow to arrange the commercial room, stalls, kiosks,... even in the car storage room.

4.10 To move the car in the multi storey garages should have the ramps, sloping floor between the floors or dedicated elevators (mechanical devices).

When using a structure with continuous spiral floor, each complete spiral is seen as a story.

For multi storey garage with mezzanine floors, the total of stories is determined by a half of mezzanine floor, a floor area is determined by the total of two adjacent mezzanine floors.

4.11 The number of ramps and necessary entrances for each garage is determined depending on the number of cars that arrange on all floors, except the floor one (for underground garages - on all floor), including operating condition of the garage, calculated discharge and solutions for ground organization.

Typically, the type and amount of ramps is taken as the number of cars as follows:

- Up to 100 vehicles: a single ramp with using the corresponding signal.
- By 1000 vehicles: a double ramp or two single ramps;
- Over 1000 vehicles: two double ramps. Do not allow to arrange the entrance (exit) from the ground floor and on the ground by parking area on the floor one or half basement floor.

4.12 In the closed garages, the common ramps for all floors must be separated (isolated) on each floor with car storage room with walls, doors and the tambour which blown the air when firing in Table 2.

Table 2

The type of garage	Fire resistance rating of covering structure (fire bulkhead), minute, no less than		Arrangement requirements of tambour
	Wall	Gate	
Underground	EI 90	EI 60	The tambour with reliable depth to open gate
On the ground	EI 45	EI 30	Not necessary

The doors and gates in the fire bulkheads and the tambours must be equipped automatic closing devices if burning.

In the garages with a floor under the ground, a front of the ramps not used as the escape, no layout of the tambour

4.13 In the garages on the ground, the naked ramps permit the layouts:

In the houses with height not more than 3 floors with the fire resistance level I and II in the group S0 and S1 and the total area of the floors (the mezzanines), are connected by naked ramps, not exceeding 10400 m^2;

4.14 From each floor of a combustion chamber of the garage (expect mechanic garages) must be not less than two dispersal exits go directly to the outside or into the staircase.

Allow one of the exits to be arranged on dividing slopes. Aisle on veranda floor of the ramp on the mezzanine floor into staircases are seen as the exits.

The exits from the rooms mentioned in section 4.3, allow going through the parking rooms. The luggage storages of guest are arranged on the floor one (entrance stage) of the garage.

The allowable distance from the farthest parking position to the nearest exit is taken in Table 3.

The ramps in the garages, and used as the exits, sidewalks must be wide and not less than 0.8 m at one side of the ramp.

The width of the stairs used as the exits shall be not less than 1 m

Table 3

The type of garages	Distance to the nearest exit, when arranging the garage	
	Between the exits	**At the truncation of room**
Underground	40	20
On the ground	60	25
Note: The length of the exit is measured from axis of the walkway and driveway with car distribution		

4.15 To go the ramps or into adjacent combustion chamber, it is necessary to arrange the fire door near the gates or in the gates with threshold height is not less than 15 cm.

To be able to put to fire rod, the lower part of the gates must have a manhole with the self – closing wing with size 20 x 20 cm.

4.16 When using roof floor as the park, then the requirements of the roof floor are taken as normal floor of garages. The top layer of the roof floor must be made of material without fire spread is not less than RP1 (Appendix B).

4.17 In car storage room at the exit (entrance) of the ramps or adjacent combustion chambers, including the roof floor (when arranging the garage in roof) must have the solutions to prevent fuel burning ability when burning

4.18 The multi storey garages must have the exits of the roof in accordance with the fire safety regulations.

4.19 The covering structures of the elevator pits must be in accordance with the fire safety regulations.

4.20 In the underground garages with two basements or more, in each combustion chamber must be arranged at least one elevator working in "fire-fighting force transporting" in accordance with the requirements of fire safety regulations.

4.21 Garage floor's covering must be durable under the impact of oil products and dry cleaning (including mechanical cleaning) of the room.

Covering of the ramps and the walkways on them must be not slip.

Floor covering must be made from materials with the fire spread is not less than RP1 group (Appendix B).

4.22 At the aisle positions and the parkings, the height of the room and the gate from the floor to the bottom edge of the protruding structure and suspension equipment must exceed at least 0.2 meters versus the height of the largest car and no less than 2 m.

4.23 The path of the car in the garage should be had direction lighting instructions for driver.

4.24 The parameters of the parkings, the ramps, paths in the garage, the distance between the cars at the parking, including the distance between the cars and the house with design structural depends on type of car, storage methods, vehicle size, and the ability to manage the distribution of the vehicle according to the requirements of applying selection standard.

4.25 The minimum size of the parking is taken as follows:

- Length of a parking: 5 m;

- Width: 2.3 m (for the disabled using wheelchairs: 3.5 m).

4.26 The car storage rooms allowed to use the natural lighting or not using the natural lighting.

4.27 In the multi-storey garages, the ramp of the floors of each stage, as well as the tracks, troughs make sure not to the liquid flowing down the ramps and the lower floor.

4.28 The ramps of garages shall meet the following requirements:

a. The slope of the straight ramp with the fence roof along the axis of the driving range is not greater than 18%, the vertical slope of the curved ramps - not more than 13%, the vertical slope of the open ramps (not covered) - not more than 10%.

b. The horizontal slope of the ramps shall not exceed 6%;

c. In the ramps with the walker should have wide sidewalks no less than 0.8 m

4.29 The tilt floor between floors should have the slope not greater than 6%.

4.30 The garages for storage of cars which powered by liquefied petroleum gas or compressed natural gas must be supplemented the requirements for the rooms, houses and buildings under partial regulations.

4.31 The garages for storage of cars which powered by liquefied petroleum gas or compressed natural gas must be arranged in the houses, separate works with fire strength of grade I, II, III, IV of group S0.

The rooms for storage of cars which powered by liquefied petroleum gas or compressed natural gas are allowed to place on the top floor of the separate garages contain cars powered gasoline or diesel.

Not regulated the arrangement of the room for storage of cars which powered liquefied petroleum gas or compressed natural gas on the floors of the garage as well as the mechanical garages (ventilation must ensure for the parking floors).

4.32 The rooms for storage of cars powered by liquefied petroleum gas or compressed natural gas don’t permit the layouts:

a) In the basement and a half basement of the garage;

b) In the form of closed garages on the ground located in the other functions houses;

c) In the closed garages on the ground with naked ramps

d) When the cars are stored in the compartments without direct access from each compartment to outside

Underground garage containing the car

4.33 Required fire resistance level, the number of floors and allowable area of one floor in a range of combustion chamber is taken according to Table 4.

Table 4

Fire resistance level of house (work)	Fire hazard group of house structure (work)	The number of floors of a combustion chamber	Allowable area of one floor in the range of a combustion chamber, m^2
I	S0	5	3000
II	S0	3	3000

4.34 The offices of duty staff and service personnel, water supply and firefighting by pump, the transformer station (only with dry transformers), luggage compartment's guest, room for people with disabilities is allowed arrangement under the first floor (top floor) of the building basement. Not regulated the layout of the other technical rooms on the floors.

The above room must be separated from the car storage room by the fire bulkhead of type 1.

4.35 In the underground garages do not allow to divide the parkings into separate chamber by the fire bulkheads.

4.36 In the underground garage with two basements or more, the exit from the basement into the stair chambers and the exit from the elevator cage must be arranged through the tambours which are blown the air when burning at each floor.

4.37 The gangplank of the underground garages must be located far the houses as follows, m:

- Go to the entrance of the house: 100

- Go to the passenger rooms of the bus station, the entrances of commercial organizations and public food: 150

- Go to the agencies and enterprises of human welfare and the administration: 250

- Go to the park entrance, stadium and exhibition: 400

4.38 On the floors of the underground garages must have equipment for drainage and firefighting. The above drainage pipes must be separately for each basement. Drainage water is allowed into the rainwater drainage network or reservoir without local cleaning.

Enclosed garage on the ground containing the car

4.39 Required fire resistance level, the number of floors and allowable area of one floor in the range of the combustion chamber is taken from Table 5

Table 5

Fire resistance level of house	Fire hazard group of house structure (work)	The number of floors of a combustion chamber	Allowable area of one floor in the range of a combustion chamber, m^2	
			One storey house	Multi – storey building
I,II	S0	9	10400	5200
	S1	2	5200	2000
III	S0	5	7800	3600
	S1	2	3600	1200
IV	S0	1	5200	-
	S1	1	3600	-
	S2	1	1200	-
V	Not regulated	1	1200	-

4.40 In the garages with the fire resistance levels of I and II, the parkings are permitted to divide into the separate compartments. The walls between compartments with fire resistance rating of R45 of group K0; the entrance gate of each compartment shall have grid shape or mesh size not smaller than 300 x 300 mm at a height of 1.4 m to 1.6 to insert the fire fighting equipments and check firefighting status of the compartment.

If each compartment have direct exit, allowed to arrange the fire bulkheads made of anti-fire materials are not regulated the fire resistance rating in the 2-storeys house with the fire resistance levels of I, II and III and in the one storey house of the group S0. For the two-storeys house, the floors must be fire-proof

floor of type 3. The entrance of the compartments must have holes with size of not smaller than 300 x 300 mm to insert the fire fighting equipment and check the firefighting status of the compartment.

Open Garages on the ground containing the cars

4.41 Required fire resistance level, the number of floors and allowable area of one floor in the range of a combustion chamber is taken according to table 6

Table 6

Fire resistance level of house	Fire hazard group of house structure (work)	The number of floors of a combustion chamber	Allowable area of one floor in the range of a combustion chamber, m^2	
			One storey house	Multi – storey building
I,II	S0	9	10400	5200
	S1	2	3500	2000
III	S0	6	7800	3600
	S1	2	2000	1200
IV	S0	6	7300	2000
	S1	2	2600	800

4.42 The width of a building frame in the garage may not exceed 36 m.

4.43 Not allow to insert the fire bulkhead, build the walls (except the wall of the staircases) and the fire bulkheads which block the ventilation. Using the grid fire bulkheads made of anti-fire material to divide the parking if necessary

4.44 The height of the diaphragm in the floors should not exceed 1 m.

Allows the use of grids made of anti-fire material to make the door at the external cladding. Then, ventilation conditions must be ensured throughout the floor.

To reduce the impact of rain must have cornices above the door hole made of anti-fire materials. Then, ventilation conditions must be ensured throughout the story.

4.45 In the houses with fire resistance level of IV, the cladding of the staircases for escape and their parts must satisfy the requirements of the staircases of the house with fire resistance level of III.

4.46 Smoke exhaust systems and ventilations are not required

4.47 In the open garage, it is necessary to have the storage of the fire extinguisher (on the floor one)

Mechanical Garage containing the car

4.48 The composition and area of the rooms, parking, the parameters of garage must match the specification of the vehicle storage system is used.

The control of mechanical device, their work inspection and fire safety of the garage must be done from the moderation room located in the floor that the car comes.

4.49 The houses (works) of the mechanical garages made from anti-fire material are allowed arranging on the ground

The garages are permitted to use the uncoated metal frame with fire resistant with cladding from anti-fire materials.

The mechanical garage allowed only to locate adjacent to the other functions houses in the position of the solid walls with fire resistance rating no less than REI 150.

4.50 A block of the mechanical garages is allowed to have a capacity of not more than 50 vehicles and the height of building not exceeding 28 m.

When you need a combination of garages from the blocks, the between the blocks must be split with the fire bulkhead of type 1.

4.51 Each block of the mechanical garage must ensure that the fire trucks and firefighting forces can approach from two opposite sides (through the glass windows or gaps).

4.52 In a block of the mechanical garage allows to install the open staircase made from anti-fire material for services systems of mechanical technique by floors.

5. Technical systems

General requirements

5.1 The technical systems of the garage and their technical equipments must fit the system of applying selection standard system, except the cases mentioned in this regularization.

In the garages, the amount of water required for fire fighting, ventilation systems is taken as for the warehouse with fire hazard level of C (Appendix B).

5.2 In the multi storey garages, the technical pipe (service for water supply, sewerage, heat) go through the floors must be made of metal.

The cable network cut through the floor must also be placed in metal pipes or in the conduit with fire resistance level of not less than EI 45.

In the underground garages need to use sheathed cables do not spread fire.

5.3 The technical systems of the garage are located the other function houses or adjacent to them must be independent of the technical systems of the buildings.

In case, general technical system is put forward through the rooms of the garage in the house that contains a garage, then the above technical systems (except for the water supply line, drainage, heating tube is made of metals) should be isolated by the construction structures with fire resistance rating of not less than EI 45.

Water supply line

5.4 The number of taps and the minimum amount of water for a fire hose inside the closed garage should be taken as follows:

- When the volume of combustion chambers from 500÷5000 m^3 : 2 taps and 2.5 l/s for a hose;

- When the volume of combustion chambers are greater than 5000 m^3 : 2 taps and 5 l/s for a hose.

The fire hose doesn't need to put inside of one and two-storeys garages with compartment form with the direct exit from each compartment.

5.5 In the open garage, including both the mechanical garage and the garage which openings in the roof, the interior fire water supply system should be made by the dry pipe with the diameter of protruding pipe of 89 (77) mm, is fitted the valves and connectors to connect to mobile fire devices if necessary.

5.6 In the underground garage with 2 basements or more, interior fire hose and automatic firefighting equipments should separate the other interior water supply system.

5.7 In the underground garage with 2 basements or more, interior fire hose and automatic extinguishing equipment must have the protruding pipe with the connector is fitted the valves and counterclockwise valves to connect portable fire fighting equipments if necessary.

5.8 The amount of consumption water for firefighting outside of the garages with open and closed form on the ground is taken according to Table 7.

The amount of consumption water for firefighting outside of the other garages is taken as follows:

- Underground garage with 2 stories or more: 20 l/s.

- The garages with compartment form have direct exit from the each compartment with the number of compartments from 50 to 200: 5 l/s, greater than 200: 10 l/s.

- Mechanical garages: 10 l/s.

- Open Parking with the number of cars to 200: 5 l/s, greater than 200: 10 l/s.

Table 7

Fire resistance level of house	Fire hazard group of house structure	The amount of consumption water for fire fighting outside the garage for a fire, l/s, house volume (combustion chamber), thousand m^3			
		To 5	Over 5 to 20	Over 20 to 50	Over 50
I,II,III	S0,S1	10	15	20	30
IV	S0,S1	10	15	20	-
	S2,S3	20	25	-	-
V	Not regulated	20	-	-	-

5.9 On the supply network between the fire pump and fire hose network must insert counterclockwise valves

Ventilation and smoke protection

5.10 In the open garage at the car storage room must have the extraction – supply ventilation to dilute and crowd out the harmful emissions as calculated by applying selection standard.

In the closed garages on the ground, the mechanical wind supply just made for areas far from outside openings over 18 meters

In the underground garages, ventilation systems should be separated for each floor.

5.11 In the closed garages, it is necessary to install the equipments for measuring the concentration of carbon monoxide and detectors of test signal of corresponding carbon monoxide set at the rooms that the staffs on duty all day

5.12 In the gas pipeline outside, in which they cut through the fire bulkhead, fire valves should be installed and opened in a normal state.

The transition gas pipeline, outside the scope of the service required floor or rooms that are separated by the fire bulkhead, it is necessary to have the fire resistance level of not less than EI 30.

5.13 It is necessary to set ventilation system and smoke protection to push the combustion products from the burning floors:

a) From the car storage room;

b) From the isolation ramps.

5.14 The smoke push should be carried out through the suction wells with artificial gas absorbent.

Natural smoke is exhausted through the window and the skylight equipped the mechanical structure to open a scuttle at the top of the window from 2.2 m or more (from the floor to the bottom edge of the scuttle) and to open the skylight holes. In this case, the area total of the open hole is determined by calculation, but not less than 0.2% of the room area, the distance from the windows to the farthest point in the room should not exceed 18 m.

The garages built in the other functions house, not be pushed the smoke through open hole.

In the garages with 2 floors or more on the ground and in the garages with a basement, allow to set the natural suction wells.

In the garages with isolation ramps, at the suction wells on each floor, it is necessary to have the slack valve.

The amount of required smoke, the number of wells and the dampers is determined by calculation.

In the underground garages, allows to connect a smoke areas with area not exceeding 900 m^2 in each basement to smoke shaft

Smoke escape from the ramps in the garages on the ground are allowed to perform through the hole in the external wall and on roof.

5.15 The staircases and the elevator wells of the garages must be supplied the air with the combustion pressure or tambour of type 1 is supplied the air with the combustion pressure on all floors.

a) In the garages with two basements or more;

b) When the staircases and elevators are connected with the underground and above-ground portion of the garages;

c) When the staircases and elevators are connected the garage to the ground floor of the houses with other functions.

5.16 During a fire, a general exchange ventilation should ensure to be interrupted.

The sequence (order) for opening the smoke protection system should be done before opening the extraction ventilation system (before supplying).

5.17 The control of smoke protection systems should be done automatically - from the fire alarm signal, for remote control - from auto dashboard, from buttons and mechanical equipment by hand is placed at the entrance of the garage floor or half space of the stairs on the floor (in the fire cabinet).

5.18 Parts of the smoke protection system (ventilators, wells, wind pipe, valves, smoke devices, etc....) must match applying selection standard

In the systems of ventilation and extraction smoke protection, the fire dampers (including slack valves) must have gas osmotic resistance no less than 8000 $KG^{-1}.M^{-1}$ for 1 m^2 cross-sectional area to go through.

5.19 When determining the basic parameters of the ventilation and smoke protection of extraction – supply should calculate the input data as follows:

- The appearance of fire (the burning of one car or fire in one of the auxiliary spaces according to 4.3) in the garages on the ground at the typical floor below, even in the underground garage - at the typical floor at the top and bottom;

- The geometrical characteristics of typical floor - use area, reception capacity, the area of the cladding;

- Payload of own fire;

- Location of the openings of the exits (be opened from fire floor to the external exit);

- The parameters of the air outside.

The devices

5.20 The electrical equipment of the garages must comply with the specified requirements for installing electrical equipment.

5.21 Reliability of power supply to the electric consumers of the garage is taken in the following grades:

For grade 1: the electrical equipment used for fire protection, including for the detection and automatic firefighting, smoke protection, elevator to transport firefighting forces, fire alarm systems, as well as the automatic controlled system of atmosphere in the car storage rooms which powered by compressed air and liquefied petroleum gas;

For grade 2: power supply lines for the elevators and other mechanical devices to transport the cars;

The power supply lines to gate open structure without manually and exit lighting for the parkings, always ready to get out;

For grade 3: The other consumer of electricity in technical equipment of the garage.

The cables for the fire-fighting equipment must be directly connected to the input of the cabinet of houses (works) and not used to simultaneously power to other electrical devices.

5.22 Lighting the car storage room must comply with the requirements of the system of applying selection standards.

5.23 The following lighting instructions must be connected to the exit lighting network:

- Of the escape exits on each floor;

- Of the paths of the car;

- Of the position of the connectors to connect to the fire equipment, fire fighting;

- Of the position of the interior fire valves and the fire extinguisher;

- Of the mounting position of the water throat outside (work surface).

5.24 The motion instruction lights must be put at return position, the location changes slope, on the ramps, on the way into the floor, the doors on the floors and in the staircase.

The direction of motion instructions are located at a height of 2m and 0.5 m from the floor within the look from any point on the exist and the road.

5.25 In the closed garages, at the entrance of each floor must mount the sockets connected to the electricity supply network of grade 1 used for fire fighting equipment.

Fire Fighting and automatic fire detection

5.26 The systems of fire detection and automatic firefighting used in the garages must meet the requirements of the system of applying selection standards.

5.27 In the following closed garage, it is necessary to have an automatic fire fighting in the car storage rooms:

a) Underground garage does not depend on the number of floors;

b) The garages on the ground with two floors or more;

c) One story garage on the ground with the fire resistance levels I, II and III with an area more than 7000 m^2, fire resistance level IV, the group S0 with the area above 3600 m^2, fire resistance level IV, group S1 - 2000 m^2 or more, fire resistance level IV made from material not in two groups S2, S3 - 1000 m^2 or more, while keeping the car in private compartments (under 4.40) in the house - with the number of compartments is greater than 5;

d) The garage in the houses with other functions;

e) In the car storage rooms are used for fuel transport and lubricants;

f) The garage located under the bridge;

g) The mechanical garages. Allow no need to arrange automatic fire fighting in the underground garage with one story and the capacity up to 25 seats built on an empty land.

5.28 Automatic fire detection should be equipped to:

a) One – story closed garage on the ground with the a area less than the area specified in Section 5.27c, or when the number of compartments not exceeding 5;

b) The rooms specified in 4.3, except for the toilets and the vent chamber.

In the rooms of the staff on duty day and night, it is not necessary to equip the automatic fire detection.

5.29 In the one and two-storeys garages with compartment form have direct exit from each compartment, it is not necessary to equip the fire fighting and automatic fire detection.

5.30 The closed garages with 2 floors or more on the ground (excluding the garage with the direct exit from each compartment and the mechanical garages) with a capacity up to seat 100 seats - vehicle must be equipped the fire alarm system of type 1,more than 100 seats -vehicle - type 2 in Table 8.

The underground garage with two stories or more must be equipped with fire alarm systems:

- When the capacity up to 50 seats- vehicle : type 2;
- Greater than 50 seats - vehicle to 200 seats-vehicle: type 3;
- Greater than 200 seats- vehicle: type 4 and 5.

6. The requirements for operators

6.1 The exit on each floor of the garage should have the instruction signs clearly and conspicuously.

To sign the driveway and the main point (the exit on the floors, the location of fire valves, fire extinguishers ...) need to use the glowing paint and reflective coating.

6.2 The car storage rooms and the ramps should have the instructions for " no smoking" in the garage.

6.3 The garage must be equipped with initially fire fighting equipment satisfy the requirements of the applying selection standard

6.4 The single – purpose fire – resisting coating and the penetrate coatings on exposed surfaces of the structure must be restored periodically or replaced when broken (can not be used in whole or in part) or in accordance with the expiry date specified in technical documentation of the paints and the coatings.

Table 8

Sequence number	The characteristic of the fire farm systems	Type of the fire farm systems				
		1	2	3	4	5
1	The fire alarm measures:					
	Acoustic signal (bell, siren ....)	+	+	*	*	*
	Voice (audio tapes and radio)	-	-	+	+	+
	Lights					
	Blink	*	*	-	-	-
	Light "exit"	*	+	+	+	+
	Guided motion lights	-	*	*	+	+
	Guided motion lights for each area	-	*	*	*	+
2	Contact with the fire farm with dispatch part	-	-	*	+	+
3	The order of alarm:					
	All at the same time	*	+	-	-	-
	Only in a room (a part of house)	*	*	*	-	-
	The first for service staff then all according to the	-	*	+	+	+
	Sequence is set individually					
4	Full automation on fire alarm system control and capable of performing a set of escape plan by the escape from the fire zones	-	-	-	-	+
Note: '+' – necessary ; '*'_ recommended;'-'_ Not required						

6.5 Don't improve or use the compartments where contain private car to make the repair service room

6.6 The ability of the fire protection technical system (the valve and hydrant, fire fighting pumping stations, fire detection equipment, fire protection systems, fire alarm…) must be checked no less than once a year and set records corresponding with participation of agency representatives in fire fighting.

Appendix A

Regulations on size layout of the garage

A.1 Area size of the garages depending on the number of stories be taken as follows, m^2 for a car: For the garage:

- A floor: 30 m^2 / car
- Two floors: 20 m^2 / car
- Third floor: 14 m^2 /car
- Four floors: 12 m^2 / car
- Five floors: 10 m^2 / car
- The garage on the ground: 25 m^2 / car

A.2 Minimum distance from the gangplank of the garage to the intersections of main roads - 50 m; to the internal road - 20 m to the stopping point of the passenger transport - 30 m.

The driveway of the underground garages contain the car should be far windows of the house, the office of the public houses and the school's areas, kindergartens and health agencies according to Table A.1.

Table A.1

House (Work)	**Distance, m**					
	From the garage and closed parking with capacity				**From technical service station with capacity**	
	From 10 seats down	**11 to 50 seats**	**51to 100 seats**	**101 to 300 seats**	**From 10 seats down**	**11 to 30 seats**
House – Window	**10****	**15**	**25**	**35**	**15**	**25**
House – The edge house without the window	**10****	**10****	**15**	**25**	**15**	**25**
Public house – the office	**10****	**10****	**15**	**25**	**15**	**20**
Schools, Kindergartens	**15**	**25**	**25**	**50**	**50**	*****
The health authorities	**25**	**50**	*****	*****	**50**	*****

with nursing rooms						

* To be determined by agreement with the authorities of the State on Sanitary and Epidemiology;

** For the garage with the fire resistance grade III - V, the distance taken no less than 12 m.

NOTE:

1. Distances are calculated from the windows of houses, public houses and from the area boundaries of schools, kindergartens and health authorities to the wall of the garages or the boundaries of open parking.

2. Distance from the house block to the open parking with capacity from 101 to 300 vehicles placed according to vertical house no less than 50 m.

3. For garages with fire resistance grade I - II, the distance specified in Table A.1, reduced to 25% if the garages without opening light or when the entrance of the garage at the side of house, public house.

4. The garages and the open parkings to keep the cars with capacity of more than 300 vehicles and the technical service station with capacity of more than 30 seats must be located outside residential areas over a distance no less than 50 m from the housing.

5. For garage with capacity more than 10 vehicles in Table A.1, the allowable distance taken by interpolation.

6. In one story garage with compartment form owned by citizens, allowing have the momentum runs

APPENDIX B

Technical Classification on fire

B.1 Classification of building materials according to burning qualities

B.1.1 Building material is classified into two types: flammable material and anti-fire material basing on value of fire test as follows:

a) Anti-fire material, should ensure that in the whole duration of the test:

- Temperature increase of the furnace does not exceed 50^{o}C.
- Reduction of sample amount is not greater than 50%.
- Prolonging time of the flame is not greater than 10 seconds.

b) Flammable material is the material does not meet one of above requirements during the test.

NOTE: These test parameters are determined by the standard TCXDVN 331:2004 (EN ISO 1182), " Non-combustibility test of building materials " or equivalent standard

B.1.2 Flammable material is classified into 4 groups according to the values of fire test parameters as follows:

Table B. 1 - Grouping of flammable materials on the fire

Fire group of material	Fire parameters			
	Air temperature in the chimney [^{o} C]	Damage level to according to the sample length (L) [%]	Damage level according to the sample volume (m) [%]	Burn duration of the sample [Seconds]
G1 – Weak fire	≤ 135	≤ 65	≤ 20	0
G2- Moderate fire	≤ 235	≤ 85	≤ 50	≤ 30
G3- Normal fire	≤ 450	> 85	≤ 50	≤ 300
G4- strong fire	> 450	> 85	> 50	> 300
NOTE: The test parameters are determined by the standard GOST 30244-94 - Method II "Building Materials. Test method of flammability "or equivalent standard				

B.1.3 Flammable material is classified into 3 groups according to the flame, with the fire test parameters as follows:

Table B. 2 - Grouping of materials according to ignitability

Ignition group of the material	**Heat flux intensity of limit surface** [kW/m^2]
1	2
V1- difficult ignition	≥ 35.0
V2-moderate ignition	More than or equal to 20.0 and less than 35.0
V3- easy ignition	< 20.0
NOTE: The test parameters are determined by the standard GOST 30402 - 96 (ISO 5657-86) "Building materials. Testing methods of ignitability "or equivalent standard.	

B.1.4 Flammable material is classified into 4 groups according to flame spread on surface, with the fire test parameters as follows:

Table B. 3 – Classification of flammable material on the flame spread on the surface

Groups of fire spread on the surface of the material	**Heat flux Intensity of limit surface** [kW/m^2]
RP1- not spread	≥ 11.0
RP2 - weak spread	More than or equal to 8.0 and less than 11.0
RP 3-moderate spread	More than or equal to 5.0 and less than 8.0
RP 4- strong spread	< 5
NOTE: The test parameters are determined by the standard GOST 30444 - 96 (ISO 9239-2) " Building materials. Testing methods of flame spread "or equivalent standard.	

B.1.5 Flammable material is classified into 3 groups according to fuming ability, with the test parameters as follows:

Table B. 4 - Classification of flammable materials according to fuming

Group according to ability of fuming of materials	**Number of fuming coefficient of the material [m^2 /kG]**
D1- low fuming	≤ 50
D2- moderate fuming	More than 50 and less than or equal to 500
D3- High fuming	>500
NOTE: The test parameters are determined by the standard GOST 12.1.044 "The explosion hazard of substances and materials. List of criteria and determination methods" or equivalent standard.	

B.1.6 Flammable material is classified into 4 groups according to toxicity, with the toxicity index H_{CL50} of combustion products as follows:

Table 5: Classification of flammable materials according toxicity

Group according to toxicity of material	Index H_{CL50} [g/m^3]; corresponding to the time to reveal			
	5 minutes	15 minutes	30 minutes	60 minutes
1	2	3	4	5
T4 - particularly high toxicity	≤ 25	≤ 47	≤ 13	≤ 10
T3 - high toxicity	25 to 70	47 to 50	13 to 40	10 to 30
T2 - moderate toxicity	70 to 210	50 to o150	40 to 120	30 to 90
T1- low toxicity	> 210	> 150	> 120	>90
NOTE: The test parameters and calculations of criteria H_{CL50} are made by the standard GOST 12.1.044 "The explosion hazard of substances and materials. List of criteria and determination methods" or equivalent standard.				

B.2 The fire resistance rating of constructional elements

B.2.1 The fire resistance rating of constructional elements defined by refractory period (minutes), to appear one or these signs manifest the limit state specified for that component:

- R: Loss of bearing capacity;

- E: Loss of integrity;

- I: Loss of thermal insulation.

B.2.2 The fire resistance level of constructional elements identified through testing in accordance with prescribed standards and denoted by REI, EI, RE or R.

For example, elements are required the fire resistance rating of REI 120 means that elements must simultaneously maintain three possibilities: strength, integrity and insulation during 120 minutes; elements are required the fire resistance rating of R120 means that it must only maintain its load bearing capacity during 120 minutes, does not require remaining thermal insulation and integrity.

B.3 Grouping of constructional element on the fire hazard: According to Table B.6

B.4 Classification of the fire insolated parts

B.4.1 Fire insolated parts used to prevent fire and prevent fire products (heat, smoke, toxic gases) spread from a fire space to another space.

The fire insolated parts include fire walls, fire resistive floorings, and fire bulkheads

B.4.2 The fire insolated parts are characterized by fire strength and fire hazard.

B.4.3 Depending on the fire resistance rating of the covering part of fire insolated part, fire insolated parts are categorized as Table B.7. The door panels, hatches, hatch, windows, valves, screens covering the vents on the fire insolated parts are categorized as in Table B.8.

Table B. 6 – Classification of fire hazard of constructional elements

Fire hazard group of constructional elements	**Allowable damage size of structure (cm)**		**Appearance**		**Fire hazard characteristics of surface material**		
					Group by properties		
	Horizontal structure	**Vertical Structure**	**Heat effects**	**Fire**	**Fire**	**Ignition**	**Fuming**
1	2	3	4	5	6	7	8
K0	0	0	KCP	KCP	---	---	---
K1	≤ 40	≤ 25	KCP	KCP	KQĐ	KQĐ	KQĐ
	≤ 40	≤ 25	KQĐ	KCP	G2	V2	D2
K2	More than 40 and less than or equal to 80	More than 25 and less than or equal to 50	KCP	KCP	KQĐ	KQĐ	KQĐ
	More than 40 and less than or equal to 80	More than 35 and less than or equal to 50	KQĐ	KCP	G3	V3	D2
K3	Not regulated						

Determine the damage size and fire appearance by the standard GOST 30403 - 96 ", Building Structure. The determination method of fire hazard "or equivalent standard.

- KCP: Not allowed
- KQĐ: Not specified
- Allow no need to test to determine the fire hazard level of structure as follows:

+ K0 level, if the structure is made only from anti-fire materials;
+ K3 level, if the structure is made only from flammable materials of group G4;

Table B.7 Classification of fire insolated parts

Name of fire insolated parts	Type	The fire resistance rating of fire insolated parts, no less than	Type of fire bulkhead sealing the vents on the fire insolated parts, no less than
Fire wall	1	REI 150	1
	2	REI 45	2
Fire bulkhead	1	EI 45	2
	2	EI 45	3
Fire resistive flooring	1	REI 150	1
	2	REI 60	2
	3	REI 45	2
	4	REI 15	3

NOTE:

The fire strength of the fire insolated part is determined by the fire strength of the component parts of its, such as:

- The covering of fire insolated parts;
- Stable structures for fire insolated parts;
- Structures which fire insolated parts entitled to;
- The links between the component parts of the fire insolated part.

Table B.8 - Classification of part sealed the vents on the fire insolated part

Departments sealed the vents on fire insolated part	Type	Fire resistance rating, no less than
Doors, hatches, hatch, valve	1	EI 60
	2	EI 30
	3	EI 15
Window	1	EI 60
	2	EI 30
	3	EI 15
Screen	1	EI 60

B.4.4. The tambours are categorized as Table B.9

Table B.9 - Classification of anteroom

Type of anteroom	Type of constituent parts of anteroom, no less than		
	Bulkhead	Floor	The seal of vents
1	1	3	2
2	2	4	3

B.5 Classification of the house (works) according to the fire resistance grade

B.5.1 Combustion chamber: House (work) or a part of them is separated from house (work) or other parts by the fire wall of type 1 - called the combustion chamber

B.5.2 House (work) or a combustion chamber is classified as fire resistance grade: according to Table B.10

Table B.10

Fire resistance grade of house (work)	Fire resistance rating of constructional element of house (work), no less than						
	Structures with bearing	External walls without bearing	Floor divides floors (including the basement and attic)	Parts of the roof without attic		Stair chamber	
				Seamless tile	Platform, Wood girder	Inside wall	Half space
I	R 120	E 30	REI 60	RE 30	R 30	REI 120	R 60
II	R 90	E 15	REI 45	RE 15	R 15	REI 90	R 60
III	R 45	E 15	REI 45	RE 15	R 15	REI 60	R 45
IV	R 15	E 15	REI 15	RE 15	R 15	REI 45	R 15
V	Not regulated						

B.6 Classification of house according to fire hazard of structure: according to Table B.11

Table B.11

Fire hazard group on house structure	Fire hazard group of constructional element, no less than				
	The bearing bars (columns, beams bunch ...)	External wall from outside	Floors and roofs without attics	Walls of the stair parts and fire insolated parts	Half space in the stair chamber
S0	K0	K0	K0	K0	K0
S1	K1	K2	K1	K0	K0
S2	K3	K3	K2	K1	K1
S3	Not regulated			K1	K3

B.7 Classification of the manufacturing by the fire hazard and explosion

Houses and spaces for manufacturing and storage are classified the production class according to the fire hazard and explosion of substances and materials contained in them as shown in Table B.12.

Table B.12 – Classification of fire hazard and explosion for the house and the room

Rank of fire hazard of the house	Properties of substances and materials (forms) in the house, the room
A Explosion hazard	There are fire gases, flammable liquid with inflammation temperature not exceeding 28 ° C, the mass can create a mixtures gas - explosion hazard steam, when burning the design redundant explosive pressure is created in the room exceeds 5 kPa. - There are substances and flammable materials when reacting with water, oxygen in the air or with each other, with volume to the design redundant explosive pressure in the room exceeds 5 kPa.
B Explosion hazard	With the dust or fire fibers, flammable liquid, with inflammation temperature greater than 28 ° C, inflammable liquid, with mass can create a mixture gas-dust or gas – explosive hazard gas, when burning the design redundant explosive pressure is created in the room exceeds 5 kPa
C1 to C4 Fire hazard	There are inflammable liquids or slow-burning, and the substances and flammables materials or slow- burning in solid (including dust and fibers). The substances and materials when reacting with the water, with oxygen in the air or react with each other can cause burning, but with the condition of the room which have the substances and the materials not in the grades A or B The division of the room into the class C1 to C4 under individual fire load values of substances contained there as follows: C1 - There are individual fire loads greater than 2200 MJ/m^2 C2 - There are individual fire loads from 1401 MJ/m^2 to 2200 MJ/m^2 C3 - There are individual fire loads from 181 MJ/m^2 to 1400 MJ/m^2 C2 - There are individual fire loads from 1 MJ/m^2 to 180 MJ/m^2
D	There are substances and anti-fire materials in hot conditions, read hot or melting, but the process is accompanied by the generation of heat radiation, sparks and flames; solids, liquids, combustible gas for use as fuel.
E	The substances and anti- fire materials in cold state

B.8 Classification of house according to the fire hazard on the using functions as Table B.13

Table B.13 Classification of house according to the fire hazard on using functions

Group	Using function of construction
F1	House with the people in permanent or temporary (including day and night)
F1.1	Kindergarten, preschool, special housing for the elderly and people with disabilities (not apartment), hospitals, dormitories blocks of residential schools and facilities for children
F1.2	Hotels, hostels, bed blocks of the nursing home and hostel with common form, campgrounds, inns and resorts
F1.3	The apartment with many apartments
F1.4	Separate houses, including home fleet
F2	The construction of sport cultural
F2.1	Theatres, cinemas, concert halls, clubs, circuses, sports facilities with auditorium, library and other facilities with the number of seats calculated for guests in the closed room;
F2.2	Museums, galleries, and dancing room and other similar facilities in the closed rooms
F2.3	The facilities mentioned in Section F2.1 exposed outdoors
F2.4	The facilities mentioned in Section F2.2 exposed outdoors
F3	The residential service facilities
F3.1	Sale facilities
F3.2	Public catering facilities
F3.3	Station
F3.4	Polyclinics and emergency
F3.5	The room for guests of life service facilities and public with the number of seats is not calculated (post office, savings bank, box office, law consultant office, notary office, laundry shops, tailors, shoe repair and clothing, barber shops, funeral service facilities, religious institutions and similar facilities
F3.6	The physical training complex and sports training ground without the stands, the service space, saunas

F4	Schools, scientific institutions and design, agencies
F4.1	Secondary Schools, training institutions outside schools, professional schools, vocational-technical
F4.2	The universities, schools for professional training
F4.3	The management agencies, design organizations, media organizations and publishers, scientific research institutions, banks, offices, office
F4.4	The fire station
F5	Factory and warehouse, buildings and the rooms with similar capabilities
F5.1	The houses and production construction, production halls and laboratories, workshops
F5.2	The houses and warehouse projects, the parkings without technical service, storage of books, archives, the stockroom
F5.3	The houses for agricultural service

Content