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Code for Fire Protection Design of Buildings

建筑设计防火规范

Issued on: August 27, 2014 Implemented on: May 1, 2015

Jointly Issued by the Ministry of Housing and Urban-Rural Development of the People's Republic of China and the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China

National Standard of the People's Republic of China

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Code for Fire Protection Design of Buildings

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Developed by:

The Ministry of Public Security of the People's Republic of China

Approved by:

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Announcement of the Ministry of Housing and Urban-Rural Development on Publishing the National Standard "Code for Fire Protection Design of Buildings"

"Code for Fire Protection Design of Buildings" has been approved as a national standard with a serial number of GB 50016-2014 and shall be implemented from May 1, 2015. Thereinto, 3.2.2, 3.2.3, 3.2.4, 3.2.7, 3.2.9, 3.2.15, 3.3.1, 3.3.2, 3.3.4, 3.3.5, 3.3.6(2), 3.3.8, 3.3.9, 3.4.1, 3.4.2, 3.4.4, 3.4.9, 3.5.1, 3.5.2, 3.6.2, 3.6.6, 3.6.8, 3.6.11, 3.6.12, 3.7.2, 3.7.3, 3.7.6, 3.8.2, 3.8.3, 3.8.7, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.5(3, 4, 5, 6), 4.3.1, 4.3.2, 4.3.3, 4.3.8, 4.4.1, 4.4.2, 4.4.5, 5.1.3, 5.1.4, 5.2.2, 5.2.6, 5.3.1, 5.3.2, 5.3.4, 5.3.5, 5.4.2, 5.4.3, 5.4.4(1, 2, 3, 4), 5.4.5, 5.4.6, 5.4.9(1, 4, 5, 6), 5.4.10(1, 2), 5.4.11, 5.4.12, 5.4.13(2, 3, 4, 5, 6), 5.4.15(1, 2), 5.4.17(1, 2, 3, 4, 5), 5.5.8, 5.5.12, 5.5.13, 5.5.15, 5.5.16(1), 5.5.17, 5.5.18, 5.5.21(1, 2, 3, 4), 5.5.23, 5.5.24, 5.5.25, 5.5.26, 5.5.29, 5.5.30, 5.5.31, 6.1.1, 6.1.2, 6.1.5, 6.1.7, 6.2.2, 6.2.4, 6.2.5, 6.2.6, 6.2.7, 6.2.9(1, 2, 3), 6.3.5, 6.4.1(2, 3, 4, 5, 6), 6.4.2, 6.4.3(1, 3, 4, 5, 6), 6.4.4, 6.4.5, 6.4.10, 6.4.11, 6.6.2, 6.7.2, 6.7.4, 6.7.5, 6.7.6, 7.1.2, 7.1.3, 7.1.8(1, 2, 3), 7.2.1, 7.2.2(1, 2, 3), 7.2.3, 7.2.4, 7.3.1, 7.3.2, 7.3.5(2, 3, 4), 7.3.6, 8.1.2, 8.1.3, 8.1.6, 8.1.7(1, 3, 4), 8.1.8, 8.2.1, 8.3.1, 8.3.2, 8.3.3, 8.3.4, 8.3.5, 8.3.7, 8.3.8, 8.3.9, 8.3.10, 8.4.1, 8.4.3, 8.5.1, 8.5.2, 8.5.3, 8.5.4, 9.1.2, 9.1.3, 9.1.4, 9.2.2, 9.2.3, 9.3.2, 9.3.5, 9.3.8, 9.3.9, 9.3.11, 9.3.16, 10.1.1, 10.1.2, 10.1.5, 10.1.6, 10.1.8, 10.1.10(1, 2), 10.2.1, 10.2.4, 10.3.1, 10.3.2, 10.3.3, 11.0.3, 11.0.4, 11.0.7(2, 3, 4), 11.0.9, 11.0.10, 12.1.3, 12.1.4, 12.3.1, 12.5.1 and 12.5.4 are mandatory and must be implemented strictly. The former "Code of Design on Building Fire Protection and Prevention" (GB 50016-2006) and "Code for Fire Protection Design of Tall Building" (GB 50045-95) shall be abolished simultaneously.

Authorized by the Research Institute of Standards and Norms (RISN) of the Ministry of Housing and Urban-Rural Development, this code is published and distributed by China Planning Press.

Ministry of Housing and Urban-Rural Development of the People's Republic of China
August 27, 2014

Foreword

According to the requirements of Document JianBiao [2007] No.125 - “Notice on Printing the Development and Revision Plan of National Engineering Construction Standards and Codes (the First Batch) in 2007” and Document JianBiao [2009] No.94 - "Letter on the Correction of Revision Plan for 'Code of Design on Building Fire Protection and Prevention' and 'Code for Fire Protection Design of Tall Building'", issued by the Ministry of Housing and Urban-Rural Development, this code was formulated by Tianjin Fire Control Institute and Sichuan Fire Research Institute of Ministry of Public Security jointly with other organizations concerned through integrating and revising on the basis of "Code of Design on Building Fire Protection and Prevention" (GB 50016-2006) and "Code for Fire Protection Design of Tall Building" (GB 50045-95).

During the process of revising this code, the revision group followed the relevant national principles and policies in capital construction, implemented the fire policy of "prevention first and combining prevention with fire-fighting", learned the lessons from major fire accidents in China in recent years, earnestly summarized practical experience in fire protection design of buildings and scientific and technical achievements in fire-fighting at home and abroad, made deep researches on the new conditions and problems in engineering construction and the difficult problems in the code implementation, seriously studied and absorbed experience from developed countries, carried out a lot of subject studies, technical discussions and necessary tests, solicited wide opinions from design, production, construction, scientific research, education and fire supervision organizations, etc. and finalized this code through review.

This code comprises twelve chapters and three appendixes, covering: requirements for fire hazard classification of production and storage and classification of high-rise buildings, basic requirements for fire resistance class of industrial and civil buildings such as factory buildings, storages, residential buildings and public buildings and basic requirements for fire resistance rating, plane arrangement, fire compartment, fire separation, building fire protection construction, fire separation distance and fire-fighting facilities arrangement of the building elements, basic measures and requirements for explosion protection of industrial buildings; basic requirements for evacuation distance, evacuation width, evacuation stairs layout type, emergency lighting and evacuation indicating signs, and safety exit and evacuation door layout of industrial and civil buildings; basic requirements for the fire separation distance, grouped layout and storage volume of Class A, B, C liquid and gas tanks (tank farm) and stackyard for combustibles; basic requirements for fire protection design of timber building and city road tunnel engineering; basic requirements of field for fire fighting, fire lane, fire elevator and other facilities set to meet the fire fighting and rescue requirements; fire protection requirements in such aspects as heating, ventilating and air conditioning and electricity of buildings as well as basic requirements for power supply, distribution line and the like of fire-fighting electric equipment.

There have been some significant changes in this code over "Code of Design on Building Fire Protection and Prevention" (GB 50016-2006) and "Code for Fire Protection Design of Tall Building" (GB 50045-95) (2005 edition) as follows:

1. "Code of Design on Building Fire Protection and Prevention" and "Code for Fire Protection Design of Tall Building" were incorporated, with their inconsistent requirements adjusted. The residential buildings were classified uniformly by their building height.

2. Two chapters ("Fire Fighting and Rescue Facilities" and "Timber Buildings") were added, improving the relevant requirements of fire-fighting and rescue and standardizing the fire protection requirements of timber buildings.

3. The fire protection requirements of thermal insulation system for buildings were supplemented.

4. Specific requirements were made for the arrangement of fire-fighting facilities and the relevant contents were perfected; the requirements for the design of fire water supply system, indoor and outdoor fire hydrant systems and smoke control and smoke exhaust system were specified in corresponding national standards respectively.

5. The fire protection requirements of high-rise residential buildings and the high-rise civil buildings with building height larger than 100m were properly improved.

6. The fire protection requirements of roofed commercial pedestrian street when it is used for the safe evacuation of the buildings on both sides of it were supplemented; the design evacuation people density of business hall and exhibition hall of building materials, furniture and light fixture stores were adjusted and supplemented.

7. The fire protection requirements for underground storages, logistics buildings, large combustible gas tanks (tank farm), liquid ammonia tanks and LNG tanks were supplemented, and the fire separation distance of liquid oxygen tanks and the like were adjusted.

8. The relevant requirements for preventing vertical or horizontal fire spread in buildings were improved.

Provisions printed in bold type in this code are mandatory ones and must be implemented strictly.

The Ministry of Housing and Urban-Rural Development of the People's Republic of China is in charge of the administration of this code and the explanation of compulsory provisions; the Ministry of Public Security of the People's Republic of China is responsible for the routine management; authorized by Fire Department of MPS, Tianjin Fire Research Institute and Sichuan Fire Research Institute are responsible for the explanation of specific technical contents.

Whereas this code is a comprehensive fire protection technical standard with strong policy and technology orientations and wide coverage, all relevant organizations are kindly requested to sum up and accumulate your experience in engineering practice and scientific research during the process of implementing this code, and relevant comments, recommendations and problems, whenever necessary, can be posted or passed on to the Fire Department of MPS (address: No.70 Guang'anmen South Street, Xicheng District, Beijing, 100054, China) for reference in the future revision and for interpretation by Tianjin and Sichuan Fire Research Institutes of MPS.

Chief development organizations, co-development organizations, chief drafters and chief examiners of this code:

Chief Development Organizations:

Tianjin Fire Research Institute of the Ministry of Public Security

Sichuan Fire Research Institute of the Ministry of Public Security

Co-development Organizations:

China Academy of Building Research
China Northeast Architecture Design and Research Institute Co., Ltd.
China IPPR International Engineering Co., Ltd.
North China Municipal Engineering Design & Research Institute
China Light Industry International Engineering Co., Ltd.
China Huanqiu Contracting & Engineering Corporation
China Architecture Design and Research Group
Shenyang Fire Research Institute of the Ministry of Public Security
Beijing Institute of Architectural Design
Tianjin Architecture Design Institute
Architectural Design and Research Institute of Tsinghua University Co., Ltd.
Northeast Electric Power Design Institute
East China Architectural Design & Research Institute Co., Ltd.
Shanghai Tunnel Engineering & Rail Transit Design and Research Institute
Beijing Public Security Fire Corps
Shanghai Public Security Fire Corps
Tianjin Public Security Fire Corps
Sichuan Public Security Fire Corps
Shaanxi Public Security Fire Corps
Liaoning Public Security Fire Corps
Fujian Public Security Fire Corps

Chief Drafters:

Du Lanping, Ma Heng, Ni Zhaopeng, Lu Guojian, Shen Wen, Wang Zongcun, Huang Dexiang, Qiu Peifang, Zhang Lei, Wang Jiong, Du Xia, Wang Jinyuan, Gao Jianmin, Zheng Jinli, Zhou Xiang, Song Xiaoyong, Zhao Kewei, Chao Haiou, Li Yinqing, Zeng Jie, Liu Zuling, Guo Shulin, Ding Hongjun, Shen Youdi, Chen Yunyu, Xie Shujun, Zheng Shi, Liu Jianhua, Huang Xiaojia, Li Xiangdong, Zhang Fengxin, Song Xiaochun, Dou Jiugui and Zheng Tieyi.

Chief Examiners:

Fang Ruqing, Zhang Yaoze, Zhao Li, Liu Yuehong, Zhang Shuping, Zhang Fulin, He Renfei, Jin Hongxiang, Wang Qingsheng, Wu Hua, Pan Yiping, Su Dan, Xia Weiping, Jiang Gang, Dang Jie, Guo Jing, Fan Long, Yang Xiwei, Hu Xiaoyuan, Zhu Dongqing, Long Weiguo and Huang Xiaokun.

Contents

1 General Provisions

1.0.1 This code is formulated with a view to preventing fire accidents in buildings, reducing fire hazards and protecting personal and property safety.

1.0.2 This code is applicable to the following constructed, renovated and extended buildings:

1 Factory buildings;

2 Storages;

3 Civil buildings;

4 Class A, B, C liquid tanks (tank farm);

5 Combustible and combustion-supporting gas tanks (tank farm);

6 Stackyard for combustibles;

7 City road tunnels.

If special national standards are available, the fire protection design of buildings for civil air defense engineering, petroleum and natural gas engineering, petrochemical engineering, thermal power plants and substations should comply with such standards.

1.0.3 This code is not applicable to the fire protection design of buildings such as factory buildings (storages) for gunpowder, explosive and their products as well as fireworks and firecrackers.

1.0.4 Where occupancies for different purposes are arranged in the same building, fire separation shall be provided between them. The fire protection design for this building and their functional occupancies shall be determined according to the relevant requirements of this code.

1.0.5 The fire protection design of buildings shall comply with the relevant national principles and policies, and guarantee, on the whole, safety and usability, advanced technology as well as economy and rationality according to the characteristics of buildings and fire hazards in them.

1.0.6 In addition to meeting the requirements of this code, the buildings with height larger than 250m shall also be taken with stricter fire prevention measures according to the actual conditions. Their fire protection design shall be submitted to the national fire authorities for subject study and demonstration.

1.0.7 In addition to the requirements of this code, the fire protection design of buildings shall also comply with those specified in the current relevant standards of the nation.

2 Terminologies and Symbols

2.1 Terminologies

2.1.1 High-rise building

The residential buildings with height larger than 27m and the non-single-storey factory buildings, storages and other civil buildings with height larger than 24m.

Note: The calculation of building height shall meet those specified in Appendix A of this code.

2.1.2 Podium

The ancillary building with height not larger than 24m, which is beyond the projection of the main body of high-rise building but is connected with the main body.

2.1.3 Important public building

The public building which may cause heavy casualties, property loss and severe social impact in case of fire.

2.1.4 Commercial facilities

Small business houses such as stores, post offices, savings banks, barbershops located on the first floor or on the first floor and second floor of residential buildings, with the building area of each separated unit not larger than 300m^2.

2.1.5 High rack storage

Mechanical or automatic rack storage, with rack height larger than 7m.

2.1.6 Semi-basement

A floor of a building, with the average height of the room ground below the outdoor design ground for 1/3~1/2 of the average clear height of such room.

2.1.7 Basement

A floor of a building, with the average height of the room ground below the outdoor design ground greater than 1/2 of the average clear height of such room.

2.1.8 Open flame location

A fixed location, indoor or outdoor, with exposed flame or red hot surface, excluding cooking appliance, induction cooker and the like in a civil building.

2.1.9 Sparking site

A fixed location like chimney with spotting fire, or for such operations as outdoor grinding wheel, electric welding, gas welding and gas cutting.

2.1.10 Fire resistance rating

A period starting from the time that the elements, accessories or structures of a building are exposed to fire, under standard fire resistance conditions, to the time that they lose bearing capacity, integrity or insulation, expressed in hours.

2.1.11 Fire partition wall

Non-combustible wall in a building, with fire resistance rating not inferior to relevant requirements, for preventing fire from spreading to adjacent areas.

2.1.12 Fire wall

Non-combustible wall in a building, with fire resistance rating not less than 3.00h, for preventing fire from spreading to adjacent buildings or adjacent horizontal fire compartments.

2.1.13 Refuge floor (room)

A floor (room) in a building, for temporarily protecting people from fire and its smoke in case of fire.

2.1.14 Safety exit

Exit and entrance of staircase and external stair for safe evacuation of people or exit directly leading to internal and external safe areas.

2.1.15 Enclosed staircase

Staircase set with a door at its entrance, for preventing fire smoke and heat from entering into it.

2.1.16 Smoke-proof staircase

Staircase set with such facilities as smoke-proof front room, open balcony or concave corridor (collectively called as "front room") at its entrance and with all the doors leading to the front room and staircase of fire doors, for preventing fire smoke and heat from entering into it.

2.1.17 Exit passageway

Passageway which is taken with smoke-proof measures and is also set with fire partition walls with fire resistance rating not less than 3.00h on both sides for people to go to outside safely.

2.1.18 Flash point

The lowest temperature (determined by closed cup method) of combustible liquid or solid where the mixture of vapor on their surface and air can flashover once meeting ignition source under specified test conditions.

2.1.19 Lower explosion limit

The minimum concentration where the mixture of combustible vapor, gas or dust with air can explode once meeting ignition source.

2.1.20 Boil-over oil

Water-contained oil products which can produce heat wave during combustion.

2.1.21 Fire separation distance

A spacing distance for preventing a burning building from igniting its adjacent buildings within certain time and facilitating fire control.

Note: The calculation method for fire separation distance shall meet those specified in Appendix B of this code.

2.1.22 Fire compartment

Partial space in a building, separated by fire wall, floor slab and other fire separation facilities and capable of preventing fire from spreading to the rest parts of the building within certain time.

2.1.23 Full water spout

A jet length from hose nozzle to a position where water spout equal to 90% of the jet flow passes through a round hole in diameter of 380mm.

2.2 Symbols

A - the pressure relief area

C - the pressure relief ratio

D - the diameter of storage tank

DN - the nominal diameter of pipe

ΔH - the height difference of buildings

L - the enclosed length of tunnel

N - the number of people

n - the number of seats

K - the characteristic index of explosion

V - the volume of building and stackyard or the volume or capacity of tank and bottle group

W - the capacity of stackyard for combustibles or grain silo, bin and barn

3 Factory Buildings and Storages

3.1 Classification of Fire Hazards

3.1.1 Fire hazards of production shall be classified according to such factors as the properties and quantity of substances used or generated during production, may be classified into Categories A, B, C, D and E, and shall be in accordance with those specified in Table 3.1.1.

Table 3.1.1 Classification of Fire Hazards of Production

Fire hazard category of production	Fire hazard characteristics of production using or generating the following substances
A	1. Liquid with flash point less than 28℃; 2. Gas with lower explosion limit less than 10%; 3. Substances being capable of spontaneous decomposition at normal temperature or being capable of rapid spontaneous ignition or explosion after getting oxidized in the air; 4. Substances being capable of generating combustible gas and causing combustion or explosion at normal temperature under the action of water or the water vapor in the air; 5. Strong oxidizer which is apt to cause combustion or explosion in case of acid, heat, impact, friction, catalysis as well as such flammable inorganic substances as organic substance or sulfur; 6. Substances which can cause combustion or explosion in case of impact, friction or being exposed to oxidizer and organic substances; 7. Production where the operating temperature inside the enclosed equipment is not less than the spontaneous ignition temperature of the substance
B	1. Liquid with flash point not less than 28℃ but less than 60℃; 2. Gas with lower explosion limit not less than 10%; 3. Oxidizer not belonging to Category A; 4. Flammable solid not belonging to Category A; 5. Combustion-supporting gas; 6. Floating dust and fiber which can form explosive mixture together with air, and liquid fog drop with flash point not less than 60℃
C	1. Liquid with flash point not less than 60℃; 2. Combustible solid
D	1. Production where non-combustible substance is processed, with strong radiant heat, spark or flame frequently generated at high temperature or molten state; 2. Various production where gas, liquid and solid are used as fuel or gas and liquid are combusted for other purpose; 3. Production where or processing difficult-combustible substance is used at normal temperature
E	Production where or processing non-combustible substance is used at normal temperature

3.1.2 When production with different fire hazards is carried out in a factory building or in any fire compartment of the factory building, the fire hazard category of production in factory building or in fire compartment shall be determined according to the part with higher fire hazard; when the quantity of flammables or combustibles used or generated during production process is small and is insufficient to constitute explosion or fire hazard, the fire hazard

category may be determined according to the actual conditions; when one of the following conditions is met, the fire hazard category may be determined according to the part with lower fire hazard:

1 The production part with higher fire hazard accounts for less than 5% of the building area of this floor or this fire compartment or the painting section in Categories D and E factory buildings accounts for less than 10%, and fire cannot spread to other parts during fire accident or the production part with higher fire hazard has been taken with effective fire prevention measures;

2 The painting section in Categories D and E factory buildings is adopted with enclosed paint spraying process, negative pressure is kept inside the enclosed paint spraying space, the painting section is set with combustible gas detection and alarm system or automatic explosion suppression system, and the painting section accounts for no more than 20% of the building area of the local fire compartment.

3.1.3 The fire hazard of stored articles shall be classified according to such factors as the properties of stored articles and the quantity of combustibles in stored articles, may be classified into Categories A, B, C, D and E, and shall be in accordance with those specified in Table 3.1.3.

Table 3.1.3 Classification of Fire Hazards of Stored Articles

Fire hazard category of stored articles	Fire hazard characteristics of stored articles
A	1. Liquid with flash point less than 28℃; 2. Gas with lower explosion limit less than 10%, and solid substance which can generate gas with lower explosion limit less than 10% under the action of water or the water vapor in the air; 3. Substance being capable of spontaneous decomposition at normal temperature or being capable of rapid spontaneous ignition or explosion after getting oxidized in the air; 4. Substance being capable of generating combustible gas and causing combustion or explosion at normal temperature under the action of water or the water vapor in the air; 5. Strong oxidizer which is apt to cause combustion or explosion in case of acid, heat, impact and friction as well as such flammable inorganic substances as organic substance or sulfur; 6. Substance which can cause combustion or explosion when in case of impact, friction or being exposed to oxidizer and organic substance
B	1. Liquid with flash point not less than 28℃ but less than 60℃; 2. Gas with lower explosion limit not less than 10%; 3. Oxidizer not belonging to Category A; 4. Flammable solid not belonging to Category A; 5. Combustion-supporting gas; 6. Articles which can get oxidized slowly at normal temperature if being exposed to air and cause spontaneous ignition due to accumulated heat
C	1. Liquid with flash point not less than 60℃; 2. Combustible solid
D	Difficult-combustible articles
E	Non-combustible articles

3.1.4 When articles of different fire hazards are stored in a storage or in any fire compartment of storage, the fire hazard of this storage or fire compartment shall be

determined according to the articles with the highest fire hazard.

3.1.5 As for the storages of Categories D and E articles, if the weight of combustible package is larger than 1/4 of that of the articles or the volume of combustible package is larger than 1/2 of that of the articles, the fire hazard shall be determined as Category C.

3.2 Fire Resistance Class of Factory Buildings and Storages

3.2.1 The fire resistance class of factory buildings and storages may be classified into Classes I, II, III and IV, and the combustion performance and fire resistance rating of corresponding building elements shall not be inferior to those specified in Table 3.2.1 unless otherwise stated in this code.

Table 3.2.1 Combustion Performance and Fire Resistance Rating (h) of Factory Building and Storage Building Elements of Different Fire Resistance Classes

Element name		Fire resistance class			
		Class I	Class II	Class III	Class IV
Wall	Fire wall	Non-combustible 3.00	Non-combustible 3.00	Non-combustible 3.00	Non-combustible 3.00
	Load bearing wall	Non-combustible 3.00	Non-combustible 2.50	Non-combustible 2.00	Difficult-combustible 0.50
	Walls of staircase and front room Walls of elevator shaft	Non-combustible 2.00	Non-combustible 2.00	Non-combustible 1.50	Difficult-combustible 0.50
	Partition walls on both sides of evacuation passageway	Non-combustible 1.00	Non-combustible 1.00	Non-combustible 0.50	Difficult-combustible 0.25
	Non-load-bearing exterior wall Partition wall between rooms	Non-combustible 0.75	Non-combustible 0.50	Difficult-combustible 0.50	Difficult-combustible 0.25
Column		Non-combustible 3.00	Non-combustible 2.50	Non-combustible 2.00	Difficult-combustible 0.50
Beam		Non-combustible 2.00	Non-combustible 1.50	Non-combustible 1.00	Difficult-combustible 0.50
Floor slab		Non-combustible 1.50	Non-combustible 1.00	Non-combustible 0.75	Difficult-combustible 0.50
Roof load-bearing elements		Non-combustible 1.50	Non-combustible 1.00	Difficult-combustible 0.50	Combustible
Evacuation stairs		Non-combustible 1.50	Non-combustible 1.00	Non-combustible 0.75	Combustible
Suspended ceiling (including ceiling joist)		Non-combustible 0.25	Difficult-combustible 0.25	Difficult-combustible 0.15	Combustible

Note: As for the suspended ceiling made of non-combustible materials in buildings with Class II fire resistance, its fire resistance rating is not limited.

3.2.2 The fire resistance class of high-rise factory buildings and Categories A and B factory buildings shall not be less than Class II, and that of independent Categories A and B single-storey factory buildings with building area not greater than 300m² may adopt Class III.

3.2.3 The fire resistance class of single-/multi-storey Category C factory buildings and

multi-storey Categories D and E factory buildings shall not be less than Class III.

As for the factory buildings using or generating Class C liquids and the Category D factory buildings with spark, red hot surface and open flame, the fire resistance class shall not be less than Class II. As for single-storey Category C factory buildings with building area not greater than 500m^2 and single-storey Category D factory buildings with building area not greater than 1,000m^2, the fire resistance class may adopt Class III.

3.2.4 As for the buildings using or storing particularly valuable equipment or articles such as machinery, instruments and apparatuses, the fire resistance class shall not be less than Class II.

3.2.5 The fire resistance class of boiler house shall not be less than Class II. In case of coal-fired boiler house with total evaporation not larger than 4t/h, its fire resistance class may adopt Class III.

3.2.6 The fire resistance class of oil immersed transformer room and high-voltage distribution device room shall not be less than Class II, and other fire protection design shall meet the requirements of current national standard "Code for Design of Fire Protection for Fossil Fuel Power Plants and Substations" (GB 50229) and other relevant standards.

3.2.7 The fire resistance class of high rack storages, high-rise storages, Category A storages, multi-storey Category B storages and multi-storey Category C storages storing combustible liquid shall not be less than Class II.

The fire resistance class of single-storey Category B storages, single-storey Category C storages, multi-storey Category C storages storing combustible solids and multi-storey Categories D and E storages shall not be less than Class III.

3.2.8 The fire resistance class of grain silos shall not be less than Class II; the grain silo with Class II fire resistance may adopt steel silo.

The fire resistance class of grain storehouses shall not be less than Class III; the bulk grain storehouses with Class II fire resistance may be adopted with metal load-bearing elements without fire protection.

3.2.9 The fire resistance rating of fire walls in Categories A and B factory buildings and Categories A, B and C storages shall not be less than 4.00h.

3.2.10 The fire resistance rating of columns in single-storey factory buildings (storages) with Class I or II fire resistance shall not be less than 2.50h and 2.00h respectively.

3.2.11 As for the Class I fire resistance single-/multi-storey factory buildings (storages) with full protection of sprinkler system, the fire resistance rating of their roof load-bearing elements shall not be less than 1.00h.

3.2.12 Except Categories A and B storages and high-rise storages, if the non-load-bearing exterior walls of buildings with Class I or II fire resistance adopt non-combustible wall body, their fire resistance rating shall not be less than 0.25h; if they adopt difficult-combustible wall body, their fire resistance rating shall not be less than 0.50h.

As for the 4-storey or less Categories D and E overground factory buildings (storages) with Class I or II fire resistance, if their non-load-bearing exterior walls adopt non-combustible wall body, their fire resistance rating is not limited.

3.2.13 As for factory buildings (storages) with Class II fire resistance, if the partition wall between rooms in them adopt difficult-combustible wall body, the fire resistance rating shall

be increased by 0.25h.

3.2.14 As for the prestressed reinforced concrete floor slabs in multi-storey factory buildings with Class II fire resistance, the fire resistance rating shall not be lower than 0.75h.

3.2.15 As for the accessible flat roof of factory buildings (storages) with Class I or II fire resistance, the fire resistance rating of the roof slab shall not be less than 1.50h and 1.00h respectively.

3.2.16 The roof slab of factory buildings (storages) with Class I or II fire resistance shall be made of non-combustible materials.

The roof waterproof layer should adopt non-combustible or difficult-combustible materials. If combustible waterproof materials are adopted and laid over combustible or difficult-combustible thermal insulation materials, the waterproof materials or the combustible/difficult-combustible thermal insulation materials shall be protected with non-combustible materials.

3.2.17 If it is necessary to adopt metal sandwich panels as the non-load-bearing exterior wall, partition walls between rooms and roof slab in buildings, the core material shall be non-combustible and its fire resistance rating shall meet the relevant requirements of this code.

3.2.18 Unless otherwise stated in this code, the fire resistance class of such factory buildings (storages) with load-bearing wooden columns and with walls made of non-combustible materials may be determined as Class IV.

3.2.19 Proper fire protection measures shall be taken at the exposed joint positions of precast reinforced concrete elements, and the fire resistance rating of joints shall not be less than that of corresponding elements.

3.3 Storeys, Occupied Area and Plane Arrangement of Factory Buildings and Storages

3.3.1 Unless otherwise stated in this code, the number of storeys of factory buildings and the maximum permissible building area of each fire compartment shall be in accordance with those specified in Table 3.3.1.

Table 3.3.1 Number of Storeys of Factory Buildings and Maximum Permissible Building Area of Each Fire Compartment

Fire hazard category of production	Fire resistance class of factory building	Maximum permissible number of storeys	Maximum permissible building area of each fire compartment (m^2)			
			Single-storey factory building	Multi-storey factory building	High-rise factory building	Underground or semi-underground factory building (including basement and semi-basement)
A	Class I	Single storey should	4,000	3,000	-	-
	Class II	be adopted	3,000	2,000	-	-
B	Class I	Not limited	5,000	4,000	2,000	-
	Class II	6	4,000	3,000	1,500	-
C	Class I	Not limited	Not limited	6,000	3,000	500
	Class II	Not limited	8,000	4,000	2,000	500
	Class III	2	3,000	2,000	-	-
D	Classes I and II	Not limited	Not limited	Not limited	4,000	1,000
	Class III	3	4,000	2,000	-	-
	Class IV	1	1,000	-	-	-
E	Classes I and II	Not limited	Not limited	Not limited	6,000	1,000
	Class III	3	5,000	3,000	-	-
	Class IV	1	1,500	-	-	-

Notes:

1 The fire compartments shall be separated by fire walls. As for the factory buildings with Class I or II fire resistance other than Category A factory buildings, if the building area of their fire compartment is larger than the values stated in this table and it is indeed difficult to build fire wall, fire roller shutter or water curtain for fire compartment may be adopted instead. If fire roller shutter is adopted, it shall meet the requirements of 6.5.3 in this code; if water curtain for fire compartment is adopted, it shall meet the requirements of the current national standard "Code of Design for Sprinkler Systems" (GB 50084).

2 As for the multi-storey textile factory buildings with Class I fire resistance and single-/multi-storey textile factory buildings with Class II fire resistance other than the bast fiber factory buildings, the maximum permissible building area of each fire compartment may be increased by 0.5 times according to those specified in this table, but the raw cotton unpacking and blowing rooms shall be separated from other parts in the factory buildings with fire partition walls with fire resistance rating not less than 2.50h; if it is required to set doors, windows or openings, Class A fire doors and windows shall be installed.

3 As for the single-/multi-storey combined paper factory buildings with Class I or II fire resistance, the maximum permissible building area of each fire compartment may be increased by 1.5 times according to those specified in this table. As for the combined wet paper factory buildings with Class I or II fire resistance, if automatic fire extinguishing system is set in the dryer hood of paper machine and effective fire extinguishing facilities are set at the finished section for the purpose of fire protection, the maximum permissible building area of each fire compartment may be determined according to the process requirements.

4 As for the operation tower of cereal silo with Class I or II fire resistance, if the number of worker at each storey does not exceed 2, the number of storeys is not limited.

5 The production rooms in combined cigaret factory buildings with Class I or II fire resistance, like rooms for raw material, stock, grouping formulation, silk reeling, silk storing and rolling package, auxiliary material turnover,

temporary storage of finished products, and tobacco shred expansion by carbon dioxide, shall be divided into independent fire separation units, and may be separated by fire walls when the process conditions permit. Thereinto, the silk reeling, silk storing and rolling package rooms may divided into one fire compartment and the maximum permissible building area of each fire compartment may be determined according to the process requirements, but the silk reeling, silk storing and rolling package rooms shall be separated by fire partition walls and floor slabs with fire resistance rating not less than 2.00h and 1.00h respectively. In addition, proper measures shall be taken at the openings between horizontal and vertical fire separations in the factory buildings to prevent fire spreading.

6 As for the operation platform and repair platform in factory buildings, if the number of their users is less than 10, the platform area may not be counted into the building area of local fire compartment.

7 "-" means “not allowed”.

3.3.2 Unless otherwise stated in this code, the number of storeys of storages and their area shall be in accordance with those specified in Table 3.3.2.

Table 3.3.2 Number of Storeys of Storages and Their Area

Fire hazard category of stored articles		Fire resistance class of storages	Maximum permissible number of storeys	Maximum permissible occupied area of each storage and maximum permissible building area of each fire compartment(m^2)						
				Single-storey storage		Multi-storey storage		High-rise storage		Underground or semi-underground storage (including basement and semi-basement)
				Each storage	Fire compartment	Each storage	Fire compartment	Each storage	Fire compartment	Fire compartment
A	Items 3 and 4	Class I	1	180	60	-	-	-	-	-
	Items 1, 2, 5 and 6	Classes I and II	1	750	250	-	-	-	-	-
B	Items1, 3 and 4	Class I and Class II	3	2,000	500	900	300	-	-	-
		Class III	1	500	250	-	-	-	-	-
	Items 2, 5 and 6	Classes I and II	5	2,800	700	1,500	500	-	-	-
		Class III	1	900	300	-	-	-	-	-
C	Item 1	Classes I and II	5	4,000	1,000	2,800	700	-	-	150
		Class III	1	1,200	400	-	-	-	-	-
	Item2	Classes I and II	Not limited	6,000	1,500	4,800	1,200	4,000	1,000	300
		Class III	3	2,100	700	1,200	400		-	-
D		Classes I and II	Not limited	Not limited	3,000	Not limited	1,500	4,800	1,200	500
		Class III	3	3,000	1,000		500	-	-	-
		Class IV	1	2,100	700	1,500	-	-	-	-
E		Classes I and II	Not limited	Not limited	Not limited	Not limited	2,000	6,000	1,500	1,000
		Class III	3	3,000	1,000		700	-	-	-
		Class IV	1	2,100	700	2,100	-	-	-	-

Notes:

1 The fire compartments in the storages must be separated by fire walls. The fire walls between the fire compartments in Categories A and B storages shall not be arranged with door,

window or opening. The maximum permissible occupied area of underground or semi-underground storages (including basement and semi-basement) shall not be greater than that of the overground storages of corresponding category.

2 The barrel oil storages in oil depot shall meet the requirements of the current national standard "Code for Design of Oil Depot" (GB 50074).

3 As for coal homogenizing storages with Class I or II fire resistance, the maximum permissible building area of each fire compartment shall not be greater than 12,000m^2.

4 As for the independently built ammonium nitrate storages, calcium carbide storages, the storages of molecule products such as polyethylene, urea storages, blended coal storages, independent finished product storages of paper mill, when the fire resistance class of the building is not inferior to Class II, the maximum permissible occupied area of each storage and the maximum permissible building area of each fire compartment may be increased by 1.0 times according to those specified in this table.

5 The maximum permissible occupied area of grain storehouse with Class I or II fire resistance shall not be greater than 12,000m^2, and the maximum permissible building area of each fire compartment shall not be greater than 3,000m^2; the maximum permissible occupied area of grain storehouse with Class III fire resistance shall not be greater than 3,000m^2, and the maximum permissible building area of each fire compartment shall not be greater than 1,000m^2.

6 As for single-storey cotton warehouse with Class I or II fire resistance and with occupied area not greater than 2,000 m^2, the maximum permissible building area of each of its fire compartments shall not be greater than 2,000m^2.

7 The maximum permissible occupied area of refrigeration storage with Class I or II fire resistance and the maximum permissible building area of each of its fire compartments shall meet the requirements of the current national standard "Code for Design of Cold Store" (GB 50072).

8 "-" means not allowed.

3.3.3 Where automatic fire extinguishing system is arranged in the factory buildings, the maximum permissible building area of each fire compartment may be increased by 1.0 time according to those specified in 3.3.1 of this code. Where automatic fire extinguishing system is arranged in Categories D and E overground factory buildings, the maximum permissible building area of each fire compartment is not limited. Where local automatic fire extinguishing systems are arranged in the factory buildings, the increased area of their fire compartment may be calculated as 1.0 times of this local area.

Where automatic fire extinguishing system is arranged in the storages (except the fire compartments in the refrigeration storage), the maximum permissible occupied area of each storage and the maximum permissible building area of each fire compartment may be increased by 1.0 time according to those specified in 3.3.2 of this code.

3.3.4 Categories A and B production occupancies (storages) shall not be arranged underground or semi-underground.

3.3.5 Staff dormitory must not be arranged in the factory buildings.

Offices and resting rooms shall not be arranged in Categories A and B factory buildings; if offices and resting rooms must be adjacent to the factory buildings, they shall reach Class II fire resistance at least and blast walls with fire resistance rating not less than 3.00h shall be used to separate them from the factory buildings; in addition, independent safety exits shall be arranged.

Where offices and resting rooms are arranged in Category C factory buildings, fire partition walls with fire resistance rating not less than 2.50h and floor slab with fire resistance rating not less than 1.00h shall be used to separate them from other positions; in addition, at least 1 independent safety exit shall be arranged. Where it is needed to arrange interconnected doors on partition wall, Class B fire doors shall be adopted.

3.3.6 Where intermediate storages are arranged in the factory buildings, the following requirements shall be met:

1 Categories A and B intermediate storages shall be arranged adjacent to external wall, their storage capacity should not exceed the demand for one day and night;

2 Categories A, B and C intermediate storages shall adopt fire walls and non-combustible floor slabs with fire resistance rating not less than 1.50 h to separate them from other positions;

3 Categories D and E intermediate storages shall adopt fire partition walls with fire resistance rating not less than 2.00h and floor slab with fire resistance rating not less than 1.00h to separate them from other positions;

4 The fire resistance class and occupied area of storages shall meet the requirements of 3.3.2 and 3.3.3 in this code.

3.3.7 The intermediate tanks for Class C liquid in the factory buildings shall be arranged in separate rooms and their capacity shall not be greater than $5m^3$. As for rooms arranged with intermediate tanks, fire partition walls with fire resistance rating not less than 3.00h and floor slabs with fire resistance rating not less than 1.50h shall be used to separate them from other positions; in addition, Class A fire doors shall be adopted for those rooms.

3.3.8 The outdoor power transformation and distribution stations shall not be arranged in or adjacent to Categories A and B factory buildings, and shall not be arranged in hazardous areas exposed to explosive gas or dust. As for 10kV or below

special outdoor power transformation and distribution stations for Categories A and B factory buildings, they may be adjacent to each other on one side where fire wall without door, window or opening is adopted. Moreover, they shall meet the requirements of the current national standard "Electrical Installations Design Code for Explosive Atmospheres and Fire Hazard" (GB 50058), etc.

As for power distribution station for Category B factory buildings, Class A fire window shall be adopted where a window must be arranged on the fire wall.

3.3.9 The staff dormitory must not be arranged in the storages.

The offices and resting rooms must not be arranged in or adjacent to Categories A and B storages.

Where offices and resting rooms are arranged in Categories C and D storages, fire partition wall with fire resistance rating not less than 2.50h and floor slab with fire resistance rating not less than 1.00h shall be used to separate them from other positions; in addition, independent safety exit shall be arranged. Where it is needed to arrange interconnected doors on partition wall, Class B fire doors shall be adopted.

3.3.10 The fire protection design of logistics buildings shall meet the following requirements:

1 Where the main functions of the buildings are operations such as sorting and processing, the fire protection design shall be determined according to the relevant requirements of factory buildings in this code, while the fire protection design of storages shall be determined according to intermediate storages.

2 Where the main function of a building is storage or it is difficult to distinguish the main function of a building, the fire protection design shall be determined according to the relevant requirements of storages in this code, however, where the operating areas such as sorting area adopt fire wall to completely separate them from storage areas, the fire protection requirements of operating areas and storage areas may be respectively determined according to the relevant requirements of factory buildings and storages in this code. Thereinto, where the operating areas such as sorting area adopt fire wall to completely separate them from storage areas, and when the following conditions are met, except Category C high rack storages of automation control, the maximum permissible building area of the fire compartments of storage area and the maximum permissible occupied area of the buildings in storage area may be increased by 3.0 times according to the requirements of Table 3.3.2 (excluding the notes) in this code;

1) Storing Category C articles except combustible liquid, cotton, linen, silk, wool and other textiles, foam plastic and other articles, and the building fire resistance class is not inferior to Class I;

2) Storing Categories D and E articles and the building fire resistance class is not inferior to Class II;

3) Automatic water fire extinguishing systems and fire alarm systems are arranged in the whole building.

3.3.11 Railway line shall not be arranged in Categories A and B factory buildings(storages).

As for the Categories C, D and E factory buildings (storages) with access of steam locomotive and diesel locomotive, non-combustibles shall be adopted for their roofs or other fire control measures shall be taken.

3.4 Fire Separation Distance of Factory Buildings

3.4.1 Unless otherwise stated in this code, the fire separation distance between factory buildings and between factory buildings and Categories B, C, D and E storages shall not be less than those specified in Table 3.4.1, and the fire separation distance with Category A storage shall meet those specified in 3.5.1 this code.

Table 3.4.1 Fire Separation Distance between Factory Buildings as well as between Factory Buildings and Categories B, C, D and E Storages or Civil Buildings (m)

Name			Category A factory buildings	Category B factory buildings (storages)			Categories C, D and E factory buildings (storages)				Civil buildings				
			Single-/multi-storey	Single-/multi-storey		High-rise	Single-/multi-storey			High-rise	Podium and single-/multi-storey			High-rise	
			Classes I and II	Classes I and II	Class III	Classes I and II	Classes I and II	Class III	Class IV	Classes I and II	Classes I and II	Class III	Class IV	Category I	Category II
Category A factory buildings	Single-/multi-storey	Classes I and II	12	12	14	13	12	14	16	13	25			50	
Class B factory buildings	Single-/multi-storey	Classes I and II	12	10	12	13	10	12	14	13					
		Class III	14	12	14	15	12	14	16	15					
	High-rise	Classes I and II	13	13	15	13	13	15	17	13					
Category C factory buildings	Single-/multi-storey	Classes I and II	12	10	12	13	10	12	14	13	10	12	14	20	15
		Class III	14	12	14	15	12	14	16	15	12	14	16	25	20
		Class IV	16	14	16	17	14	16	18	17	14	16	18		
	High-rise	Classes I and II	13	13	15	13	13	15	17	13	13	15	17	20	15
Categories D and E factory buildings	Single-/multi-storey	Classes I and II	12	10	12	13	10	12	14	13	10	12	14	15	13
		Class III	14	12	14	15	12	14	16	15	12	14	16	18	15
		Class IV	16	14	16	17	14	16	18	17	14	16	18		
	High-rise	Classes I and II	13	13	15	13	13	15	17	13	13	15	17	15	13
Outdoor power transformation and distribution stations	Total oil mass of transformer (t)	≥5, ≤10	25	25	25	25	12	15	20	12	15	20	25	20	
		>10, ≤50					15	20	25	15	20	25	30	25	
		>50					20	25	30	20	25	30	35	30	

Notes:

1 The fire separation distance between Category B factory buildings and important public buildings should not be less than 50m; the fire separation distance between Category B factory buildings and open flame or sparking site should not be less than 30m. The fire separation distance between single-/multi-storey Category E factory buildings as well as that between them and Category E storages may be reduced by 2m according to those specified in this table. The fire separation distance between single-/multi-storey Category E factory buildings and civil buildings may be determined according to the requirements of 5.2.2 in this code. The separate residential buildings set for Categories C, D and E factory buildings shall be determined according to the requirements of civil buildings. The fire separation distance between those residential buildings and their factory buildings shall not be less than 6m. If adjacent arrangement is really required, it shall meet the requirements of Notes 2 and 3 in this table.

2 When the adjacent higher exterior wall of two factory buildings is the fire wall, the adjacent exterior wall on any side of two adjacent buildings with Class I or II fire resistance with the same height is the fire wall and the fire resistance rating of the roof is not less than 1.00 h, the fire separation distance is not limited, but the distance between Category A factory buildings shall not be less than 4m. If two adjacent exterior walls of two Categories C, D and E factory buildings are non-combustible, the sum of the occupied area of door, window or opening in each wall shall not be greater than 5% of the exterior wall area when there is no exposed combustible eave; in addition, if the door, window or opening is not opposite to each other, their fire separation distance may be reduced by 25% according to those specified in this table. Categories A and B factory buildings (storages) shall not be adjacent to the buildings not specified in 3.3.5 of this code.

3 As for two factory buildings with Class I or II fire resistance, where the adjacent lower exterior wall is fire wall and the roof of the lower factory building has no skylight and with fire resistance rating not less than 1.00 h, or Class A fire door and window or water curtain for fire compartment are arranged for the openings of door and window in the adjacent higher exterior wall or fire roller shutter is arranged for them according to 6.5.3 of this code, the fire separation distance between Categories A and B factory buildings shall not be less than 46m, and that between Categories C, D and E factory buildings shall not be less than 4m.

4 The oil mass of main transformer in the power plant may be determined by unit set.

5 As for the existing factory buildings with the fire resistance class lower than IV, their fire resistance class may be deemed as Class IV.

6 Where Categories C, D and E factory buildings are adjacent to Categories C, D and E storages, they shall meet the requirements of Notes 2 and 3 in this table.

3.4.2 The fire separation distance between Category A factory buildings and important public buildings shall not be less than 50m; the fire separation distance between Category A factory buildings and open flame or sparking site shall not be less than 30m.

3.4.3 The fire separation distance between Category A factory buildings with combustible gas or steam and railway or road shall not be less than those specified in Table 3.4.3. However, if safety measures are taken for the loading and unloading lines of railway in Category A factory buildings, their fire separation distance may not be limited by those specified in Table 3.4.3.

Table 3.4.3 Fire Separation Distance (m) between Category A Factory Buildings with Combustible Gas or Steam and Railway or Road

Name	Center line of off-factory railway	Center line of in-factory railway	Off-factory roadside	In-factory roadside	
				Primary	Secondary
Category A factory buildings	30	20	15	10	5

3.4.4 The fire separation distance between high-rise factory building and Class A, B , C liquid tanks, combustible and combustion-supporting gas tank, LPG tank or stackyard for combustibles (except coal and coke yards) shall meet the requirements of Chapter 4 in this code, and shall not be less than 13m.

3.4.5 Where Categories C, D and E factory buildings and civil buildings reach Class I or II fire resistance, their fire separation distance may be reduced properly, but shall meet the following requirements:

1 Where the higher exterior wall or the exterior wall within 15m higher than the roof of the adjacent lower building is fire wall without door, window or opening, their fire separation distance is not limited;

2 If the adjacent lower exterior wall is fire wall and the roof has no skylight or the opening and the fire resistance rating of roof is not less than 1.00h, or the adjacent higher exterior wall is fire wall and fire control measures are taken for the opening in the wall, their fire separation distance may be properly reduced, but shall not be less than 4m.

3.4.6 If chemical flammable equipment is arranged outside the factory buildings, the fire separation distance between the external wall of such equipment and the external wall of outdoor equipment arranged outside the adjacent factory buildings or the exterior wall of the adjacent factory buildings shall not be less than those specified in 3.4.1 of this code. The outdoor equipment fabricated with non-combustible material may be determined according to buildings with Class I or II fire resistance.

If Class C liquid tank with the total volume not greater than $15m^3$ is directly buried outside the exterior wall of the factory buildings and the exterior wall within 4.0m from the tank is fire wall, their fire separation distance is not limited.

3.4.7 As for the same U-shaped or orographic factory building, the fire separation distance between two adjacent wings should not be less than those specified in 3.4.1 of this code. However, where the occupied area of the factory building is less than the maximum permissible building area of each fire compartment specified in 3.3.1 of this code, such fire separation distance may be 6m.

3.4.8 Except high-rise factory buildings and Category A factory buildings, where the sum of the occupied area of several factory buildings of other categories is less than the maximum

permissible building area of fire compartment specified in 3.3.1 of this code (the maximum permissible building area of fire compartment is subject to the smaller one, but shall not be greater than 10,000m^2 if it is not limited), they can be arranged by group. Where the height of factory buildings is not greater than 7m, the fire separation distance between factory buildings in a group shall not be less than 4m; where the height of factory buildings is greater than 7m, the fire separation distance between factory buildings in a group shall not be less than 6m.

The fire separation distance between groups or between group and adjacent buildings shall be subject to the one with inferior fire resistance class and shall be determined according to those specified in 3.4.1 of this code.

3.4.9 Class I oil filling station, Class I gas filling station and Class I oil & gas filling station shall not be arranged in urban built-up area.

3.4.10 As for the classification of oil filling station, gas filling station and oil & gas filling station, the fire separation distance from oil filling station, gas filling station, oil & gas filling station as well as their oil (gas) dispenser, oil (gas) tank to off-station open flame location, sparking site, building, railway or road, and between in-station buildings or facilities, they shall meet the requirements of the current national standard "Code for Design and Construction of Automobile Gasoline and Gas Filling Station" (GB 50156).

3.4.11 As for the outdoor power transformation and distribution stations with the voltage of electric power system between 35kV~500kV and the capacity of each transformer not less than 10MV·A, as well as the outdoor stepdown substations with the total oil mass of transformers of industrial enterprises greater than 5t, the fire separation distance between them and other buildings shall not be less than those specified in 3.4.1 and 3.5.1 of this code.

3.4.12 The spacing between the fence and the buildings in the factory area should not be less than 5m, the spacing between buildings on the both sides of the fence shall meet the fire separation distance requirements for corresponding buildings.

3.5 Fire Separation Distance of Storages

3.5.1 The fire separation distance between Category A storages as well as between them and other building, open flame location, sparking site, railway or road shall not be less than those specified in Table 3.5.1.

Table 3.5.1 Fire Separation Distance (m) between Category A Storage as Well as Between Them and Other Building, Open Flame Location, Sparking Site, Railway or Road

Name		Category A storage (storage capacity, t)			
		Category A stored articles Items 3 and 4		Category A stored articles Items 1, 2, 5, and 6	
		≤5	>5	≤10	>10
High-rise civil buildings and important public buildings		50			
Podium, other civil buildings, open flame locations or sparking sites		30	40	25	30
Category A storages		20	20	20	20
Factory buildings and Categories B, C, D and E storages	Classes I and II	15	20	12	15
	Class III	20	25	15	20
	Class IV	25	30	20	25
Outdoor power transformation and distribution stations with the voltage of electric power system between 35~500kV and the capacity of each transformer not less than 10MV·A, as well as outdoor stepdown substations with the total oil mass of transformers of industrial enterprises greater than 5t		30	40	25	30
Center line of off-factory railway		40			
Center line of in-factory railway		30			
Off-factory roadside		20			
In-factory roadside	Primary	10			
	Secondary	5			

Note: Where the stored quantity of items 3 and 4 articles is not greater than 2t and the stored quantity of Items 1, 2, 5 and 6 articles is not greater than 5t, the fire separation distance between Category A storages shall not be less than 12m and the fire separation distance between Category A storage and high-rise storage shall not be less than 13m.

3.5.2 Unless otherwise stated in this code, the fire separation distance between Categories B, C, D and E storages as well as between them and civil buildings shall not be less than those specified in Table 3.5.2.

Table 3.5.2 Fire Separation Distance (m) between Categories B, C, D and E Storages as Well as between Them and Civil Buildings

Name			Category B storages			Category C storages				Categories D and E storages			
			Single-/multi-storey		High-rise	Single-/multi-storey			High-rise	Single-/multi-storey			High-rise
			Classes I and II	Class III	Classes I and II	Classes I and II	Class III	Class IV	Classes I and II	Class II	Class III	Class IV	Classes I and II
Categories B, C, D and E storages	Single-/multi-storey	Classes I and II	10	12	13	10	12	14	13	10	12	14	13
		Class III	12	14	15	12	14	16	15	12	14	16	15
		Class IV	14	16	17	14	16	18	17	14	16	18	17
	High-rise	Classes I and II	13	15	13	13	15	17	13	13	15	17	13
Civil buildings	Podium and single-/multi-storey	Classes I and II	25			10	12	14	13	10	12	14	13
		Class III				12	14	16	15	12	14	16	15
		Class IV				14	16	18	17	14	16	18	17
	High-rise	Category I	50			20	25	25	20	15	18	18	15
		Category II				15	20	20	15	13	15	15	13

Notes:

1 The fire separation distance between single-/multi-storey Category E storages may be reduced by 2m according to those specified in this table.

2 Where the adjacent external walls of two storages are fire walls, the fire separation distance may be decreased, but it shall not be less than 6m for Category C storages, and shall not be less than 4m for Categories D and E storages. The adjacent higher exterior wall of two storages is fire wall. Or where the external wall on any side of two adjacent buildings with Class I or II fire resistance with the same height is fire wall and the fire resistance rating of the roof is not less than 1.00h, and where the total occupied area is not larger than the maximum permissible occupied area of a storage in 3.3.2 of this code, the fire separation distance is not limited.

3 As for Category B storages (except those for Category B Item 6 articles), their fire separation distance to civil buildings should not be less than 25m, and their fire separation distance to important public buildings shall not be less than 50m, and their fire separation distance to railway or road should not be less than that between Category A storage and railway or road as specified in Table 3.5.1.

3.5.3 Where Categories D and E storages and civil buildings reach Class I or II fire resistance, their fire separation distance may be reduced properly, but shall meet the following requirements:

1 Where the higher exterior wall or the exterior wall within 15m higher than the roof of the adjacent lower building is fire wall without door, window or opening, their fire separation distance is not limited;

2 If the adjacent lower exterior wall is fire wall and the roof has no skylight or opening,

and the fire resistance rating of the roof is not less than 1.00h, or the adjacent higher exterior wall is fire wall and fire control measures are taken for the opening in the wall, their fire separation distance may be properly reduced, but shall not be less than 4m.

3.5.4 The fire separation distance between grain silo and other building and grain silo group shall not be less than those specified in Table 3.5.4.

Table 3.5.4 Fire Separation Distance between Grain Silo and Other Building and Grain Silo Group (m)

Name	Total stored quantity of grains W(t)	Grain silo			Grain squat silo		Other building		
		W≤40,000	40,000<W≤50,000	W>50,000	W≤50,000	W>50,000	Level 2	Level 3	Level 4
Grain silo	500<W≤10,000	15	20	2 5	20	25	10	15	20
	10,000<W≤40,000						15	20	25
	40,000<W≤50,000	20					20	25	30
	W>50,000	25					25	30	
Grain squat silo	W≤50,000	20	20	25	20	25	20	25	-
	W>50,000	25					25	30	-

Notes:

1 Where grain silo and grain squat silo as well as operation tower, absorption tower and distribution station constitute an integral process unit cluster, the fire separation distance between buildings in the cluster is not subject to this table.

2 The stored quantity of each independent silo in the grain squat silo cluster shall not be greater than 10,000t.

3.5.5 The spacing between the fence of the storage area and the buildings in the storage area should not be less than 5m. The spacing between buildings on both sides of the fence shall meet the fire separation distance requirements for appropriate buildings.

3.6 Explosion Prevention of Factory Buildings and Storages

3.6.1 The Categories A and B factory buildings with explosive risk should be arranged independently and should be open or semi-open. In addition, reinforced concrete or steel frame and bent structure should be adopted as their load-bearing structure.

3.6.2 As for factory building or any of their positions with explosive risk, pressure relief facilities shall be arranged.

3.6.3 The pressure relief facilities should adopt light roof slab, light wall, easy-to-relieve-pressure doors, windows, etc., and materials without generating sharp fragments in explosion , such as safety glass, shall be adopted.

The pressure relief facilities shall be kept away from crowded locations and main roads, and should be close to positions with explosive risk.

The mass of light roof slab and wall body of the pressure relief facilities should not be greater than 60kg/m^2.

Measures avoiding ice and snow accumulation shall be taken for the pressure relief facilities on the roof.

3.6.4 The pressure relief area of factory buildings should be calculated according to the following formula. However, where the length-diameter ratio of factory buildings is greater than 3, they should be divided into several calculating sections with the length-diameter ratio not greater than 3. The public cross-section of all calculating sections shall not serve as the pressure relief area:

$$A = 10CV^{\frac{2}{3}} \quad (3.6.4)$$

Where,

A - the pressure relief area, m^2;

V - the volume of factory building, m^3;

C - the pressure relief ratio, which may be selected according to those specified in Table 3.6.4, m^2/m^3.

Table 3.6.4 Category of Explosive Substances in Factory Buildings and Specified Value of Pressure Relief Ratio (m^2/m^3)

Category of explosive substances in factory buildings	C value
Ammonia, grain, paper, leather, lead, chromium and copper with K_{dust} less than 10MPa·m·s^{-1}	≥0.030
Wood chip, carbon dust, pulverized coal, stibium and tin with K_{dust} larger than or equal to 10MPa·m·s^{-1} and less than or equal to 30MPa·m·s^{-1}	≥0.055
Acetone, gasoline, methanol, LPG, methane, spraying shop or drying room, phenol resin, aluminium, magnesium and zirconium with K_{dust} greater than 30MPa·m·s^{-1}	≥0.110
Ethylene	≥0.160
Acetylene	≥0.200
Hydrogen	≥0.250

Notes:

1 The length-diameter ratio refers to the ratio of the product of the maximum length in the geometric shape of building plane and the perimeter of its cross-section to 4.0 times the cross-section area of the building.

2 K_{dust} refers to the dust explosion index.

3.6.5 As for Category A factory buildings full of combustible gas or steam lighter than air, light roof slab should be adopted as the pressure relief area. The ceiling shall be flat and smooth without dead corner. The upper space of the factory buildings shall be well ventilated.

3.6.6 Category A factory buildings full of combustible gas or steam heavier than air as well as Category B factory buildings with explosive risk of dust and fiber shall meet the following requirements:

1 Spark-free floor shall be adopted. If insulating materials are adopted as an integral layer, anti-static measures shall be taken.

2 As for factory buildings emitting combustible dust or fiber, their internal surface shall be flat, smooth and convenient for cleaning.

3 Trench should not be arranged in the factory buildings. If trench must be arranged, its cover plate shall be tight and effective measures shall be taken to prevent combustible gas, steam, dust or fiber from accumulating in the trench. In addition, fire-proof materials shall be used to seal the connection between trench and adjacent factory buildings.

3.6.7 As for Categories A and B production positions with explosive risk, they should be arranged nearby pressure relief facilities close to the exterior wall of single-storey factory buildings or the exterior wall of the top floor of multi-storey factory buildings.

The equipment with explosive risk should be arranged away from the main load bearing members of factory buildings, such as beam and column.

3.6.8 The master control room of Categories A and B factory buildings with explosive risk shall be arranged independently.

3.6.9 The branch control room of Categories A and B factory buildings with explosive risk should be arranged independently. If it is adjacent to the exterior wall, fire partition wall with fire resistance rating not less than 3.00h shall be adopted to separate it from other positions.

3.6.10 Protective measures, like foyer, shall be taken for staircase, external stairway in area with explosive risk or connection part between area with explosive risk and its adjacent area. The partition wall of foyer shall be fire partition wall with fire resistance rating not less than 2.00h; Category A fire door shall be adopted and staggered with the door of staircase.

3.6.11 As for factory buildings for using and producing Class A, B and C liquids, their pipe and trench shall not be connected with those of adjacent factory buildings. Oil-separating facilities shall be arranged for sewers.

3.6.12 The storages for Class A, B and C liquids shall be arranged with facilities to prevent liquid from dispersion. As for storages for articles prone to combustion and explosion in case of wet environment, measures shall be taken to prevent them from water immersion.

3.6.13 As for silo with dust explosion hazards, its top cover plate shall be arranged with necessary pressure relief facilities.

The pressure relief area of the operation tower and upper corridor of grain silo shall be determined through calculation according to 3.6.4 of this code. Explosion prevention measures shall be taken for other grain storage facilities with dust explosion hazards.

3.6.14 As for storages or any of their positions with explosive risk, explosion prevention measures should be taken and pressure relief facilities shall be arranged according to the requirements of this section.

3.7 Safe Evacuation of Factory Buildings

3.7.1 The safety exits of factory building shall be dispersedly arranged. As for every fire compartment or every storey in a fire compartment, the horizontal distance between the nearest edges of the two adjacent safety exits shall not be less than 5m.

3.7.2 As for every fire compartment in the factory buildings or every storey in a fire compartment, the quantity of the safety exits shall be determined through calculation and shall not be less than 2; in case the following conditions are met, it is allowed to arrange one safety exit:

1 As for Category A factory buildings, the building area of each floor is not greater than 100m^2 and the number of personnel operating simultaneously is less than or equal to 5;

2 As for Category B factory buildings, the building area of each floor is not greater than 150m^2 and the number of personnel operating simultaneously is less than or equal to 10;

3 As for Category C factory buildings, the building area of each floor is not greater than 250m^2 and the number of personnel operating simultaneously is less than or equal to 20;

4 As for Categories D and E factory buildings, the building area of each floor is not greater than 400m^2 and the number of personnel operating simultaneously is less than or equal to 30;

5 As for underground or semi-underground factory buildings (including basement and semi-basement), the building area of each floor is not greater than 50m^2 and the number of personnel operating simultaneously is less than or equal to 15;

3.7.3 As for underground or semi-underground factory buildings (including basement and semi-basement), if many fire compartments are adjacently arranged and separated with fire wall, the Class A fire door on fire wall and leading to adjacent fire compartment may be adopted for each fire compartment as second safety exit, but each fire compartment must be at least with one independent safety exit directly leading to outdoors.

3.7.4 The linear distance between any point and the nearest safety exit in the factory buildings shall not be greater than those specified in Table 3.7.4.

Table 3.7.4 Linear Distance between Any Point and the Nearest Safety Exit in the Factory Buildings (m)

Fire hazard category of production	Fire resistance class	Single-storey factory building	Multi-storey factory building	High-rise factory building	Underground or semi-underground factory building (including basement and semi-basement)
A	Classes I and II	30	25	-	-
B	Classes I and II	75	50	30	-
C	Classes I and II	80	60	40	30
	Class III	60	40		-
D	Classes I and II	Not limited	Not limited	50	45
	Class III	60	50	-	-
	Class IV	50	-	-	-
E	Classes I and II	Not limited	Not limited	75	60
	Class III	100	75	-	-
	Class IV	60	-	-	-

3.7.5 The respective total clear width of evacuation stairway, passageway and door in the factory buildings shall be determined through calculation according to the number of evacuated persons and the basis that the minimum clear width for evacuation per 100 persons is not less than those specified in Table 3.7.5. However, the minimum clear width of evacuation stairway, evacuation passageway and door should not be less than 1.10m, 1.40m and 0.90m respectively. If the number of evacuated persons at each story is not equal, the total clear width of evacuation stairway shall be calculated by stories, the total clear width of the lower staircase shall be calculated according to the number of evacuated persons of the current story or upper story with the largest number of evacuated persons.

Table 3.7.5 Minimum Clear Width for Evacuation per 100 Persons of Evacuation Stairway, Passageway and Door in the Factory Buildings

Number of factory building storeys (storey)	1~2	3	≥4
Minimum clear width for evacuation (m/hundred persons)	0.60	0.80	1.00

The total clear width of the exterior door on the 1st floor shall be calculated according to the number of evacuated persons of the current story or upper story with the largest number of evacuated persons, and the minimum clear width of the door shall not be less than 1.20m.

3.7.6 Enclosed staircase or external stairway shall be adopted as the evacuation stairway for high-rise factory building and Categories A, B and C multi-storey factory

buildings. As for factory building with the building height greater than 32m and number of people at each story exceeding 10, smoke-proof staircase or external stairway shall be adopted.

3.8 Safe Evacuation of Storages

3.8.1 The safety exits of storage shall be dispersedly arranged. As for every fire compartment or every storey in a fire compartment, the horizontal distance between the nearest edges of the two adjacent escape exits shall not be less than 5m.

3.8.2 The number of safety exits for each storage shall not be less than 2; if the floor area of a storage is not greater than 300m^2, it is allowed to arrange one safety exit. At least two exits should be arranged for each fire compartment in storage for leading to evacuation passageway, stairway or outdoor. Where the building area of fire compartment is not greater than 100m^2, it is allowed to arrange one exit. Class B fire door shall be adopted as the door leading to evacuation passageway or stairway.

3.8.3 The number of safety exits of underground or semi-underground storages (including basement and semi-basement) shall not be less than 2; if the building area is not greater than 100m^2, it is allowed to arrange one safety exit.

As for underground or semi-underground storages (including basement and semi-basement), if many fire compartments are adjacently arranged and separated with fire wall, the Class A fire door on fire wall and leading to adjacent fire compartment may be adopted as the second safety exit for each fire compartment, but each fire compartment must be at least with one safety exit directly leading to outdoors.

3.8.4 The safe evacuation design of refrigeration storage, grain silo and treasury shall meet the requirements of the current national standards "Code for Design of Cold Store" (GB 50072) and "Code for Design of Grain Steel Silos" (GB 50322) respectively.

3.8.5 Where upper-layer area of grain silo is less than 1,000m^2 and there are not more than 2 operating personnel, it is allowed to arrange one safety exit.

3.8.6 The outdoor metal ladder in storage and silo meeting the requirements of 6.4.5 in this code may serve as evacuation stairway, but the fire resistance rating of the external stairway landing of silo shall not be less than 0.25h.

3.8.7 Enclosed staircase shall be adopted for the evacuation stairway of high-rise storage.

3.8.8 Except for multi-storey Category E storages with Classes I and II fire resistance, the lifting facilities for vertically handling articles in other storages should be arranged outside the storage. If they must be arranged in the storage, they shall be arranged in shaft with the fire resistance rating of shaft wall not less than 2.00h. Class B fire door or fire roller shutter complying with the requirements of 6.5.3 in this code shall be arranged for the entrance of internal and external lifting facilities leading to the storage.

4 Class A, B, C Liquid and Gas Tanks (Tank Farm) and Stackyard for Combustibles

4.1 General Requirements

4.1.1 Class A, B and C liquid tank farm, LPG tank farm, combustible and combustion-supporting gas tank farm and stackyard for combustibles shall be arranged at the edge of urban (area) or in the relatively independent safety zone and should be arranged at the windward side in the wind direction with the annual minimum frequency.

Class A, B and C liquid tanks (tank farm) should be arranged in the zone with low terrain. Where they are arranged in the zone with high terrain, security facilities shall be adopted.

LPG tank (tank farm) should be arranged in the zone where liquefied petroleum is not easy to be stored such as in places with flat and open terrain.

4.1.2 Category A liquid in barrel or bottle shall not be stored outdoors.

4.1.3 Non-combustible solid protection wall with the height not less than 1.0m shall be arranged around the LPG tank group or tank farm.

4.1.4 Class A, B and C liquid tank farm, LPG tank farm, combustible and combustion-supporting gas tank farm and stackyard for combustibles shall be arranged separately from the loading area, auxiliary production area and office area.

4.1.5 The smallest horizontal distance between Class A, B and C liquid tanks, LPG tanks, combustible and combustion-supporting gas tanks, combustibles stacks and overhead power lines shall meet the requirements of 10.2.1 of this code.

4.2 Fire Separation Distance of Class A, B, C Liquid Tanks (Tank Farm)

4.2.1 The fire separation distance between Class A, B and C liquid tanks (tank farm)/ barreled Class B and C liquid stackyard and other buildings shall not be less than those specified in Table 4.2.1.

Table 4.2.1 Fire Separation Distance between Class A, B and C Liquid Tanks (Tank Farm)/ Barreled Class B and C Liquid Stackyard and Other Buildings (m)

Category	Total volume of a tank farm or storage yard V(m^3)	Buildings				Outdoor substation and distribution station
		Classes I and II		Class III	Class IV	
		High-rise civil building	Podium Other building			
Class A and B liquid tanks (tank farms)	$1 \le V < 50$	40	12	15	20	30
	$50 \le V < 200$	50	15	20	25	35
	$200 \le V < 1{,}000$	60	20	25	30	40
	$1{,}000 \le V < 5{,}000$	70	25	30	40	50
Category C liquid tank (tank farm)	$5 \le V < 250$	40	12	15	20	24
	$250 \le V < 1{,}000$	50	15	20	25	28
	$1{,}000 \le V < 5{,}000$	60	20	25	30	32
	$5{,}000 \le V < 25{,}000$	70	25	30	40	40

Notes:

1 Where Class A, B, C liquid tanks are arranged in the same tank farm, the total volume of the tank farm may be converted according to follows: 1m³ Class A and B liquids is equivalent to 5m³ Class C liquid.

2 The distance between the outside footing line of the fire dike of the storage tank and the adjacent building shall not be less than 10m.

3 The fire separation distance between Class A, B and C liquid tank farm with fixed roof or semi-open stackyard/ barreled Class B and C liquid stackyard and Category A factory buildings (storage)/civil building shall be increased by 25% on basis of those specified in this table, and that between Class A and B liquid tank farms with fixed roof or semi-open stackyard/ barreled Class B and C liquid stackyard and Category A factory buildings (storage)/podium/single-/multi-storey civil buildings shall not be less than 25m, and that from the open flame or sparking site shall be increased by 25% on basis of those for Class IV fire resistance building specified in this table.

4 The fire separation distance between tank farm with floating roof or liquid tank farm with the flash point over 120℃ shall be decreased by 25% on basis of those specified in this table.

5 In case several tank farms are arranged in the same storage area, the fire separation distance between tank farms shall not be less than the larger value of the fire separation distance specified in this table between tank farm with corresponding volume and building with Class IV fire resistance.

6 As for the directly buried Class A, B and C liquid horizontal tanks, where the volume of single tank is no greater than 50m³ and the total volume is not greater than 200m³, the fire separation distance between it and the building shall be decreased by 50% on basis of those specified in this table.

7 Outdoor power transformation and distribution stations refer to those with the voltage of electric power system between 35kV~500kV and the capacity of each transformer not less than 10MV·A, as well as outdoor stepdown substations with the total oil mass of transformers in industrial enterprises greater than 5t.

4.2.2 The fire separation distance between Class A, B and C liquid tanks shall not be less than those specified in Table 4.2.2.

Table 4.2.2 Fire Separation Distance between Class A, B and C Liquid Tanks (m)

Category			Fixed roof tank			Floating roof tank or storage tank set with nitrogen-filling protection equipment	Horizontal tank
			Overground type	Semi-underground type	Underground type		
Class A and B liquid tanks	Volume of single tank V(m³)	$V \leq 1{,}000$	0.75D	0.5D	0.4D	0.4D	≥0.8m
		$V > 1{,}000$	0.6D				
Class C liquid tank		Not limited	0.4D	Not limited	Not limited	-	

Notes:

1 D is the diameter (m) of the adjacent larger vertical storage tank, and the diameter of the rectangular storage tank is half of the sum of the long-side and short-side.

2 The fire separation distance between tanks with difference liquids as well as that between storage tanks of difference types shall not be less than the larger value specified in this table.

3 The fire separation distance between two rows of horizontal tanks shall not be less than 3m.

4 Where the volume of single tank is not greater than 1,000 m³ and fixed cooling system is adopted, the fire separation distance between overground fixed roof tanks of Class A and B liquids shall not be less than 0.6*D*.

5 Where overground storage tank is set with base injection foam extinguishing system, fixed cooling water system and foam fire extinguishing facility used for putting out liquid fire in the fire dike, the fire separation distance between

storage tanks may be reduced properly and should not be less than 0.4*D*.

6 As for the liquid with the flash point higher than 120℃, where the volume of single tank is larger than 1,000m^3, the fire separation distance between storage tanks shall not be less than 5m; where the volume of single tank is not greater than 1,000m^3, the fire separation distance between storage tanks shall not be less than 2m.

4.2.3 In case Class A, B and C liquid tanks are arranged by group, the following requirements shall be met:

1 The volume of single tank and total volume of the storage tank in the group shall not be greater than those specified in Table 4.2.3.

Table 4.2.3 Maximum Volume of Class A, B and C Liquid Tanks Arranged by Group

Category	Maximum volume of single tank (m^3)	Maximum volume of a group of storage tank (m^3)
Class A and B liquids	200	1,000
Class C liquid	500	3,000

2 The storage tanks in a group shall not be arranged in more than two rows. The fire separation distance between vertical tanks for Class A and B liquids shall not be less than 2m, and that between horizontal tanks shall not be less than 0.8 m; the fire separation distance between Class C liquid tanks is Not limited.

3 The fire separation distance between storage tank groups shall be converted into standard single tanks of the same class according to the form and total volume of storage tank in group and shall be determined according to the requirements of 4.2.2 of this code.

4.2.4 As for the overground and semi-underground tank farms of Class A, B and C liquids, the storage tanks with same or similar fire hazard category should be arranged in every fire dike. Storage tank for boil-over oil and that for non boil-over oil shall not be arranged in the same fire dike. Overground and semi-underground storage tanks shall not be arranged in the same fire dike as underground storage tank.

4.2.5 As for overground and semi-underground storage tanks or storage tank group used for Class A, B and C liquids, the non-combustible fire dike shall be arranged around them. The arrangement of fire dike shall meet the following requirements:

1 The storage tanks in the fire dike should not be arranged in more than 2 rows, the volume of single tank shall not be greater than 1,000m^3 and the liquid tanks with the flash point higher than 120℃ should not be arranged in more than 4 rows;

2 The effective volume of fire dike shall not be less than the volume of the maximum storage tank therein. As for floating roof tank, the effective volume of fire dike may be half of the volume of the maximum storage.

3 The horizontal distance from the inside footing line of the fire dike to the outer wall of vertical tank shall not be less than half of the storage tank wall height. The horizontal distance from the inside footing line of fire dike to the horizontal tank shall not be less than 3m.

4 The design height of the fire dike shall be 0.2m higher than the calculated height and the height shall be 1.0m~2.2m; footboard convenient for the fire-fighting and rescue staff going in and out of the fire dike shall be arranged at proper positions of the fire dike.

5 As for the overground and semi-underground storage tanks used for boil-over oil, one fire dike or fire prevention separation dike shall be arranged for every storage

tank.

6 As for the oily sewer, the water seal facilities shall be arranged at the exit of the fire dike; as for rain drainage pipe, closing and isolation devices such as valve shall be arranged.

4.2.6 As for the semi-open stackyard for Class A liquid, stackyard for barreled Class B and C liquids and liquid tanks (tank farm) with flash point higher than 120℃, fire dike may not be arranged where the facilities to prevent liquid flow are set.

4.2.7 The fire separation distance between the Class A, B and C liquid tanks and their pump room/loading and unloading arms shall not be less than those specified in Table 4.2.7.

Table 4.2.7 Fire Separation Distance between Class A, B and C Liquid Tanks and Their Pump Room/Loading and Unloading Arms (m)

Liquid class and storage tank form		Pump room	Railway or automobile loading and unloading arms
Class A and B liquid tanks	Dome roof tank	15	20
	Floating roof tank	12	15
Class C liquid tank		10	12

Notes:

1 As for Class A and B liquid tanks with total volume not greater than 1,000 m^3 and Class C liquid tank with total volume not greater than 5,000 m^3, the fire separation distance may be decreased by 25% on basis of those specified in this table.

2 The distance between pump room/loading and unloading arms and outside footing line of fire dike of the storage tank shall not be less than 5m.

4.2.8 The fire separation distance between the loading and unloading arms of the Class A, B and C liquids and building/in-factory railway line shall not be less than those specified in Table 4.2.8.

Table 4.2.8 Fire Separation Distance between Loading and Unloading Arms of Class A, B and C Liquids and Building/In-factory Railway Line (m)

Name	Building			In-factory railway line	Pump room
	Classes I and II	Class III	Class IV		
Loading and unloading arms of Class A and B liquids	14	16	18	20	8
Loading and unloading arms of Class C liquid	10	12	14	10	

Note: The fire separation distance between the loading and unloading arms and Class A, B and C liquid loading and unloading railway line for directly loading and unloading is not limited.

4.2.9 The fire separation distance between Class A, B and C liquid tanks and railway/road shall not be less than those specified in Table 4.2.9.

Table 4.2.9 Fire Separation Distance between Class A, B and C Liquid Tanks and Railway/Road (m)

Name	Center line of off-factory railway	Center line of in-factory railway	Off-factory roadside	In-factory roadside	
				Main	Secondary
Class A and B liquid tanks	35	25	20	15	10
Class C liquid tank	30	20	15	10	5

4.2.10 The distance between zero-position tank and railway for loading and unloading line which it belongs to shall not be less than 6m.

4.2.11 The fire separation distance between the tanks (tank farm) of oil depot and building, the arrangement of and fire separation distance between the storage tanks in oil depot and the fire separation distance between storage tank and such buildings as pump room and loading

and unloading arms in oil depot shall meet the requirements of the current national standard "Code for Design of Oil Depot" (GB 50074).

4.3 Fire Separation Distance of Combustible and Combustion-supporting Gas Tanks (Tank Farm)

4.3.1 The fire separation distance between combustible gas tank and building/storage tank/stackyard shall meet the following requirements:

1 The fire separation distance between wet combustible gas tank and building/storage tank/stackyard shall not be less than those specified in Table 4.3.1.

Table 4.3.1 Fire Separation Distance between Wet Combustible Gas Tank and Building/Storage Tank/Stackyard (m)

Name		Wet combustible gas tank (total volume V, m^3)				
		V<1,000	1,000≤V<10,000	10,000≤V<50,000	50,000≤V<100,000	100,000≤V<300,000
Category A storage Class A, B and C liquid tanks Stackyard for combustibles Outdoor substation and distribution station Open flame or sparking site		20	25	30	35	40
High-rise civil buildings		25	30	35	40	45
Podium; single-/multi-storey civil buildings		18	20	25	30	35
Other buildings	Classes I and II	12	15	20	25	30
	Class III	15	20	25	30	35
	Class IV	20	25	30	35	40

Note: The total volume of combustible gas tank with constant volume shall be calculated according to the product of geometrical volume of the storage tank (m^3) and the designed storage pressure (absolute pressure, 10^5 Pa).

2 The fire separation distance between combustible gas tank with constant volume and building/storage tank/stackyard shall not be less than those specified in Table 4.3.1.

3 The fire separation distance between dry combustible gas tank and building/storage tank/stackyard: where the density of the combustible gas is greater than that of the air, the distance shall be increased by 25% on basis of those specified in Table 4.3.1; where the density of combustible gas is smaller than that of the air, the distance shall be determined according to those specified in Table 4.3.1.

4 As for the fire separation distance between such auxiliary facilities as water sealed well, oil pump room and elevator room of wet or dry combustible gas tank and this storage tank, they may be arranged according to the process requirements.

5 The fire separation distance between combustible gas tank with volume not greater than 20m^3 and its factory building is Not limited;

4.3.2 The fire separation distance between combustible gas tanks (tank farms) shall meet the following requirements:

1 The fire separation distance between wet combustible gas tanks or between dry combustible gas tanks or between wet combustible gas tank and dry combustible gas

tank shall not be less than 1/2 of the diameter of adjacent larger tank.

2 The fire separation distance between combustible gas tanks with constant volume shall not be less than 2/3 of the diameter of adjacent larger tank.

3 The fire separation distance between combustible gas tank with constant volume and wet or dry combustible gas tank shall not be less than 1/2 of the diameter of the adjacent larger tank.

4 Where the total volume of several combustible gas tanks with constant volume is greater than 200,000m^3, they shall be arranged by group. The fire separation distance between horizontal tank groups shall not be less than half of the length of the adjacent larger tank; the fire separation distance between spherical tank groups shall not be less than the diameter of the adjacent larger tank and shall not be less than 20m.

4.3.3 The fire separation distance between the oxygen tank and building, storage tank and stackyard shall meet the following requirements:

1 The fire separation distance between the wet oxygen tank and building, storage tank and stackyard shall not be less than those specified in Table 4.3.3.

Table 4.3.3 Fire Separation Distance between the Wet Oxygen Tank and Building, Storage Tank and Stackyard (m)

Name		Wet oxygen tank (total volume V, m^3)		
		V≤1,000	1,000<V≤50,000	V>50,000
Open flame or sparking site		25	30	35
Classes A, B, C liquid tanks, combustibles stackyards, Category A warehouses, outdoor power transformation and distribution stations		20	25	30
Civil buildings		18	20	25
Other buildings	Classes I and II	10	12	14
	Class III	12	14	16
	Class IV	14	16	18

Note: The total volume of oxygen tanks with constant volume shall be the product of geometric volume (m^3) of the tank multiplied by the designed storage pressure (absolute pressure 10^5 Pa).

2 The fire separation distance between the oxygen tanks shall not be less than 1/2 of the diameter of adjacent larger tank.

3 The fire separation distance between the oxygen tank and the combustible gas tank shall not be less than the diameter of adjacent larger tank.

4 The fire separation distance between the oxygen tank with constant volume, and building, tank and stackyard shall not be less than those specified in Table 4.3.3.

5 The fire separation distance between the oxygen tank and other oxygen generation factory building may be determined according to the requirements of the process layout.

6 The fire separation distance between the oxygen tank with volume not greater than 50m^3 and their factory building is not limited.

Note: 1m^3 liquid oxygen is converted into 800m^3 gaseous oxygen under standard condition.

4.3.4 The fire separation distance between the liquid oxygen tank and building, storage tank and stackyard shall meet the requirements for the fire separation distance between wet oxygen tanks with the corresponding volume in 4.3.3 of this code. The distance between the liquid

oxygen tank and its pump room should not be less than 3m. The fire separation distance between the liquid oxygen tank with total volume less than or equal to $3m^3$ and other buildings shall meet the following requirements:

1 When the liquid oxygen tank is arranged in the independent special building with Classes I and II fire resistance, the fire separation distance shall not be less than 10m;

2 When the liquid oxygen tank is arranged in the independent special building with Classes I and II fire resistance, and is separated against the building by fire wall without door ,window or opening, the fire separation distance is not limited;

3 When the liquid oxygen tank stored in low temperature adopts fire prevention measures, the fire separation distance shall not be less than 5m.

The liquid oxygen tank at the gas source station of the medical liquid oxygen tank in the medical and health organizations shall meet the following requirements:

1 The volume of single tank shall not be greater than $5m^3$ and the total volume should not be greater than $20m^3$;

2 The distance between the adjacent storage tanks shall not be less than 0.75 times of the largest tank diameter;

3 The fire separation distance between the medical liquid oxygen tank and the outer buildings of medical and health organizations shall meet the requirements of 4.3.3 in this code, and the fire separation distance between the medical liquid oxygen tank and the inner buildings of medical and health organizations shall meet the requirements of the current national standard "Technical Code for Medical Gases Engineering" (GB 50751).

4.3.5 Combustibles and asphalt pavement shall not exist within 5m around the liquid oxygen tank.

4.3.6 The fire separation distance between the combustible & combustion-supporting gas tank and railways & roads shall not be less than those specified in Table 4.3.6.

Table 4.3.6 Fire Separation Distance between Combustible & Combustion-supporting Gas Tank and Railways & Roads (m)

Name	Center line of off-factory railway	Center line of in-factory railway	Off-factory roadside	In-factory roadside	
				Main	Secondary
Combustible & combustion-supporting gas tank	25	20	15	10	5

4.3.7 The fire separation distance between the liquid hydrogen and liquid ammonia tanks and building, storage tank and stackyard shall be determined by the reduction of 25% on basis of the requirements for fire separation distance of LPG tank with corresponding volume as specified in 4.4.1 of this code.

4.3.8 The fire separation distance between the LNG tank (tank farm) of LNG gasification station and the off-station buildings shall not be less than those specified in Table 4.3.8 and the fire separation distance from other buildings not specified in Table 4.3.8 shall meet the requirements of current national standard "Code for Design of City Gas Engineering" (GB 50028).

Table 4.3.8 Fire Separation Distance between LNG Tank (Tank Farm) of LNG Gasification Station and Off-station Buildings (m)

Name	LNG tank (tank farm) (total volume V, m^3)	The natural

		$V\leq10$	$10<V\leq30$	$30<V\leq50$	$50<V\leq200$	$200<V\leq500$	$500<V\leq1,000$	$1,000<V\leq2,000$	gas vent main of concentrated venting device
Volume of single tank V(m^3)		$V\leq10$	$V\leq30$	$V\leq50$	$V\leq200$	$V\leq500$	$V\leq1,000$	$V\leq2,000$	
The residential area, village and small town, and important public buildings (external wall of the outermost building)		30	35	45	50	70	90	110	45
Industrial enterprise (external wall of the outermost building)		22	25	27	30	35	40	50	20
Open fire or sparking sites, outdoor power transformation and distribution stations		30	35	45	50	55	60	70	30
Other civil buildings, Classes A and B liquid tanks, Categories A and B storages, Categories A and B factory buildings and the stackyards of the materials such as straw, common reed, and packed waste paper		27	32	40	45	50	55	65	25
Class C liquid tank, combustible gas tank, Categories C and D factory buildings, Categories C and D storages		25	27	32	35	40	45	55	20
Road (roadside)	High speed, Classes I and II roads, and urban express	20			25				15
	Others	15			20				10
Overhead power line (center line)		1.5 times of pole height				1.5 times of pole height, but the height of overhead power line at 35kV or above shall not be less than 40m			2.0 times of pole height
Overhead communication line (center line)	Classes I and II	1.5 times of pole height		30		40			1.5 times of pole height
	Others	1.5 times of pole height							
Railway (center line)	National line	40	50	60	70	80			40
	Dedicated lines for enterprises	25			30	35			30

Note: The residential area or village and small town refers to those with 1,000 inhabitants or 300 households or above; when there are less than 1,000 inhabitants or 300 households, the corresponding fire separation distance shall be determined according to the requirements for other civil buildings in this table.

4.4 Fire Separation Distance of LPG Tanks (Tank Farm)

4.4.1 The fire separation distance between the fully pressurized & semi-refrigerated tanks (tank farm) of LPG supply base and open flame or sparking site as well as off-base buildings shall not be less than those specified in Table 4.4.1. The fire separation distance from other buildings not specified in Table 4.4.1 shall meet the requirements of current national standard "Code for Design of City Gas Engineering" (GB 50028).

Table 4.4.1 Fire Separation Distance between the Fully Pressurized & Semi-refrigerated Tanks (Tank Farm) of LPG Supply Base and the Open Flame or Sparking Site as well as Off-base Buildings (m)

Name		LNG tank (tank farm) (total volume V, m^3)						
		30<*V*≤50	50<*V*≤200	200<*V*≤500	500<*V*≤1,000	1,000<*V*≤2,500	2,500<*V*≤5,000	5,000<*V*≤10,000
Volume of single tank *V* (m^3)		*V*≤20	*V*≤50	*V*≤100	*V*≤200	*V*≤400	*V*≤1,000	*V*>1,000
The residential area, village and small town, and important public buildings (external wall of the outermost building)		45	50	70	90	110	130	150
Industrial enterprises (external wall of the outermost building)		27	30	35	40	50	60	75
Open fire or sparking sites, outdoor power transformation and distribution stations		45	50	55	60	70	80	120
Other civil buildings, Classes A and B liquid tanks, Categories A and B storages, Categories A and B factory buildings and the stackyards of the materials such as straw, common reed, and packed waste paper		40	45	50	55	65	75	100
Class C liquid tank, combustible gas tank, Categories C and D factory buildings, Categories C and D storages		32	35	40	45	55	65	80
Combustion-supporting gas tank and the stackyard of materials such as timber		27	30	35	40	50	60	75
Other buildings	Classes I and II	18	20	22	25	30	40	50
	Class III	22	25	27	30	40	50	60
	Class IV	27	30	35	40	50	60	75
Road (roadside)	High speed, Classes I	20	25					30

Name		LNG tank (tank farm) (total volume V, m^3)						
		30<*V*≤50	50<*V*≤200	200<*V*≤500	500<*V*≤1,000	1,000<*V*≤2,500	2,500<*V*≤5,000	5,000<*V*≤10,000
	and II							
	Classes III and IV	15	20					25
Overhead power line (center line)		It shall meet the requirements of 10.2.1 in this code.						
Overhead communication line (center line)	Classes I and II	30			40			
	Classes III and IV	1.5 times of pole height						
Railway (center line)	National line	60	70		80		100	
	Dedicated lines for enterprises	25	30		35		40	

Notes:

1 The fire separation distance shall be determined according to the total volume of tank farm or the volume of single tank (whichever is larger) in this table.

2 When the volume of single underground LPG tank is not greater than $50m^3$ and the total volume is not greater than $400m^3$, the fire separation distance may be reduced by 50% on basis of those specified in this table.

3 The residential area or village and small town refers to those with 1,000 inhabitants or 300 households or above; when there are less than 1,000 inhabitants or 300 households, the corresponding fire separation distance shall be determined according to the requirements of other civil buildings in this table.

4.4.2 The fire separation distance between the LPG tanks shall not be less than the diameter of adjacent larger tank.

When the total volume of several storage tanks is more than $3,000m^3$, they shall be arranged by groups and should be arranged in single row in each group. The fire separation distance of the adjacent storage tanks between groups shall not be less than 20m.

4.4.3 The fire separation distance between LPG tank and its pump room shall not be less than 15m. When fire wall without door, window or opening is adopted as the external wall of the pump room facing the storage tank, the fire separation distance may be reduced to 6m. When the LPG pump is set outdoors at the tank farm, the distance between the storage tank and pump is not limited.

4.4.4 The fire separation distance from the fully-refrigerated LPG tanks, LPG gasification station tanks and gas mixing station tanks to the surrounding buildings shall meet the requirements of current national standard "Code for Design of City Gas Engineering" (GB 50028).

When the storage tanks of LPG gasification station and gas mixing station with total volume not greater than $10m^3$ in the industrial enterprises are arranged within the dedicated independent buildings, the fire separation distance between the exterior wall and the adjacent factory building as well as its auxiliary equipment shall be determined according to the specifications on the fire separation distance of Category A factory buildings. When they are

arranged outdoors, the fire separation distance from the buildings, storage tanks and stackyards shall meet the requirements of the current national standard "Code for Design of City Gas Engineering" (GB 50028).

4.4.5 The fire separation distance between the cylinder storage at Classes I and II bottled LPG supply station and the off-station buildings shall not be less than those specified in Table 4.4.5. The grading of the bottled LPG supply station and the arrangement of cylinder storage at bottled LPG station with total volume of stored cylinders not greater than 1m^3 shall meet the requirements of the current national standard "Code for Design of City Gas Engineering" (GB 50028).

Table 4.4.5 Fire Separation Distance between Cylinder Storages at Classes I and II Bottled LPG Supply Station and Off-station Buildings (m)

Name	Class I		Class II	
The total volume of stored cylinders of cylinder storages V(m^3)	6<*V*≤10	10<*V*≤20	1<*V*≤3	3<*V*≤6
Open flame or sparking site	30	35	20	25
Important public buildings	20	25	12	15
Other civil buildings	10	15	6	8
Main roadside	10	10	8	8
Secondary roadside	5	5	5	5

Note: The total volume of stored cylinders shall be the product of actual number of cylinders multiplied by the geometric volume of single cylinder.

4.4.6 Non-combustible solid walls should be arranged around Class I bottled LPG supply station, but non-combustible non-solid walls may be arranged at the side facing the exit and entrance.

Non-combustible solid walls should be arranged around Class II bottled LPG supply station or the height of the lower solid section shall not be less than the 0.6m-high fences.

4.5 Fire Separation Distance of Stackyard for Combustibles

4.5.1 The fire separation distance between outdoor and semi-outdoor stackyard for combustibles and buildings shall not be less than those specified in Table 4.5.1.

Table 4.5.1 Fire Separation Distance between Outdoor and Semi-outdoor Stackyard for Combustibles and Buildings (m)

Name	Total storage volume of a stackyard	Building		
		Classes I and II	Class III	Class IV
Grain bin *W* (t)	10≤*W*<5,000	15	20	25
	5,000≤*W*<20,000	20	25	30
Grain barn *W* (t)	500≤*W*<10,000	10	15	20
	10,000≤*W*<20,000	15	20	25
Cotton, flax, fur, chemical fibre and general merchandises *W* (t)	10≤*W*<500	10	15	20
	500≤*W*<1,000	15	20	25
	1,000≤*W*<5,000	20	25	30
Stover, common reed and packed	10≤*W*<5,000	15	20	25

Name	Total storage volume of a stackyard	Building		
		Classes I and II	Class III	Class IV
waste paper W (t)	5,000≤W<10,000	20	25	30
	W≥10,000	25	30	40
Timber, etc. V (m^3)	50≤V<1,000	10	15	20
	1,000≤V<10,000	15	20	25
	V≥10,000	20	25	30
Coal and coke W (t)	100≤W<5,000	6	8	10
	W≥5,000	8	10	12

Note: As for the outdoor and semi-outdoor stackyards for materials such as stover, common reed and packed waste paper, the fire separation distance from Category A factory buildings (storages) and civil building shall be increased by 25% on basis of those specified in this table and according to the fire resistance class of the buildings, and shall not be less than 25m; the fire separation distance from the outdoor power transformation and distribution stations shall not be less than 50m; and that from open flame or sparking site shall be increased by 25% on basis of the corresponding requirements for Class IV buildings in this table.

Where the total storage volume of a timber stackyard is greater than 25,000m^3 or the total storage volume of the stackyard for such materials as stover, common reed and packed waste paper is greater than 20,000t, stackyards should be arranged separately. The fire separation distance between different stackyards shall not be less than that between the larger adjacent stackyard and Class IV buildings.

The fire separation distance between stackyards for materials of different natures shall not be less than the larger value of the fire separation distance between stackyard with corresponding storage volume and Class IV buildings as specified in this table.

4.5.2 The fire separation distance between the outdoor and semi-outdoor stackyards for combustibles and Classes A, B, C liquid tanks shall not be less than the larger value of the fire separation distance between the stackyard with corresponding storage volume and Class IV buildings as specified in Table 4.2.1 and Table 4.5.1 of this code.

4.5.3 The fire separation distance between the stackyards for such materials as stover, common reed and packed waste paper and the railways and roads shall not be less than those specified in Table 4.5.3. The fire separation distance between stackyards for other combustibles and the railways and roads shall be determined according to the fire hazards of the materials and on basis of analogue principle.

Table 4.5.3 Fire Separation Distance between Outdoor and Semi-outdoor Stackyards for Combustibles and the Railways and Roads (m)

Name	Center line of off-factory railway	Center line of in-factory railway	Off-factory roadside	In-factory roadside	
				Main	Secondary
Stackyards for such materials as stover, common reed, packed waste paper, etc.	30	20	15	10	5

5 Civil Buildings

5.1 Classification and Fire Resistance Class

5.1.1 Civil buildings may be classified into single-/multi-storey civil buildings and high-rise civil buildings according to their building height and number of storeys. High-rise civil buildings may be classified into Category I and Category II according to their building height, use function and floor building area. The classification of civil buildings shall be in accordance with those specified in Table 5.1.1.

Table 5.1.1 Classification of Civil Buildings

Name	High-rise civil building		Single-/multi-storey civil building
	Category I	Category II	
Residential building	Residential buildings with height larger than 54m (including the residential buildings arranged with commercial facilities)	Residential buildings with height larger than 27m but not larger than 54m (including the residential buildings arranged with commercial facilities)	Residential buildings with height not larger than 27m (including the residential buildings arranged with commercial facilities)
Public building	1. Public buildings with height larger than 50m; 2. Stores, buildings for exhibition, telecommunication, postal service, finance and trade, and other buildings having multiple functions, with the building height larger than 24m and the building area of any floor larger than 1,000m^2; 3. Medical buildings and important public buildings 4. Broadcast television and disaster prevention commanding and dispatching buildings at the provincial level or above; large-scale or provincial-level power dispatching buildings 5. Libraries and stack rooms with collection of books more than 1,000,000	Other high-rise public buildings other than Category I high-rise public buildings	1. Single-storey public buildings with height larger than 24m 2. Other public buildings with height not larger than 24m

Notes:

1 As for the buildings not listed in this table, their category shall be determined through analogy according to this table.

2 Unless otherwise stated in this code, the fire protection requirements of such non-domestic residential buildings as dormitory and apartment shall meet the requirements about public buildings in this code.

3 Unless otherwise stated in this code, the fire protection requirements of podium shall meet the requirements about high-rise civil buildings in this code.

5.1.2 The fire resistance class of civil buildings may be classified into Classes I, II, III and IV. Unless otherwise stated in this code, as for the buildings of different fire resistance classes,

the combustion performance and fire resistance rating of their corresponding elements shall not be inferior to the requirements of Table 5.1.2.

Table 5.1.2 Combustion Performance and Fire Resistance Rating (h) of the Corresponding Elements of Buildings of Different Fire Resistance Classes

Element name		Fire resistance class			
		Class I	Class II	Class III	Class IV
Wall	Fire wall	Non-combustible 3.00	Non-combustible 3.00	Non-combustible 3.00	Non-combustible 3.00
	Load bearing wall	Non-combustible 3.00	Non-combustible 2.50	Non-combustible 2.00	Difficult-combustible 0.50
	Non-load-bearing exterior wall	Non-combustible 1.00	Non-combustible 1.00	Non-combustible 0.50	Combustible
	Walls of staircase and front room Walls of elevator shaft Walls and separating walls between units of residential buildings	Non-combustible 2.00	Non-combustible 2.00	Non-combustible 1.50	Difficult-combustible 0.50
	Partition walls on both sides of evacuation passageway	Non-combustible 1.00	Non-combustible 1.00	Non-combustible 0.50	Difficult-combustible 0.25
	Partition wall between rooms	Non-combustible 0.75	Non-combustible 0.50	Difficult-combustible 0.50	Difficult-combustible 0.25
Column		Non-combustible 3.00	Non-combustible 2.50	Non-combustible 2.00	Difficult-combustible 0.50
Beam		Non-combustible 2.00	Non-combustible 1.50	Non-combustible 1.00	Difficult-combustible 0.50
Floor slab		Non-combustible 1.50	Non-combustible 1.00	Non-combustible 0.50	Combustible
Roof load-bearing elements		Non-combustible 1.50	Non-combustible 1.00	Combustible 0.50	Combustible
Evacuation stairs		Non-combustible 1.50	Non-combustible 1.00	Non-combustible 0.50	Combustible
Suspended ceiling (including ceiling joist)		Non-combustible 0.25	Difficult-combustible 0.25	Difficult-combustible 0.15	Combustible

Notes:

1 Unless otherwise stated in this code, the fire resistance class of the buildings adopting wooden columns for bearing load and with walls built with non-combustible materials shall be determined as Class IV.

2 The fire resistance rating and combustion performance of the elements of residential buildings may comply with the current national standard "Residential Building Code" (GB 50368).

5.1.3 The fire resistance class of civil buildings shall be determined according to such factors as their building height, use function, importance and fire suppression difficulty, and shall meet the following requirements:

1 The fire resistance class of underground or semi-underground buildings

(basement or semi-basement) and Category I high-rise buildings shall not be less than Class I;

2 The fire resistance class of single-/multi-storey important public buildings and Category II high-rise buildings shall not be less than Class II.

5.1.4 As for civil buildings with height larger than 100m, the fire resistance rating of their floor slabs shall not be less than 2.00h.

As for the accessible flat roof of such buildings with Class I or II fire resistance, the fire resistance rating of their roof slabs shall not be less than 1.50h and 1.00h respectively.

5.1.5 The roof slab of the buildings with Class I or II fire resistance shall be made of non-combustible materials.

The roof waterproof layer should adopt non-combustible or difficult-combustible materials. If combustible waterproof materials are adopted and laid over combustible or difficult-combustible thermal insulation materials, the waterproof materials or the combustible/difficult-combustible thermal insulation materials shall be protected with non-combustible materials.

5.1.6 As for the difficult-combustible partition walls of rooms in the buildings with Class II fire resistance, their fire resistance rating shall not be less than 0.75h; when the building area of room is not larger than 100m^2, the room partition walls may adopt the difficult-combustible wall body with fire resistance rating not less than 0.50h or non-combustible wall body with fire resistance rating not less than 0.30h.

As for the floor slabs made of prestressed reinforced concrete in the multi-storey residential buildings with Class II fire resistance, their fire resistance rating shall not be less than 0.75h.

5.1.7 If it is necessary to adopt metal sandwich panels as the non-load-bearing exterior wall, partition walls between rooms and roof slab in buildings, the core material shall be non-combustible and its fire resistance rating shall meet the relevant requirements of this code.

5.1.8 As for the suspended ceiling made of non-combustible materials in the buildings with Class II fire resistance, its fire resistance rating is not limited.

As for the medical buildings with Class III fire resistance, teaching buildings of middle schools and primary schools, senior citizen buildings, and children activity places such as children rooms and children amusement arcades in nurseries and kindergartens, the suspended ceiling shall be made of non-combustible materials; if the suspended ceiling is made of combustible-difficult materials, its fire resistance rating shall not be less than 0.25h.

In the buildings with Class II or II fire resistance, the suspended ceilings of hallway and passageway shall be made of non-combustible materials.

5.1.9 The exposed joint positions of the precast reinforced concrete elements in buildings shall be taken with fire protection measures, and the fire resistance rating of the joints shall not be less than the fire resistance rating of corresponding elements.

5.2 General Layout

5.2.1 In the general layout, the position, fire separation distance, fire lane, fire water supply

and the like of buildings shall be determined reasonably, and the civil buildings should not be arranged nearby Categories A and B factory buildings (storages), Class A, B, C liquid tanks, combustible gas tanks or stackyard for combustibles.

5.2.2 The fire separation distance between civil buildings shall not be less than those specified in Table 5.2.2 and the fire separation distance between civil building and other buildings shall also meet the requirements of other chapters in this code in addition to complying with the requirements of this section.

Table 5.2.2 Fire Separation Distance (m) between Civil Buildings

Building category		High-rise civil building	Podium and other civil buildings		
		Classes I and II	Classes I and II	Class III	Class IV
High-rise civil buildings	Classes I and II	13	9	11	14
Podiums and other civil buildings	Classes I and II	9	6	7	9
	Class III	11	7	8	10
	Class IV	14	9	10	12

Notes:

1 As for two adjacent single-/multi-storey buildings, if the adjacent exterior walls are made of non-combustible wall body and there is no exposed combustible eave, the doors, windows and openings without fire protection in each exterior wall are set without directly facing each other, and the sum of area of these doors, windows and openings is not larger than 5% of the area of this exterior wall, the fire separation distance may be reduced by 25% according to those specified in this table.

2 As for two adjacent buildings, if the higher wall is a fire wall or the exterior wall within the scope of 15m or less above the roof of the adjacent lower building with Class I or II fire resistance is a fire wall, their fire separation distance will not be limited.

3 As for two adjacent buildings with Class I or Class II fire resistance and of the same height, if the exterior wall at any adjacent side is a fire wall and the fire resistance rating of roof is not less than 1.00h, the fire separation distance will not be limited.

4 As for two adjacent buildings, if the fire resistance class of the lower one is not less than Class II, the adjacent lower exterior wall is a fire wall, the roof is without a skylight and the fire resistance rating of roof is not less than 1.00h, the fire separation distance shall not be less than 3.5m; as for high-rise buildings, the fire separation distance shall not be less than 4m.

5 As for two adjacent buildings, if the fire resistance class of the lower one is not less than Class II, the roof is without a skylight, the opening position on the adjacent higher exterior wall within the scope of 15m or less above the roof of the lower building is set with Class A fire door or window, or if the water curtain for fire compartment meeting the requirements of the current national standard "Code of Design for Sprinkler Systems" (GB 50084) or the fire roller shutter meeting the requirements of 6.5.3 in this code is set, the fire separation distance shall not be less than 3.5m; as for the high-rise buildings, the fire separation distance shall not be less than 4m.

6 If the adjacent buildings are connected through vestibule, overpass or bottom buildings, their distance shall not be less than those specified in this table.

7 As for the existing buildings with fire resistance class less than Class IV, the fire resistance class may be determined as Class IV.

5.2.3 The fire separation distance between civil building and separately built substation shall meet the requirements relevant to door power transformation and distribution stations in 3.4.1 of this code, however the fire separation distance between civil building and separately built single-ended substation may be determined based on the fire resistance class of

substation and according to the requirements relevant to civil buildings in 5.2.2 of this code.

The fire separation distance between civil building and 10kV or below prefabricated substation shall not be less than 3m.

The fire separation distance between civil building and oil-fired, gas-fired or coal-fired boiler house shall meet the requirements relevant to Category D factory buildings in 3.4.1 of this code, however the fire separation distance between civil building and the coal-fired boiler house with evaporation capacity of single steam boiler not larger than 4t/h or rated thermal power of single hot water boiler not larger than 2.8MW may be determined based on the fire resistance class of boiler house and according to the requirements relevant to civil buildings in 5.2.2 of this code.

5.2.4 Except high-rise civil buildings, residential buildings or office buildings with Class I or II fire resistance may be arranged in group if the sum of their floor area is not larger than 2,500m^2, however the distance between buildings in a group should not be less than 4m. The fire separation distance between building groups or between building group and adjacent buildings shall not be less than those specified in 5.2.2 of this code.

5.2.5 The fire separation distance between civil building and the cylinder storages of gas regulator station, LPG gasification station or gas mixing station, and urban LPG supply station shall meet the requirements of the current national standard "Code for Design of City Gas Engineering" (GB 50028).

5.2.6 The fire separation distance between the civil building with height larger than 100m and its adjacent buildings shall not be reduced even when the conditions permit to reduce the fire separation distance specified in 3.4.5, 3.5.3, 4.2.1 and 5.2.2 of this code are met.

5.3 Fire Compartment and Storeys

5.3.1 Unless otherwise stated in this code, as for the buildings of different fire resistance classes, the permissible building height or number of storeys and the maximum permissible building area of fire compartment shall be in accordance with those specified in Table 5.3.1.

Table 5.3.1 Permissible Building Height or Number of Storeys, and Maximum Permissible Building Area of Fire Compartment of the Buildings of Different Fire Resistance Classes

Name	Fire resistance class	Permissible building height or number of storeys	Maximum permissible building area of fire compartment (m^2)	Remarks
High-rise civil building	Class II	Determined according to 5.1.1 of this code	1,500	As for the audience halls of gymnasium and theatre, the maximum permissible building area of the fire compartment may be increased properly.
Single-/multi-storey civil building	Class II	Determined according to 5.1.1 of this code	2,500	
	Class III	5 storeys	1,200	
	Class IV	2 storeys	600	
Underground or semi-underground buildings (basement or semi-basement)	Class I	-	500	As for equipment rooms, the maximum permissible building area of fire compartment shall not be greater than 1,000m^2.

Notes:

1 If automatic fire extinguishing system is set in the building, the maximum permissible building area of fire compartment specified in this table may be increased by 1.0 times according to those specified in this table; if the automatic fire extinguishing system is set locally, the increased area of fire compartment may be calculated according to 1.0 times of this local area.

2 If fire wall is arranged between podium and the main body of high-rise building, the fire compartment of podium may be determined according to the requirements of single-/multi-storey buildings.

5.3.2 If the opening connecting upper and lower floors such as escalator and open stair is set in the building, the building area of fire compartment shall be calculated by superposing the connected building area of upper and lower floors; if the building area calculated by superposing is larger than those specified in 5.3.1 of this code, the fire compartments shall be divided.

If atrium is arranged in the building, the building area of fire compartment shall be calculated by superposing the connected building area of upper and lower floors; if the building area calculated by superposing is larger than those specified in 5.3.1 of this code, the following requirements shall be met:

1 The atrium shall be carried with fire separation from the surrounding connected spaces; if fire partition wall is adopted, its fire resistance rating shall not be less than 1.00h; if fireproof glass wall is adopted, its fire insulation and fire integrity shall not be less than 1.00h, and sprinkler system shall be set for protection in case that the non-insulating fireproof glass wall with fire integrity not less than 1.00h is adopted; if fire roller shutter is adopted, its fire resistance rating shall not be less than 3.00h and shall meet those specified in 6.5.3 of this code; the doors and windows connected with the atrium shall adopt Class A fire doors and windows which are capable of automatically closing in case of fire;

2 The atrium corridor in high-rise building shall be set with sprinkler system and fire alarm system;

3 The atrium shall be set with proper smoke exhaust facilities;

4 No combustibles can be arranged in the atrium.

5.3.3 Fire wall shall be adopted for the separation between fire compartments; if it is difficult to set fire wall, fire separation facilities such as fire roller shutter may be adopted for separation. If fire roller shutter is adopted, it shall meet those specified in 6.5.3 of this code.

5.3.4 As for the shop business hall and exhibition hall in the buildings with Class I or II fire resistance, if automatic fire extinguishing system and fire alarm system are set and the non-combustible or difficult-combustible decorative materials are adopted, the maximum permissible building area of each fire compartment shall meet the following requirements:

1 It shall not be larger than 4,000m^2 if the shop business hall and exhibition hall are arranged in high-rise buildings

2 It shall not be larger than 10,000m^2 if the shop business hall and exhibition hall are arranged in single-storey building or only on the first floor of multi-storey building;

3 It shall not be larger than 2,000m^2 if shop business hall and exhibition hall are arranged in underground or semi-underground spaces.

5.3.5 The underground or semi-underground stores with total building area greater than 20,000m^2 shall be separated into multiple areas with building area not greater than 20,000m^2 by adopting the fire walls without door, window or opening and the floor slabs with fire resistance rating not less than 2.00h. If it is necessary to connect the adjacent areas partially, the connection shall be carried out by the means of outdoor open space (like sunk square), fire lobby, exit passageway, smoke-proof staircase and the following requirements shall be met:

1 Outdoor open spaces, like sunk square, shall be able to prevent fire spreading in adjacent areas and be convenient for safe evacuation, and shall also meet shall meet those specified in 6.4.12 of this code;

2 The walls of fire lobbies shall be the fire partition wall with fire resistance rating not less than 3.00h, and shall also meet those specified in 6.4.13 of this code;

3 The exit passageway shall meet those specified in 6.4.14 of this code;

4 The door of smoke-proof staircase shall adopt Class A fire door.

5.3.6 If the commercial facilities such as catering services and stores are connected by means of shed pedestrian street and the buildings on the both sides of pedestrian street need to utilize the pedestrian street for safe evacuation, the following requirements shall be met:

1 The fire resistance class of the buildings on both sides of pedestrian street shall not be less than Class II.

2 The minimum distance between the opposite sides of the buildings on both sides of pedestrian street shall neither be less than the requirements for fire separation distance of the buildings with corresponding height in this code nor be less than 9m. The ends of pedestrian street should not be closed on any floor, otherwise the openable doors and windows shall be set in the exterior wall and the area of such doors and windows shall not be less than half of the exterior wall area at this position. The length of pedestrian street should not exceed 300m.

3 The fire partition walls with fire resistance rating not less than 2.00h shall be set

between the stores in the buildings on both sides of pedestrian street, and the building area of each store should not exceed 300m^2.

4 As for the stores in the buildings on both sides of pedestrian street, the fire resistance rating of their envelope elements on the side facing towards the pedestrian street shall not be less than 1.00h, and solid wall should be adopted, besides their doors and windows shall adopt Class B fire doors and windows; if fireproof glass wall (including door and window) is adopted, its fire insulation and fire integrity shall not be less than 1.00h; if the non-insulating fireproof glass wall (including door and window) with fire integrity not less than 1.00h is adopted, the closed sprinkler system shall be set for the purpose of protection. As for adjacent stores, solid wall with width not less than 1.0m and fire resistance rating not less than 1.00h shall be set between them on the side facing towards the pedestrian street.

If the buildings on both sides of pedestrian street are multi-storey buildings, the stores facing towards the pedestrian street on each floor shall be taken with proper measures to prevent the vertical spreading of fire and shall meet those specified in 6.2.5 of this code; if corridor or overhanging eave is set, its overhanging width shall not be less than 1.2m; if the stores on both sides of pedestrian street need to be set with corridor and connecting overpass on the upper floors, it shall be ensured that the opening area of floor slab on each upper floor of pedestrian street is not less than 37% of the ground area of pedestrian street, and the openings should be arranged uniformly.

5 The evacuation stairs in the buildings on both sides of pedestrian street shall be arranged next to the exterior wall and should directly lead to outdoor; if there is difficulty, these buildings may be directly led to the pedestrian street on the first floor; the evacuation doors of stores on the first floor may directly lead to the pedestrian street, and the walking distance from any point in the pedestrian street to the nearest outdoor safe place shall not be larger than 60m. The linear distance from the evacuation doors of stores on the second floor or above in the buildings on both sides of pedestrian street to the head of nearest evacuation stairs or other safety exits on this floor shall not be larger than 37.5m.

6 The ceiling of pedestrian street shall be made of non-combustible or difficult-combustible materials, and the fire resistance rating of its bearing structure shall not be less than 1.00h. No combustible material shall be arranged in the pedestrian street.

7 The height from the lower ceiling eave of pedestrian street to the ground shall not be less than 6.0m, the ceiling shall be set with proper natural smoke exhaust facilities and should adopt normally-open smoke vents, and the effective area of natural smoke vents shall not be less than 25% of the ground area of pedestrian street. The normally-closed natural smoke exhaust facilities shall be capable of manual and automatic opening in case of fire.

8 Outside the stores in the buildings on both sides of pedestrian street, *DN*65 fire hydrants shall be set at an interval of 30m and shall be equipped with fire hose reels or fire hoses; inside the stores, sprinkler system and fire alarm system shall be set; the corridors on each floor shall be set with sprinkler system. The automatic tracking and positioning jet flow fire extinguishing system should be set in pedestrian street.

9 Inside and outside the stores in the buildings on the both sides of pedestrian street, evacuation lighting, lighting evacuation indicating signs and fire emergency broadcast system shall be set.

5.4 Plane Arrangement

5.4.1 The plane arrangement of civil buildings shall be conducted reasonably in combination with the fire resistance class, fire hazard, use function, safe evacuation and other factors of the building.

5.4.2 Except the auxiliary storerooms set to meet the use functions of civil buildings, the production workshop and other storerooms shall not be arranged in civil building.

The stores, workshops and storerooms operating, storing or using Categories A and B fire-hazardous articles must not be arranged in civil buildings.

5.4.3 If store buildings and exhibition buildings are the buildings with Class III fire resistance, their number of storeys shall not exceed 2; if they are the buildings with Class IV fire resistance, they shall be single-storey buildings. If the business hall and exhibition hall are arranged in the buildings with Class III fire resistance, they shall be arranged on the first or second floor; if they are arranged in the buildings with Class IV fire resistance, they shall arranged on the first floor.

The business hall and exhibition hall shall not be arranged on the third floor underground or below. The underground or semi-underground business hall and exhibition hall shall not operate, store or exhibit Categories A and B fire-hazardous articles.

5.4.4 The children activity places such as the children rooms in nursery and kindergarten and the senior activity places should be arranged in independent buildings and shall not be arranged underground or semi-underground; if the building with Class I or II fire resistance is adopted, the number of storeys shall not exceed 3; if the building with Class III fire resistance is adopted, the number of storeys shall not exceed 2; if the building with Class IV fire resistance is adopted, it shall be a single-storey building; if it is necessary to arrange in other civil buildings, the following requirements shall be met:

1 If they are arranged in buildings with Class I or II fire resistance, they shall be arranged on the first, second or third floor;

2 If they are arranged in the buildings with Class III fire resistance, they shall be arranged on the first or second floor;

3 If they are arranged in the buildings with Class IV fire resistance, they shall be arranged on the first floor;

4 If they are arranged in high-rise buildings, they shall be set with independent safety exits and evacuation stairs;

5 If they are arranged in single-/multi-storey buildings, they should be set with independent safety exits and evacuation stairs.

5.4.5 The inpatient part of hospital and sanatorium shall not be arranged underground or semi-underground.

If the inpatient part of hospital and sanatorium adopts the building with Class III fire resistance, the number of storeys shall not exceed 2; if it adopts the building with Class IV fire resistance, it shall be single-storey building; if it is arranged in the building with Class III fire resistance, it shall be arranged on the first or second floor; if it is arranged in the building with Class IV fire resistance, it shall be arranged on the first floor.

Fire partition walls with fire resistance rating not less than 2.00h shall be adopted for the separation between adjacent nursing units in the inpatient building of hospital and sanatorium, the doors in these partition walls shall adopt Class B fire doors, and the fire doors arranged on passageway shall adopt normally-open fire doors.

5.4.6 If the teaching building, canteen and vegetable market adopt the buildings with Class III fire resistance, the number of storeys shall not exceed 2; if they adopt the buildings with Class IV fire resistance, they shall be single-storey buildings; if they are arranged in the buildings with Class III fire resistance, they shall be arranged on the first or second floor; if they arranged in the buildings with Class IV fire resistance, they shall be arranged on the first floor.

5.4.7 Theatre, cinema and auditorium should be arranged in independent buildings; if they adopt the buildings with Class III fire resistance, the number of storeys shall not exceed 2; if they are necessary to be arranged in other civil buildings, they shall be arranged with at least one independent safety exit and one evacuation stair, and shall also meet the following requirements:

1 They shall be separated from other areas by adopting the fire partition walls with fire resistance rating not less than 2.00h and the Class A fire doors.

2 If they are arranged in the buildings with Class I or II fire resistance, the audience hall should be arranged on the first, second or third floor; if they are necessary to be arranged on the fourth floor or above, the number of evacuation doors of each hall and room shall not be less than 2, and the building area of each audience hall should not be larger than 400m^2.

3 If they are arranged in the buildings with Class III fire resistance, they shall not be arranged on the third floor or above.

4 If they are arranged underground or semi-underground, they should be arranged on the first floor underground but shall not be arranged on the third floor underground or below.

5 If they are arranged in high-rise buildings, they shall be set with such automatic fire extinguishing systems as fire alarm system and sprinkler system.

5.4.8 The conference hall, multi-function hall and other crowded locations in buildings should be arranged on the first, second or third floor. If they are arranged in the buildings with Class III fire resistance, they shall not be arranged on the third floor or above. If they are necessary to be arranged on other floors in the buildings with Class I or II fire resistance, they shall meet the following requirements:

1 The number of evacuation doors of each hall/room shall not be less than 2, and the building area of each hall/room should not be larger than 400m^2;

2 If they are arranged underground or semi-underground, they should be arranged on the first floor underground but shall not be arranged on the third floor underground or below;

3 If they are arranged in high-rise buildings, they shall be set with such automatic fire extinguishing systems as fire alarm system and sprinkler system.

5.4.9 The arrangement of such sing and dancing entertainment and show venues as KTV, video hall, nightclub, karaoke hall (including the restaurant having the functions of karaoke), recreation hall (including the electronic recreation hall), sauna room (excluding the bathing part) and netbar shall meet the following requirements:

1 They shall not be arranged on the second floor underground or below;

2 They should be arranged at the positions near the exterior walls on the first, second

or third floor in the buildings with Class I or II fire resistance;

3 They should not be arranged on both sides or at the terminals of dead end;

4 If they are necessary to be arranged on the first floor underground, the height difference between the ground of the first floor underground and the terrace at the outdoor exit and entrance shall not be larger than 10m;

5 If they are necessary to be arranged underground or on the fourth floor or above, the building area of each hall/room shall not be larger than 200m^2;

6 The halls and rooms shall be separated from each other as well as from other parts of the building by adopting the fire partition walls with fire resistance rating not less than 2.00h and the non-combustible floor slabs with fire resistance rating not less than 1.00h; moreover, the doors set on the walls of these halls and rooms and the doors connecting this location to other parts of the building shall adopt Class B fire doors.

5.4.10 Except the commercial facilities, if residential building is constructed jointly with the buildings of other use functions, the following requirements shall be met:

1 The residential part and non-residential part shall be completely separated by adopting the fire partition walls (without door, window or opening) with fire resistance rating not less than 2.00h and the non-combustible floor slabs with fire resistance rating not less than 1.50h; in case of high-rise building, they shall be completely separated by adopting fire walls without door, window or opening and the non-combustible floor slabs with fire resistance rating not less than 2.00h. The fire prevention measures taken for exterior wall between openings of upper and lower floors shall meet the requirements specified 6.2.5 of this code.

2 The safety exits and evacuation stairs of residential part and non-residential part shall be arranged independently; the ground garage serving for the residential part shall be arranged with independent evacuation stairs or safety exit, while the evacuation stairs of underground garage shall be separated according to those specified in 6.4.4 of this code.

3 As for the residential part and non-residential part, the allocation of their safe evacuation, fire compartment and indoor fire-fighting facilities may comply with the requirements about residential buildings and public buildings in this code respectively according to their respective building height; other fire protection design of this building shall comply with the requirements about public buildings in this code according to the total building height and building scale.

5.4.11 As for the residential buildings set with commercial facilities, the residential part shall be completely separated from the commercial facilities by adopting fire partition walls with fire resistance rating not less than 2.00h and without door, window or opening and non-combustible floor slabs with fire resistance rating not less than 1.50h; the safety exits and evacuation stairs of residential buildings and commercial facilities shall be set respectively and independently.

The separation units in commercial facilities shall be mutually separated by the fire partition wall without door, window or opening and with fire resistance rating not less than 2.00h, when the building area of any storey of each separation unit is larger than 200m^2, 2 safety exits or evacuation doors shall be set on this floor. The linear distance from any point in each separation unit to the nearest exit directly leading to outdoor

shall not be greater than the maximum linear distance from the evacuation door on both sides or at the terminal of the dead end in other multi-storey buildings to the nearest safety exit, as specified in Table 5.5.17 of this code.

Note: The distance of indoor stairs may be calculated according to 1.50 times of its horizontal projection length.

5.4.12 The fuel oil or gas-fired boiler, oil immersed transformer and high voltage capacitor charged with combustible oil and heavy oil switch should be set in the special room outside the building; where they must be set adjacent to civil building, fire wall shall be adopted to separate it from the adjacent building, and shall not be adjacent to the crowded public areas; the fire resistance rating of the special room shall not be less than Class II; where they must be set in civil buildings, they shall not be set on upper floor, lower floor of the crowded public areas or adjacent to the latter and shall meet the following requirements:

1 The fuel oil or gas-fired boiler house, transformer room shall be set at the positions adjacent to the exterior wall on the first floor or on the ground floor, but the constant (negative) compression fuel oil or gas-fired boiler may be set on the second floor underground or on the roof. The distance from constant (negative) compression fuel oil boiler set on the roof to the safety exit on the roof shall not be less than 6m.

The boiler adopting combustible gas with the relative density (ratio to air density) not less than 0.75 as the fuel shall not be set underground or semi-underground;

2 All the evacuation doors of boiler house and transformer room shall directly lead to outdoor or safety exits.

3 The fire partition wall with fire resistance rating not less than 2.00h and the non-combustible floor slab with fire resistance rating not less than 1.50h shall be adopted to separate boiler house and transformer room from other parts. Openings shall not be set on the partition wall and floor slab; where door and window must be set on the partition wall, Class A fire door and window shall be adopted.

4 Where oil storage room is set in the boiler house, the total storage volume shall not be greater than 1m^3, and the fire partition wall with fire resistance rating not less than 3.00h shall be adopted to separate the oil storage room from the boiler house; Class A fire door shall be set where door must be set on the fire wall.

5 The fire prevention partition wall with fire resistance rating not less than 2.00h shall be set between the transformer rooms and between the transformer room and power distribution room.

6 As for the oil immersed transformer, heavy oil switch room and high voltage capacitor room, the facilities to prevent oil product bleeding shall be set. The accident oil storage facility capable of storing all the oil volume of the transformer shall be set under the oil immersion transformer.

7 Fire alarm installations shall be set.

8 The fire extinguishing facilities appropriate to the volume of boiler, transformer, electric capacitor and heavy oil switch as well as the building scale shall be set; when sprinkler systems are arranged in other parts in a building, sprinkler systems shall be set.

9 The boiler capacity shall meet the requirements of the current national standard "Code for Design of Boiler Plant" (GB 50041). The total capacity of oil immersed

transformer shall not be greater than 1,260kV·A and its single capacity shall not be greater than 630kV·A.

10 Explosion pressure relief facilities shall be set in the gas-fired boiler house. Independent ventilation system shall be set for fuel oil or gas fired boiler and shall meet the requirements of Chapter 9 of this code.

5.4.13 The diesel generator rooms arranged in civil buildings shall meet the following requirements:

1 They should be arranged on the first floor or the first and second floors underground.

2 They shall not be arranged on the upper floor or lower floor of crowded public areas or adjacent to the latter.

3 The fire partition wall with fire resistance rating not less than 2.00h, and the non-combustible floor slab with fire resistance rating of 1.50h shall be adopted to separate them from other parts; and class A fire doors shall be adopted.

4 Where oil storage room is arranged in the machine room, its total storage volume shall not be greater than 1m^3, and the fire partition wall with fire resistance rating not less than 3.00h shall be adopted to separate oil storage room from generator room; Class A fire door shall be arranged where door must be set on the fire partition wall.

5 Fire alarm installations shall be set.

6 The fire extinguishing facilities appropriate to the volume of diesel generator and to building scale shall be set; where sprinkler systems are set at other parts in the building, sprinkler system shall be set in the machine room.

5.4.14 As for Category C liquid fuel for use in a building, its storage tanks shall be arranged outside the building and shall meet the following requirements:

1 Where the total capacity is no greater than 15m^3 and it is buried directly underground around the building and the exterior wall of the building within 4.0m from the side facing the oil tank is fire wall, the fire separation distance between the storage tanks and the building is not limited;

2 Where the total capacity is greater than 15m^3, the arrangement of the storage tank shall meet the requirements of 4.2 in this code;

3 Where tundish is arranged, the capacity of the tundish shall not be greater than 1m^3 and shall be arranged in the separate rooms with Class I or Class II fire resistance and the class A fire door shall be adopted.

5.4.15 As for the boilers and diesel generators arranged in the building, their fuel feeding pipes shall meet the following requirements:

1 Automatic and manual block valves shall be set on the pipes before entering the building and in the equipment room;

2 The oil tanks in the oil storage room shall be closed and set with vent pipes to outdoor; the breather valve with flame arrester shall be set for vent pipe and the facilities to prevent oil product bleeding shall be set at the bottom of the oil tanks;

3 The laying of fuel gas supply pipes shall meet the requirements of the current national standard "Code for Design of City Gas Engineering" (GB 50028).

5.4.16 Where combustible gas is applied in high-rise civil buildings, pipe air supply shall be adopted. The room or position where combustible gas is applied should be set adjacent to the

exterior wall and shall meet the requirements of the current national standard "Code for Design of City Gas Engineering" (GB 50028).

5.4.17 Where air supply of LPG cylinder group is adopted in the building, the following requirements shall be met:

1 Independent cylinder group rooms shall be set;

2 Cylinder group room shall not be adjacent to residential buildings, important public buildings and other high-rise public buildings; where the cylinder group room with the total capacity of LPG cylinder not greater than 1m³ is adjacent to other buildings served, natural gasification method shall be adopted for air supply.

3 The fire separation distance from the independent cylinder group room with total capacity of LPG cylinder larger 1m³ and not larger than 4m³ to the building served shall meet the requirements of Table 5.4.17 of this code;

Table 5.4.17 Fire Separation Distance Between Independent Cylinder Group Room of LPG Cylinder and the Building Served (m)

Name		Total volume (V) of independent cylinder group room of LPG cylinder (m³)	
		$V \leq 2$	$2 < V \leq 4$
Open flame location or sparking site		25	30
Important public buildings and Category I high-rise civil buildings		15	20
Podiums and other civil buildings		8	10
Roads (roadside)	Primary	10	
	Secondary	5	

Note: The total capacity of gas container shall be calculated according to the product of the cylinder number multiplied by the geometrical capacity of single cylinder.

4 Emergency automatic shutoff valve shall be set on the general air outlet pipe of cylinder group room;

5 Combustible gas concentration alarm device shall be set in cylinder group room;

6 The fire protection shall meet the requirements of the current national standard "Code for Design of City Gas Engineering" (GB 50028).

5.5 Safe Evacuation and Refuge

I General Requirements

5.5.1 Safe evacuation and refuge facilities shall be arranged reasonably for the civil buildings according to the factors such as the building height, scale, application function and fire resistance rating. The location, quantity and width of the safety exits and evacuation doors and the forms of evacuation stairs shall meet the requirements of safe evacuation of personnel.

5.5.2 The safety exits and evacuation doors in the building shall be in distributed arrangement, and the horizontal distance between the nearest edges of two adjacent safety exits on each floor in each fire compartment in the building or in a fire compartment and in each dwelling unit as well as the horizontal distance between the nearest edges of two

adjacent evacuation doors in each room shall not be less than 5m.

5.5.3 The staircase of building should lead to the roof, and the door or window leading to the roof shall open outward.

5.5.4 The escalator and elevator shall not be regarded as safe evacuation facilities.

5.5.5 Except crowded public areas, as for the underground or semi-underground buildings (rooms) with building area not greater than 500m^2 and number of users not exceeding 30 and the buried depth not greater than 10m, when two safety exits are required, one of them may use the metallic vertical stairs directly leading to outdoor.

Except singing and dancing entertainment and show venues, in the underground or semi-underground equipment rooms with building area of fire compartment not greater than 200m^2 and other underground or semi-underground buildings (rooms) with building area of fire compartment not greater than 50m^2 and with the number of people frequently staying not exceeding 15, one safety exit or one evacuation stair may be set.

Unless otherwise stated in this code, in the underground or semi-underground equipment rooms with building area not greater than 200m^2 and other underground or semi-underground rooms with building area not greater than 50m^2 and with the number of people frequently staying not exceeding 15, one evacuation door may be set.

5.5.6 As for the elevator directly leading to the attached garage in the building, elevator hall shall be set in the garage, and Class B fire door with fire resistance rating not less than 2.00h shall be adopted to separate from the garage.

5.5.7 Protection cornice with width not less than 1.0m corbelling out shall be set above the safety exit of the high-rise building directly leading to outdoor.

II Public Buildings

5.5.8 As for every fire compartment in the public building or every floor in a fire compartment, the quantity of safety exits shall be determined through calculation and shall not be less than 2. The public buildings meeting one of the following conditions may be set with one safety exit or one evacuation stair:

1 Except nursery and kindergarten, the first floor of single-storey public building or multi-storey public building with 50 people and the building area of less than 200m^2;

2 Except medical buildings, senior citizen buildings, the children rooms for nursery and kindergarten, children activity places such as children amusement hall as well as singing and dancing entertainment and show venues, the public buildings in accordance with those specified in Table 5.5.8;

Table 5.5.8 Public Building Where an Evacuation Stairs May Be Set

Fire resistance rating	Maximum number of storeys	Maximum building area of each layer (m^2)	Number of people
Classes I and II	3	200	The total number of people on the second and third floor shall not exceed 50
Class III	3	200	The total number of people on the second and third floor shall not exceed 25
Class IV	2	200	The number of people on the second floor shall not exceed 15

5.5.9 As for the fire compartments with difficulty for all the safety exits in public building with Class I or II fire resistance to lead to outdoor, Class A fire door leading to the adjacent fire compartments may be used as safety exits, but they shall meet the following requirements:

1 Where Class A fire door leading to adjacent fire compartments are used as safety exits, fire wall shall be adopted to separate from the adjacent fire compartments;

2 As for the fire compartments with building area of no greater than 1,000m^2, the number of the safety exits leading directly outdoor shall not be less than 2. as for the fire compartments with building area not greater than 1,000m^2, the number of safety exits directly leading to outdoor shall not be less than one;

3 The clear evacuation width of the fire compartment leading to outdoor shall not be greater than 30% of the total clear evacuation width required for the calculation according to the requirements of 5.5.21 in this code; the total clear width of the safety exits on each floor of the building directly leading to outdoor shall not be less than the total evacuation clear width required for the calculation according to the requirements of 5.5.21 in this code.

5.5.10 As for the evacuation stairs of high-rise public building, where it is difficult for dispersion arrangement and the distance from the evacuation door to the nearest evacuation stairs entrance is not less than 10m, scissor staircase may be adopted but the following requirements shall be met:

1 Staircase shall be smoke-proof;

2 Fire partition wall with fire resistance rating not less than 1.00h shall be set between the stair flights;

3 The front rooms of staircases shall be arranged respectively;

5.5.11 As for the multi-storey public buildings with Class I or Class II fire resistance where no less than 2 evacuation stairs are arranged, if the top floors rise partially, when the number of storeys of the higher parts does not exceed 2, and the total number of people does not exceed 50 and the building area of every storey is not greater than 200m^2, one evacuation stair may be arranged for the higher part, but at least one safety exit directly leading to the accessible flat roof of the main body of building shall be arranged and the accessible roof shall meet the requirements of safe evacuation of personnel.

5.5.12 As for Category I high-rise public buildings and Category II high-rise public buildings with building height of more than 32m, smoke-proof staircase shall be adopted as evacuation stairs.

As for podiums and Category II high-rise public buildings with height of no greater than 32m, enclosed staircase shall be adopted as evacuation stairs.

Note: Where fire wall is set between podiums and main body of high-rise building, the evacuation stairs of podiums may be determined according to the relevant requirements of single-/multi-storey buildings in this code.

5.5.13 Except the staircase connected directly with open veranda, enclosed staircase shall be adopted as the evacuation stairs of the following multi-storey public buildings:

1 Medical buildings, hotels, senior citizen buildings as well as buildings with similar functions;

2 The buildings where singing and dancing entertainment and show venues are arranged;

3 Store, library and exhibition building, conference center and buildings with

similar application functions;

4 Other buildings with 6 floors or more,

5.5.14 Elevator halls should be arranged for the passenger and goods elevators in public buildings, and should not be arranged directly in the locations such as business hall, exhibition hall and multi-function hall.

5.5.15 The number of the evacuation doors in the rooms in public buildings shall be determined according to the calculation and shall not be less than 2 . Except the rooms located at the end of the passageways in nurseries, kindergartens, senior citizen buildings, medical buildings and teaching buildings, the rooms meeting one of the following conditions may be set with one evacuation door:

1 As for the rooms located between two safety exits or on the two sides of dead end, the building area is not greater than 50m^2 for nurseries, kindergartens and senior citizen buildings; the building area is not greater than 75m^2 for medical buildings and teaching buildings; the building area is not greater than 120m^2 for other buildings or locations.

2 As for the rooms at the end of passageways, the building area is less than 50m^2 and the clear width of evacuation door is less than 0.90m, or the linear distance from any point in the room to the evacuation door is not greater than 15m, the building area is not greater than 200m^2 and the clear width of the evacuation is not less than 1.40m.

3 The halls or rooms with the building area not greater than 50m^2 and the number of people frequently staying not exceeding 15 in the singing and dancing entertainment and show venues.

5.5.16 As for the audience halls or multi-function halls of theatre, cinema, auditorium and gymnasium, the number of evacuation doors shall be determined through calculation and shall not be less than 2 and shall meet the following requirements:

1 As for the audience halls or multi-function halls of theatres, cinemas and auditoriums, the average number of evacuated persons of each evacuation door shall not exceed 250; when the number of persons exceeds 2,000, for the persons over 2,000, the average number of evacuated persons shall not exceed 400 at each evacuation door.

2 As for the audience hall of gymnasium, the average number of evacuated persons at each evacuation door should not exceed 400~700.

5.5.17 The safety evacuation distance in public buildings shall meet the following requirements:

1 The linear distance from the evacuation door of the room directly leading to evacuation passageway to the nearest safety exit shall not be greater than those specified in Table 5.5.17.

Table 5.5.17 Linear Distance from the Evacuation Door of the Room Directly Leading to Evacuation Passageway to the Nearest Safety Exit (m)

Name			Evacuation door located between two safety exits			Evacuation doors located at the both sides or terminal of dead end		
			Classes I and II	Class III	Class IV	Classes I and II	Class III	Class IV
Nurseries, kindergartens and senior citizen buildings			25	20	15	20	15	10
Singing and dancing entertainment and show venues			25	20	15	9	-	-
Medical buildings	Single-/multi-storey		35	30	25	20	15	10
	High-rise	Ward part	24	-	-	12	-	-
		Other parts	30	-	-	15	-	-
Teaching buildings	Single-/multi-storey		35	30	25	22	20	10
	High-rise		30	-	-	15	-	-
High-rise hotels and exhibition buildings			30	-	-	-	-	-
Other buildings	Single-/multi-storey		40	35	25	22	20	15
	High-rise		40	-	-	20	-	-

Notes:

1 The linear distance from the evacuation door of the room toward open veranda in the building to the nearest safety exit may increase 5m according those specified in this table.

2 Where the room is located between two staircases, the linear distance from the room evacuation door directly leading to the evacuation passageway to the nearest open stairway shall reduce 5m according to the requirements of this table; where the room is located at both sides or terminal of dead end, the distance shall reduce 2m according to the requirements of this table.

3 Where sprinkler system is arranged in the whole building, the safety evacuation distance may increase 25% according to the requirements of this table.

2 The staircase shall lead to outdoor directly on the first floor; where there is any difficulty, enlarged enclosed staircase or smoke-proof staircase front room shall be adopted on the first floor. Where the number of storeys does not exceed 4, and enlarged enclosed staircase or smoke-proof staircase front room is not adopted, the door leading directly to outdoor shall be arranged at the place no less than 15m from the staircase.

3 The linear distance from any point in the room to the room evacuation door directly leading to the evacuation passageway shall not be greater than the linear distance from the evacuation doors at two sides or terminal of the dead end to the nearest safety exit as specified in Table 5.5.17.

4 As for the audience hall, exhibition hall, multi-function hall, canteen and business hall with no less than 2 evacuation doors or safety exits in the public building with Class I or II fire resistance, the linear distance from any point in the room to the nearest evacuation door or safety exit shall not be greater than 30m; where the evacuation door cannot lead directly to the outdoor ground or escape staircase, an evacuate passageway not greater than 10m shall be adopted to lead directly to the nearest safety exit. Where sprinkler system is arranged in this location, the safety evacuation distance from any point in the room to the nearest safety exit may increase

25% respectively.

5.5.18 Unless otherwise stated in this code, the clear width of the evacuation doors and safety exits in public buildings shall not be less than 0.90m and the clear width of evacuation passageway and evacuation stairs shall not be less than 1.10m.

The minimum clear width of evacuation door on the first floor of staircase, exterior evacuation door on the first floor, evacuation passageway and evacuation stairs in high-rise public buildings shall meet the requirements of Table 5.5.18.

Table 5.5.18 The Minimum Clear Width of Evacuation Door on the First Floor of Staircase, Exterior Evacuation Door on the First Floor, Evacuation Passageway and Evacuation Stairs in High-Rise Public Buildings (m)

Building category	Evacuation door on the first floor of staircase and exterior evacuation door on the first floor	Corridor		Evacuation stairs
		Rooms on one side	Rooms on both sides	
High-rise medical buildings	1.30	1.40	1.50	1.30
Other high-rise public buildings	1.20	1.30	1.40	1.20

5.5.19 The evacuation doors of crowded public areas and audience halls shall not be set with threshold, and the clear width of the doors shall not be less than 1.40m, and no stairstep shall be set within 1.4m around the doorway.

The clear width of the outdoor evacuation route of crowded public areas shall not be less than 3.00m and shall lead directly to wide zones.

5.5.20 The respective total clear width of the evacuation passageway, evacuation staircase, evacuation door and safety exit at the locations such as theatre, cinema, audience hall and gymnasium shall meet the following requirements:

1 The clear width of evacuation passageway in audience hall shall be calculated as not less than 0.6m for every 100 people and shall not be less than 1.00m; the clear width of side passageway should not be less than 0.80m.

Where the evacuation passageway is arranged, the seats between horizontal passageways should not exceed 20 rows; the seats between longitudinal passageways shall meet the following requirements: for theatre, cinema and auditorium, the number of seats in each row should not exceed 22; for gymnasium, the number of seats in each row should not exceed 26; where the distance between front and rear rows is not less than 0.90m, the number of seats in each row may be increased by 1.0 times, but shall not exceed 50; where longitudinal passageway is only on one side, the seats shall be reduced by half.

2 The respective total clear width of all the internal doors, external doors, stairs and passageways in theatre, cinema and auditorium shall be determined according to the calculation of the minimum evacuation clear width not less than those specified in Table 5.5.20-1 for every 100 people.

Table 5.5.20-1 Minimum Evacuation Clear Width for Every 100 People in Theatre, Cinema and Auditorium (m/hundred people)

Number of seats in audience hall (seat)			≤ 2,500	≤ 1,200
Fire resistance rating			Classes I and II	Class III
Evacuation position	Door and passageway	Flat slope ground and steps ground	0.65	0.85
			0.75	1.00
	Stairs		0.75	1.00

3 The respective total clear width of all the internal doors, external doors, stairs and passageways for the evacuation of audience in gymnasium shall be determined according to the calculation of the minimum evacuation clear width not less than those specified in Table 5.5.20-2 for every 100 evacuation people.

Table 5.5.20-2 Minimum Evacuation Clear Width for Every 100 People in Gymnasium (M/Hundred People)

Scope of seat number in audience hall (seat)			3,000~5,000	5,001~10,000	10,001~20,000
Evacuation position	Door and passageway	Flat slope ground	0.43	0.37	0.32
		Steps ground	0.50	0.43	0.37
	Stairs		0.50	0.43	0.37

Note: The total evacuation clear width calculated according to the specification corresponding to the greater seat number in this table shall not be less than the total evacuation clear width according to the maximum seat number corresponding to the adjacent smaller seat number. As for the gymnasium with the number of seats in audience hall less than 3,000, in the calculation of the total clear width of all the inner doors, exterior doors, stairs and passageways for evacuation of audience, the minimum evacuation clear width shall not be less than those specified in 5.5.20-1 for every 100 people.

4 The entrance used for waiting shall not be used as the evacuation door of audience hall.

5.5.21 As for other public buildings except theatre, cinema, auditorium and gymnasium, the respective total clear width of the room evacuation doors, safety exits, evacuation passageways and evacuation stairs shall meet the following requirements:

1 The respective total clear width of room evacuation doors, safety exits, evacuation passageway and evacuation stairs on each floor shall be determined according to the calculation of the minimum clear evacuation width for every 100 people not less than those specified in Table 5.5.21-1. Where the number of evacuated persons on every floor is not equal, the total clear width of evacuation stairs may be calculated according to different floors, the total clear width of the lower stairs in above-ground buildings shall be calculated according to the largest number of evacuated people on this floor or above this floor; the total clear width of the stairs on upper floors in underground buildings shall be calculated according to the largest number of evacuated people on this floor or below this floor.

Table 5.5.21-1 Minimum Clear Evacuation Width of the Room Evacuation Doors, Safety Exits, Evacuation Passageways and Evacuation Stairs on Every Floor for Every 100 People (m/hundred people)

Number of building floors		Fire resistance rating of buildings		
		Classes I and II	Class III	Class IV
Overground storey	1~2	0.65	0.75	1.00
	3	0.75	1.00	-
	≥4	1.00	1.25	-
Underground storey	Height difference with the ground entrance/exit ΔH≤10m	0.75	-	-
	Height difference with the ground entrance/exit ΔH>10m	1.00	-	-

2 As for underground or semi-underground crowded halls, rooms and singing and dancing entertainment and show venues, the respective total clear width of the room evacuation doors, safety exits, evacuation passageways and evacuation stairs shall be

determined according to the calculation of 1.00m for every 100 evacuation people.

3 The total clear width of the external doors on the first floor shall be determined according to the calculation of the maximum evacuation people in this building; as for the external door not for evacuation of people from other floors, the width may be determined according to the calculation of the number of evacuated persons on this floor.

4 The number of evacuated persons in video hall of singing and dancing entertainment and show venues shall be calculated as 1.0 person/m^2 according to the building area of the halls and rooms; and the number of evacuated persons in singing and dancing entertainment and show venues shall be calculated as 0.5 person/m^2 according to the building area of the halls and rooms.

5 As for the locations with fixed seats, the number of evacuated persons may be calculated according to 1.1 times the actual number of seats.

6 The number of evacuated persons in exhibition hall shall be calculated according to the building area and people density of exhibition hall, and the people density in exhibition hall should not be less than 0.75 person / m^2.

7 The number of evacuated persons in stores shall be calculated according to the building area of business hall on each floor multiplied by the people density specified in Table 5.5.21-2. The people density of building material stores, furniture and light fixture exhibition buildings may be determined according to 30% of the specified values in Table 5.5.21-2.

Table 5.5.21-2 People Density in Shop Business Hall (person / m^2)

Storey position	Second floor underground	First floor underground	First and second floors overground	Third floor overground	Fourth floor or above overground
People density	0.56	0.60	0.43~0.60	0.39~0.54	0.30~0.42

5.5.22 As for public crowded buildings, metallic fences should not be arranged at window and balcony, etc.; where they must be arranged there, they shall be able to be opened from inside; suitable auxiliary evacuation escape facilities shall be set at the window and balcony according to their heights.

5.5.23 Refuge floor (room) shall be arranged in the public buildings with the building height greater than 100m. The refuge floor (room) shall meet the following requirements:

1 The height from the floor of the first refuge floor (room) to the ground of the fire fighting and rescue site shall not be greater than 50m and the height between two refuge floors (rooms) should not be greater than 50m.

2 The evacuation stairs leading to refuge floor (room) shall be separated, misaligned on the same floor or disconnected on the upper and lower floors.

3 The net area of refuge floor (room) shall be able to meet the requirements of the designed number of refuge people, and should be calculated according to 5.0 persons/m^2.

4 Refuge floor may also be used as mechanical floor. The equipment pipes should be concentrated, and the inflammable, combustible liquid or gas pipes shall be concentrated; the equipment pipe area shall be separated from refuge area by adopting the fire partition wall with fire resistance rating not less than 3.00h. Piping shafts and equipment room shall be separated from refuge area by adopting the fire partition wall

with fire resistance rating not less than 2.00h; the doors of piping shafts and equipment room shall not open toward refuge area directly; when it is necessary to do so, the distance to the entrance/exit of refuge floor shall not be less than 5m, and class A fire door shall be adopted.

Flammable, combustible liquid or gas pipes shall not be arranged, and other openings except windows and evacuation doors shall not be set in refuge room.

5 Fire elevator exits shall be arranged on refuge floor.

6 Fire hydrants and fire hose reels shall be arranged.

7 Dedicated telephone and emergency broadcasting for fire protection shall be arranged.

8 Obvious indication signs shall be arranged at the entrance from refuge floor (room) to staircase and at the exit from evacuation stairs to refuge floor (room).

9 Windows which may be opened outwards directly or independent mechanical smoke-proof facilities shall be arranged, and Class B fire window shall be adopted.

5.5.24 As for high-rise inpatient buildings, refuge rooms shall be arranged on the inpatient building floor and at clean operating department on the second floor and above and shall meet the following requirements:

1 The number of care units for the service in refuge room shall not exceed 2 and the net area shall be determined with each care unit not less than 25.0m^2.

2 Where refuge room is also used for other purposes, the refuge safety of people shall be guaranteed and the net area for refuge shall not be reduced.

3 Refuge rooms shall be close to staircase and fire partition with fire resistance rating not less than 2.00h and class A fire door shall be adopted for separating from other parts.

4 Dedicated telephone and emergency broadcasting for fire protection shall be arranged.

5 Obvious indication sign shall be arranged at the entrance of refuge room.

6 Windows which may be opened outwards directly or independent mechanical smoke-proof facilities shall be arranged, and Class B fire window shall be adopted.

III Residential buildings

5.5.25 The arrangement of safety exit of residential building shall meet the following requirements:

1 As for the buildings with height not greater than 27m, where the building area of any floor in each unit is more than 650m^2 or the distance from the entry door to the nearest safety exit is more than 15m, the safety exit number on every floor of each unit shall not be less than 2.

2 As for the buildings with height between 27m ~ 54m, where the building area of any floor in each unit is more than 650m^2 or the distance from the entry door to the nearest safety exit is more than 10m, the safety exit number on every floor of each unit shall not be less than 2.

3 As for the buildings with height more than 54m, the safety exit number on every floor of each unit shall not be less than 2.

5.5.26 As for the residential buildings with the height between 27m ~ 54m, where an evacuation staircase is arranged for each unit, the evacuation staircase shall lead to the roof, the evacuation staircase between units can be connected through roofs and Class B fire door shall be adopted as the entry door. Two safety exits shall be arranged where it cannot lead to the roof or cannot be connected through roofs.

5.5.27 The arrangement of evacuation staircase of residential building shall meet the following requirements:

1 Open staircase may be adopted for the residential buildings with height not greater than 21m; enclosed staircase shall be adopted for the evacuation staircase arranged adjacent to elevator shaft; where Class B fire door is adopted as entry door, open staircase still may be adopted.

2 As for the residential buildings with height between 21m ~ 33m, the enclosed staircase shall be adopted; where Class B fire door is adopted as entry door, open staircase may be adopted.

3 Smoke-proof staircase shall be adopted for residential buildings with height greater than 33m. Entry door should not directly open toward front room, where it is inevitable, the number of entry doors opening toward the same front room on each floor shall not be more than 3, and Class B fire door shall be adopted.

5.5.28 Where there is difficulty for the dispersion arrangement of evacuation staircase for the residential unit and the distance from any entry door to the entrance of the nearest escape staircase is not greater than 10m, scissor staircase may be adopted and the following requirements shall be met:

1 Smoke-proof staircase shall be adopted.

2 Fire partition wall with fire resistance rating not less than 1.00h shall be arranged between the stair flights.

3 The front room of staircase should not be shared; where it is shared, the utilization area of the front room shall not be less than 6.0m^2.

4 The front room of the staircase or the shared front room should not be shared by the fire elevator; if the staircase and the fire elevator share the same front room, the utilization area of the shared room shall not be less than 12.0m^2 and the length of the short side shall not be less than 2.4m.

5.5.29 The safety evacuation distance of the residential building shall meet the following requirements:

1 The linear distance from the entry door directly leading to the evacuation passageway to the nearest safety exit shall not be greater than those specified in Table 5.5.29.

Table 5.5.29 Linear Distance from Residential Building Entry Door Directly Leading to Evacuation Passageway to the Nearest Safety Exit (m)

Residential building category	Entry door between two safety exits			Entry door at both sides of dead end or end		
	Classes I and II	Class III	Class IV	Classes I and II	Class III	Class IV
Single-/multi-storey	40	35	25	22	20	15
High-rise	40	-	-	20	-	-

Notes:

1 The maximum linear distance from the entry door opening toward open veranda to the nearest safety exit may be

5m longer than those specified in the table.

2 As for the linear distance from entry door directly leading to evacuation passageway to the nearest open staircase, it shall be 5m shorter than those specified in this table when the entry door locates between two staircases, and it shall be 2m shorter than those specified in this table when the entry door locates on both sides or terminals of dead end.

3 When sprinkler system is arranged in all residential buildings, the safety evacuation distance may be increased by 25% on the basis of those specified in this table.

4 The distance from the entry door of skip floor apartment building to the nearest safety exit shall be counted from entry door; the distance of a flight of small stair may be calculated as 1.50 times of its horizontal projection length.

2 The staircase shall lead to outdoors directly on the first floor; or expanding enclosed staircase or front room of smoke-proof staircase shall be adopted on the first floor. Where the storey number does not exceed 4, the door leading directly to outdoors shall be arranged at the place no less than 15m away from the staircase.

3 The linear distance from any point in the room to the entry door directly leading to evacuation passageway shall not be greater than the maximum linear distance from evacuation door on both sides or terminals of the dead end to the nearest safety exit as specified in Table 5.5.29.

Note: As for duplex apartment building, the distance of indoor stair may be calculated according to 1.50 times of the horizontal projection length of the stair flight.

5.5.30 The total clear width of entry door, safety exit, evacuation passageway and evacuation staircase of residential building shall be determined through calculation, the clear width of entry door and safety exit shall not be less than 0.90m, and the clear width of evacuation passageway, evacuation staircase and exterior evacuation door on first floor shall not be less than 1.10m. As for the evacuation staircase with one side arranged with handrail in residential building with the height not greater than 18m, the clear width shall not be less than 1.0m.

5.5.31 Refuge floor shall be arranged in the residential building with height greater than 100m; the arrangement of refuge floor shall meet the requirements of refuge floor specified in 5.5.23 of this code.

5.5.32 As for residential building with height greater than 54m, one room of each household shall meet the following requirements:

1 It shall be arranged next to the exterior wall and arranged with openable exterior window;

2 The fire resistance rating of interior and exterior wall bodies shall not be less than 1.00h; Class B fire door should be adopted as the door of this room; the fire integrity of exterior window should not be less than 1.00h.

6 Building Construction

6.1 Fire Wall

6.1.1 Fire wall shall be constructed directly onto the foundation or the load-bearing structures like the frame and beam; the fire resistance rating of load-bearing structures like the frame and beam shall not be less than that of the fire wall.

The fire wall shall be parted from floor base to the bottom base of beam, floor slab or roof slab. Where the fire resistance rating of the load-bearing structure of high-rise factory building (storage) and roof slab is less than 1.00h, and the fire resistance rating of the load-bearing structure and roof slab of other building roof is less than 0.50h, the fire wall shall be more than 0.5m taller than the roof.

6.1.2 Where the horizontal distance from the center line of fire wall cross section to the end-surface of skylight is less than 4.0m, and the end-surface of skylight is combustible wall body, measures shall be taken to prevent the fire from spreading.

6.1.3 Where the exterior wall of building is a difficult-combustible or combustible wall body, the fire wall shall protrude the exterior surface of wall by more than 0.4m; the exterior walls on both sides of fire wall shall be non-combustible wall bodies, the width of which shall not be less than 2.0m and its fire resistance rating shall not be less than that of the exterior wall.

In case the exterior wall of the building is non-combustible wall body, fire wall may not protrude the exterior surface of wall, and the horizontal distance between the closest edges of door, window or opening on both sides of fire wall shall not be less than 2.0m; when measures such as arranging Class B fire window preventing fire horizontally spreading are adopted, such distance is not limited.

6.1.4 The fire wall in a building should not be arranged at the corner, where it is inevitable, the horizontal distance between the closest edges of door, window or opening on the walls on both sides of interior angle shall not be less than 4.0m; where measures such as arranging Class B fire window preventing fire horizontally spreading is adopted, such distance is not limited.

6.1.5 Door, window or opening shall not be arranged on the fire wall; where it is inevitable, Class A fire door and window unable to open or self-closing in case of fire shall be arranged.

Pipes conveying combustible gas and Class A, B, C liquids are strictly prohibited from penetrating the fire wall. Exhaust duct shall not be arranged inside the fire wall.

6.1.6 Pipes, besides those specified in 6.1.5 of this code, should not penetrate the fire wall; where it is inevitable, the firestop materials shall be adopted to fill the gaps between wall and pipes tightly; non-combustible material shall be adopted as the insulation material for pipes penetrating fire wall; where the pipes are of difficult-combustible or combustible material, fire prevention measures shall be adopted for pipes on both sides of fire wall.

6.1.7 The structure of fire wall shall be able to keep it standing still even the roof truss, beam or floor slab at its either side is damaged in case of fire.

6.2 Building Elements and Pipe Shafts

6.2.1 The partition wall between the stage and the audience hall of the building like theatre shall be fire partition wall with the fire resistance rating not less than 3.00h.

Fire partition wall with fire resistance rating not less than 1.50h may be adopted as the partition wall between upper part of stage and blind ceiling of audience hall, and Class B fire door shall be adopted on the partition wall.

The light control room and combustible material storeroom in the lower part of stage shall be separated from other parts with fire partition wall with the fire resistance rating not less than 2.00h.

Film projection room and rewinding room shall be separated from other parts with fire partition wall with the fire resistance rating not less than 1.50h. The observation hole and projection hole shall be adopted with fire separation measures.

6.2.2 Operating room or operating department, delivery room, intensive care unit, room for precise and precious medical equipment, storeroom, laboratory and film room in the medical buildings, children activity places such as the nursery, children room of kindergarten and the entertainment hall in the buildings as well as the senior activity place shall be separated from other sites or locations with fire partition wall and floor slab with fire resistance ratings not less than 2.00h and 1.00h respectively; The doors and windows necessary on the wall shall be Class B fire doors and windows.

6.2.3 The partition wall with the fire resistance rating not less than 2.00h shall be adopted to separate the following locations from other parts; Class B fire doors and windows shall be adopted as the doors and windows on the wall, where it is difficult, fire roller shutter may be adopted, but it shall meet those specified in 6.5.3 of this code.

1 Categories A and B production parts and parts using Category C liquid in the building;

2 Locations with open flame and high temperature in the factory buildings;

3 Rooms of different fire hazard types arranged in Categories A, B and C factory buildings (storages);

4 Auxiliary storerooms in the civil building; auxiliary rooms at the backstage of theatre;

5 Besides the kitchen in residential building, the common kitchen in dormitory or apartment building and the kitchen in other building;

6 Mobile garage arranged in residential building.

6.2.4 Fire wall in building shall be separated from the floor base to the bottom base of beam, floor slab or roof slab. The residential building separating wall and the walls between units shall be separated to the bottom base of beam, floor slab or roof slab; the fire resistance rating of the roof slab shall not be less than 0.50h.

6.2.5 Unless otherwise stated in this code, solid wall with the height not less than 1.2m or fire resisting overhanging eave with width not less than 1.0m and length not less than the width of opening shall be arranged between openings of upper and lower storeys of exterior wall of the building; where sprinkler system is arranged in the room, the height of solid wall between openings of upper and lower storeys shall not be less than 0.8m. If it is difficult to arrange solid wall between openings of upper and lower storeys,

fireproof glass wall may be arranged; the fire integrity of fireproof glass wall of high-rise building shall not be less than 1.00h, and the fire integrity of fireproof glass wall of multi-storey buildings shall not be less than 0.50h. The fire integrity of exterior window shall not be less than the requirements of fire integrity of fireproof glass wall.

The width of wall body between openings of adjacent households on the exterior wall of residential building shall not be less than 1.0m; if the width is less than 1.0m, clapboard protruding the exterior wall by not less than 0.6m shall be arranged between openings.

Fire resistance ratings and combustion performances of solid wall, fire resisting overhanging eave and clapboard shall not be inferior to the requirements of the building exterior wall with corresponding fire resistance rating.

6.2.6 As for building curtain wall, fire prevention measures meeting those specified in 6.2.5 in this code shall be adopted at the floor slab outer edge on each storey; the gap between curtain wall and floor slab on each storey shall be blocked by firestop materials.

6.2.7 The fire control room, extinguishing equipment room, fire pump room and machine room for air conditioning as well as power transformation and distribution room arranged in building shall be separated from other parts with the partition wall and floor slab with fire resistance ratings not less than 2.00h and 1.50h respectively.

The ventilation room arranged in Categories D and E factory buildings shall be separated from other parts with fire partition wall and floor slab with fire resistance ratings not less than 1.00h and 0.50h respectively.

Class A fire doors shall be adopted as the doors of ventilating and air conditioning machine room as well as power transformation and distribution room opening inward the building; Class B fire door shall be adopted as the doors of fire control room and other equipment room opening inward the building.

6.2.8 If foam plastic and other combustibles are adopted as the thermal insulation layer in wall body of refrigeration storages and low temperature production locations, non-combustible thermal insulating materials should be applied at each floor slab for horizontal fire separation. The fire resistance rating of fire separation position shall not be inferior to that of the floor slab. The combustible thermal insulation layer on garret floor and wall body of refrigeration storages should be separated by non-combustible wall body.

If foam plastic and others are adopted as the internal thermal insulation layer of refrigeration storages and low temperature production locations, the combustion performance of thermal insulation layer shall not be less than Class B_1 and the surface of thermal insulation layer shall be protected with non-combustible materials.

When the storeroom and processing workshop of refrigeration storage are built adjacent to each other, they shall be separated by fire walls. If it is necessary to set an opening to connect them, measures such as fire lobby shall be taken to separate them, and doors on both sides of the lobby shall be Class A fire doors. When ammonia compressor room is adjacent to processing workshop, they shall be separated by such fire walls without any door or window.

6.2.9 The vertical shafts such as elevator shaft in building shall meet the following requirements:

1 Elevator shaft shall be constructed independently. No pipes for combustible gases and Categories A, B, and C liquids and no cables or wires irrelevant to the elevator

shall be permitted in elevator shaft. Except elevator door, safety emergency exit and vent hole, no other opening shall be arranged on the wall of elevator shaft.

2 Such vertical shaftway as cable shaft, pipe shaft, discharge flue, exhaust duct and refuse channel shall be arranged independently. The fire resistance rating of shaft wall shall not be less than 1.00h; the Class C fire door shall be adopted as the inspection door in the shaft wall.

3 Cable shafts or pipe shafts within the building shall be blocked at the joint of floor slab on each layer with non-combustible material or firestop material with the fire resistance rating not inferior to that of the floor slab.

Openings that connect the cable shaft or pipe shaft with rooms or corridors in building shall be blocked with firestop materials.

4 Refuse channel in building should be arranged against the exterior wall; the exhaust outlet of refuse channel shall open directly to outdoor; refuse hopper shall be made of non-combustible material and capable of automatically closing.

5 The fire resistance rating of elevator landing door shall not be less than 1.00h and shall comply with the requirements of completeness and insulation specified in the current national standard "Fire Resistance Test for Lift Landing Doors - Methods of Measuring Integrity, Thermal Insulation and Heat Flux" (GB/T 27903).

6.2.10 Outdoor electro luminescence billboard shall not be directly arranged on the wall with combustible or difficult-combustible materials.

The arrangement of outdoor billboard shall not shelter the exterior window of building and shall not influence the outdoor fire-fighting and rescue action.

6.3 Roof, Blind Ceiling and Joints

6.3.1 Where combustible material is adopted for the insulation layer of blind ceiling of buildings with Class III or IV fire resistance rating, grey tile shall not be adopted for the roof.

Non-combustible material shall be adopted as the insulation layer used within the range of 0.5m around the nonmetallic chimney or 0.7m around the metal chimney in the blind ceiling.

6.3.2 As for blind ceiling in the building of Class III fire resistance with more than 2 storeys, dormer window shall be arranged within the range of every fire partition, and the spacing of dormer windows should not be greater than 50m.

6.3.3 As for blind ceiling containing combustible material, blind ceiling entrance with the clear width and clear height not less than 0.7m shall be arranged within the range of each fire partition; as for public building, the number of the blind ceiling entrances within the range of each fire partition should not be less than 2. The entrance of the blind ceiling should be in the corridor close to the staircase.

6.3.4 Non-combustible material shall be adopted for the filling material of deformation joint and the construction base of deformation joint.

The electrical wire, cable and pipes for combustible gas and Class A, B, C liquids should not penetrate the deformation joint in building, where it is inevitable, sleeve made of non-combustible material shall be arranged at the place where the deformation joint is penetrated or other measures avoiding deformation shall be adopted, and firestop materials

shall be adopted for blocking.

6.3.5 Firestop materials shall be adopted to block the joints where pipes in smoke control, smoke exhaust and heating, ventilating and air conditioning system and other pipes in building penetrate the fire partition wall, floor slab or fire wall.

Where the air pipe penetrates the fire partition wall, floor slab and fire wall, the air pipe within the range of 2.0m to each sides of fire valve or smoke fire valve on air pipe at penetrating part shall be fireproof air pipe or the air pipe outer wall shall be taken with fire protection measures, and the fire resistance rating shall not be inferior to that of the fire partition.

6.3.6 As for pipes in the building prone to deforming under high temperature and flame, fire retardant measures should be taken at the penetrating position of floor slab and on both sides of penetrated fire partition wall.

6.3.7 Measures preventing fire spreading shall be taken between opening on building roof and adjacent building or facility.

6.4 Evacuation Staircases and Stairs

6.4.1 Evacuation staircase shall meet the following requirements:

1 Natural lighting and ventilation shall be available for the staircase which should be arranged against the exterior wall. If it is arranged against the exterior wall, the horizontal distance from the windows on exterior walls of staircase, front room and shared front room to the nearest edges of door, window or opening on both sides shall not be less than 1.0m.

2 Water boiling room, combustible material storage room or refuse channel shall not be arranged in the staircase.

3 There shall be no protrusions or other obstacles that hinder evacuation in the staircase.

4 The enclosed staircase, smoke-proof staircase and its front room shall not be arranged with roller shutter.

5 Category A, B or C liquid pipe shall not be arranged in the staircase.

6 Combustible gas pipes are forbidden to penetrate or be arranged in enclosed staircase, smoke-proof staircase and its front room. Combustible gas pipes shall not be arranged in the open staircase; where it is necessary to arrange combustible gas pipes and combustible gas meters in the open staircase of residential building, metallic pipe shall be adopted and valve cutting off the gas source shall be arranged.

6.4.2 The enclosed staircase shall not only meet the requirements of 6.4.1 of this code, but also meet the following requirements:

1 Where the natural ventilation is unavailable or the natural ventilation fails to meet the requirements, mechanical pressurized air supply system shall be arranged or smoke-proof staircase shall be adopted.

2 Except for exit, entrance or exterior window in staircase, other door, window or opening shall not be arranged on the wall of staircase.

3 As for the high-rise buildings, crowded public areas and crowded multi-storey Category C factory building and Categories A and B factory buildings, the door of the enclosed staircase shall be Class B fire door and shall open to the evacuation direction;

two-way swing door may be adopted for other buildings.

4 As for first floor of staircase, passageway and hallway may be contained in the staircase to form an enlarged enclosed staircase, and Class B fire door shall be adopted to separate it from other passageways and rooms.

6.4.3 Smoke-proof staircase shall not only meet the requirements of 6.4.1 of this code, but also meet the following requirements:

1 Smoke-proof facilities shall be arranged.

2 The front room may be shared by the fire elevator room.

3 Utilization area of front room: for public building and high-rise factory building (storage), the area shall not be less than 6.0m^2; for residential building, the area shall not be less than 4.5m^2.

Where the front room is shared by the fire elevator room, the utilization area of shared front room: shall not be less than 10.0m^2 for public building and high-rise factory building (storage); and shall not be less than 6.0m^2 for residential building.

4 Class B fire doors shall be adopted as the doors leading from evacuation passageway to front room and from front room to the staircase;

5 Except for the staircase front room of residential building, no door, window or opening other than evacuation door and air inlet shall be arranged on the wall in smoke-proof staircase and front room.

6 As for first floor of staircase, the passageway and hallway may be contained in the staircase front room to form an enlarged front room, but they shall be separated from other passageway and room with Class B fire door.

6.4.4 Except for malposed evacuation stairs leading to refuge floor, the plane position of evacuation staircase on every floor in the building shall not be changed.

Except for the self-use stairs in the residential buildings, the evacuation staircase in underground or semi-underground buildings (basement) shall meet the following requirements:

1 As for the underground or semi-underground building (basement) with height difference between the indoor and outdoor exit and entrance ground more than 10m or with 3 or more storeys, smoke-proof staircase shall be adopted as the evacuation stair; enclosed staircase shall be adopted as the evacuation stair of other underground or semi-underground building (basement).

2 It shall be separated from other parts on first floor with fire partition wall with fire resistance rating not less than 2.00h and shall directly lead to outdoors; where it is necessary to arrange door on the partition wall, Class B fire door shall be adopted.

3 The underground or semi-underground parts and overground parts of the building shall not share staircase, where it is inevitable, fire partition wall with fire resistance rating not less than 2.00h and Class B fire door shall be adopted to completely separate the connections between the underground or semi-underground parts and the overground parts on the first floor, and visible signs shall be arranged.

6.4.5 The outdoor evacuation stair shall meet the following requirements:

1 The handrail height shall not be less than 1.10m; the clear width of stair shall not be less than 0.90m.

2 The inclination angle shall not be greater than 45°.

3 Stair flight and landing shall be made of non-combustible material. The fire resistance rating of landing shall not be less than 1.00h, and the fire resistance rating of stair flight shall not be less than 0.25h.

4 Class B fire door shall be adopted as the door leading to exterior stair, and the door shall open outward.

5 Except for evacuation door, door, window or opening shall not be arranged on the wall surface within 2m around the stair. The evacuation door shall not be over against the stair flight.

6.4.6 Metal stair may be used as the second safety exit in Categories D and E factory buildings, but its clear width shall not be less than 0.90m and its inclination angle shall not be greater than 45°.

As for Categories D and E high-rise factory buildings, where the number of personnel on the operating platform of each storey is less than or equal to 2 and the number of personnel operating simultaneously on the operating platforms of all storeys is less than or equal to 10 in total, open stair may be used as evacuation stair, or metal stair with clear width not less than 0.90m and inclination angle not greater than 60° may be adopted.

6.4.7 Spiral stair and wheel step should not be adopted as the stair used for evacuation or the stair on evacuation passageway, where it is inevitable, the plane angle formed by the upper and lower stages of the step shall not be greater than 10°, and the depth of step 250mm away from handrail on each stage shall not be less than 220mm.

6.4.8 As for public evacuation stair in buildings, the horizontal clear spacing between two stair flights and handrails should not be less than 150mm.

6.4.9 Over 10m high buildings with Class III fire resistance shall be arranged with external fire ladder leading to the roof. The external fire ladder shall not be opposite to the dormer window, its width shall not be less than 0.6m and it should be arranged 3.0m high from the ground.

6.4.10 Normally-open Class A fire door shall be arranged at the fire compartment of evacuation passageway.

6.4.11 The evacuation door in building shall meet the following requirements:

1 As for evacuation door of civil building and factory building, side-hung door opening toward evacuation direction shall be adopted, and sliding door, rolling door, flap door, swing door or folding door shall not be adopted. Except for Categories A and B manufacturing workshops, as for rooms with the number of people not exceeding 60 and the average number of evacuated persons of each door not exceeding 30, the opening direction of evacuation door shall be not limited.

2 Side-hung door opening toward the evacuation direction shall be adopted as evacuation door of storages; sliding door or rolling door may be adopted at the outer side close to the wall of Categories C, D and E storages on the first floor.

3 Where the door opening toward the evacuation stair or staircase opens completely, the effective width of stair landing shall not be reduced.

4 As for the evacuation door in crowded places necessary for controlling personnel access at will at ordinary times and exterior door of residential building, dormitory or apartment building arranged with access control system, they shall be easily opened from inside without key or any other tool in case of fire, and there shall be

identification for usage notice at visible position.

6.4.12 The outdoor open space (like sunk square) for fire separation shall meet the following requirements:

1 The horizontal distance between the closest edges of different zone openings leading to outdoor open space (like sunk square) after separation shall not be less than 13m. Except for personnel evacuation, the outdoor open space shall not be used for other commercial purposes or purposes which may result in fire spreading. The net area for evacuation shall not be less than 169m^2.

2 At least one evacuation stair directly leading to ground shall be arranged in the outdoor open space (like sunk square). Where the fire compartment connecting to the sunk square need to use it for evacuation, the total clear width of evacuation stair shall not be less than the total design clear width for evacuation from any fire compartment to the outdoor open space.

3 Where it is necessary to arrange wind and rain shed, the wind and rain shed shall not be completely closed, and the opening parts around shall be arranged uniformly. The area of such openings shall not be less than 25% of the ground area of the outdoor open space and the opening height shall not be less than 1.0m. If louver is arranged for such openings, the effective smoke exhaust area of louver may be calculated by 60% of the air vent area of the louver.

6.4.13 The arrangement of fire lobby shall meet the following requirements:

1 The building area of fire lobby shall not be less than 6.0m^2.

2 Class A fire door shall be adopted as the door of fire lobby.

3 The doors, in different fire compartments, leading to the fire lobby shall not be counted as safety exit; the minimum spacing between doors shall not be less than 4m.

4 The internal decoration material of fire lobby shall reach Class A combustion performance.

5 The fire lobby shall not be used for purposes other than for personnel access.

6.4.14 The arrangement of exit passageway shall meet the following requirements:

1 The fire resistance rating of exit passageway fire partition wall shall not be less than 3.00h; the fire resistance rating of floor slab shall not be less than 1.50h.

2 The number of exit passageway directly leading to ground shall not be less than 2, and such exits shall be arranged in different directions; where the exit passageway is only connected with one fire compartment which possesses at least one safety exit directly leading to outdoor, one exit directly leading to ground may be arranged; the distance between the door of any fire compartment leading to exit passageway and exit directly leading to ground nearest to the exit passageway shall not be greater than 60m.

3 The clear width of exit passageway shall not be less than that of the total design clear width for evacuation from any fire compartment to the passageway.

4 The internal decoration material of exit passageway shall reach Class A combustion performance.

5 Smoke-proof front room shall be arranged between fire compartment and exit passageway entrance. The utilization area of front room shall not be less than 6.0m^2; Class A fire door shall be adopted as the door opening toward the front room while Class B fire door shall be adopted as the door of front room opening toward the exit passageway.

6 Fire hydrant, fire emergency lighting, emergency broadcast and fire department hotline shall be arranged in the exit passageway.

6.5 Fire Door, Window and Fire Roller Shutter

6.5.1 The arrangement of fire door shall meet the following requirements:

1 Normally-open fire door should be adopted as the fire door arranged at frequent access in a building. The normally-open fire door shall be able to close automatically in case of fire and shall have the function of signal feedback.

2 Except the position where normally-open fire door can be arranged, normally-closed fire door shall be adopted as fire door at other positions. The normally-closed fire door shall be provided with a warning sign in visible position, such as "Keep Closed".

3 Except access door of pipe shaft and door of residential building, the fire door shall have the function of automatic closing. The bi-parting fire door shall have the function of automatic closing in sequence.

4 Besides those specified in Item 4 of 6.4.11 in this code, the fire door shall be able to open manually on both inner and outer sides.

5 Near the building deformation joint, the fire door shall be arranged at the side with more storeys and shall guarantee that no deformation joint is crossed by the door leaf where such door is open.

6 The fire door shall have smoke-proof performance under closed conditions.

7 Classes A, B and C fire doors shall meet the requirements of the current national standard "Fire Resistant Doorsets" (GB 12955).

6.5.2 The fire windows arranged on fire wall and fire partition wall shall be non-openable or have the function of automatic closing in case of fire.

The fire window shall meet the requirements of the current national standard "Fire Resistant Windows" (GB 16809).

6.5.3 Where fire roller shutter is arranged at fire separation position, it shall meet the following requirements:

1 Except atrium, when the width of the fire separation position is not greater than 30m, the width of fire roller shutter shall not be greater than 10m; when the width of the fire separation position is greater than 30m, the width of fire roller shutter shall not be greater than 1/3 of width of such position and shall not be greater than 20m.

2 The fire roller shutter shall have the function of automatic closing under deadweight in case of fire.

3 Unless otherwise stated in this code, the fire resistance rating of fire roller shutter shall not be less than that required for the wall arranged at corresponding position in this code.

Where the fire resistance rating of fire roller shutter meets the relevant judgment requirements for fire integrity and fire insulation in the current national standard "Fire Resistance Tests - Door and Shutter Assemblies" (GB/T 7633), sprinkler system may not be arranged.

Where the fire resistance rating of fire roller shutter only meets the relevant judgment requirements for fire integrity in the current national standard "Fire Resistance Tests - Door

and Shutter Assemblies" (GB/T 7633), sprinkler system shall be arranged. The design of sprinkler system shall meet the requirements of the current national standard "Code of Design for Sprinkler Systems" (GB 50084), but its fire duration shall not be less than the fire resistance rating of fire roller shutter.

4 The fire roller shutter shall be smoke-proof, and the firestop material shall be adopted to block the gap between fire roller shutter and floor slab, beam, wall and column.

5 The fire roller shutter which needs land automatically in case of fire shall have the function of signal feedback.

6 Other requirements shall meet the requirements of the current national standard "Fire Resistant Shutter" (GB 14102).

6.6 Overpass, Trestle and Pipe Trench

6.6.1 Non-combustible materials shall be adopted for overpass, trestle crossing buildings as well as trestle for conveying combustible material, combustible gas and Class A, B, C liquids.

6.6.2 The trestle for conveying material with fire and explosive risk shall not be used as evacuation route at the same time.

6.6.3 Measures for preventing fire spreading should be taken for enclosed overpass, door opening at the joint of trestle and building as well as enclosed pipe trench (gallery) for laying Class A, B, C liquid pipes.

6.6.4 Measures shall be taken for overpass and vestibule connecting two buildings to prevent fire spreading between two buildings. When non-combustible materials are adopted for overpass and vestibule only used for transit, and the building exits leading to them meet the requirements of safety exit, such exits may be used as safety exits.

6.7 Building Insulation and Exterior Wall Finish System

6.7.1 As for the interior and exterior insulation system of buildings, Class A insulation materials should be adopted, Class B_2 should not be adopted, and Class B_3 must not be adopted; the fire resistance rating of base wall or roof slab set with insulation system shall meet the relevant requirements of this code.

6.7.2 When interior insulation system is adopted for the exterior wall, it shall meet the following requirements:

1 Class A insulation material shall be adopted for crowded locations, locations with fire hazard due to the application of fire, fuel oil and gas, as well as such locations or positions as evacuation staircase, exit passageway, refuge room and refuge floor in various buildings;

2 Low-smoke and low-toxic insulation material with combustion performance not less than Class B_1 shall be adopted for other locations;

3 Non-combustible material shall be adopted for the protective layer of insulation system. When Class B_1 insulation material is adopted, the protective layer shall not be less than 10mm thick.

6.7.3 When insulation material and composite insulation structural body without cavity in wall on both sides are adopted for the exterior wall, the fire resistance rating of such

composite structural body shall meet the relevant requirements of this code; when Classes B_1 and B_2 insulation materials are adopted, non-combustible material shall be adopted for the wall on both sides of insulation material and its thickness shall not be less than 50mm.

6.7.4 As for buildings arranged with crowded location, the external insulation material of exterior wall shall reach Class A combustion performance.

6.7.5 When there is no cavity between the external insulation system of exterior wall and the base wall and decoration layer, the insulation material shall meet the following requirements:

1 Residential building:

1) When the building height is greater than 100m, the insulation material shall reach Class A combustion performance;

2) When the building height is between 27~100m, the insulation material shall reach at least Class B_1 combustion performance;

3) When the building height is not greater than 27m, the insulation material shall reach at least Class B_2 combustion performance.

2 As for other buildings except for the residential buildings and buildings arranged with crowded locations:

1) When the building height is greater than 50m, the insulation material shall reach Class A combustion performance;

2) When the building height is between 24m~50m, the insulation material shall reach at least Class B_1 combustion performance;

3) When the building height is not greater than 24m, the insulation material shall reach at least Class B_2 combustion performance.

6.7.6 Except for the buildings arranged with crowded locations, when there is no cavity between the external insulation system of exterior wall and the base wall and decoration layer, the insulation material shall meet the following requirements:

1 When the building height is greater than 24m, the insulation material shall reach Class A combustion performance;

2 When the building height is not greater than 24m, the insulation material shall reach at least Class B_1 combustion performance.

6.7.7 Besides the conditions specified in 6.7.3 of this code, when the external insulation system of exterior wall adopts Class B_1 or B_2 insulation material according to the requirements of this section, it shall meet the following requirements:

1 Except the public building adopts Class B_1 insulation material and with building height not greater than 24m or residential building adopts Class B_1 insulation material and with building height not greater than 27m, the fire integrity of doors and windows on the exterior wall shall not be less than 0.50h.

2 Horizontal fire isolation belt shall be arranged on each layer of insulation system. The fire isolation belt shall adopt Class A material and its height shall not be less than 300mm.

6.7.8 When non-combustible material is adopted for the protective layer on surface of the external insulation system of exterior wall, the protective layer shall clad the insulation material completely. Except for the conditions specified in 6.7.3 of this code, when Class B_1 and B_2 insulation materials are adopted according to this section, the thickness of the first

layer of protective layer shall not be less than 15mm and that of other layers shall not be less than 5mm.

6.7.9 When there is cavity between the external insulation system of exterior wall and the base wall and decoration layer, firestop material shall be adopted at the floor slab of each storey to block it.

6.7.10 As for the external insulation system of building roof, when the fire resistance rating of roof slab is not less than 1.00h, the insulation material shall reach at least Class B_2 combustion performance; when the fire resistance rating of roof slab is less than 1.00h, the insulation material shall reach at least Class B_1 combustion performance. As for the external insulation system adopting Class B_1 or B_2 insulation material, non-combustible material shall be adopted as the protective layer which shall not be less than 10mm thick.

When Classes B_1 and B_2 insulation materials are adopted for the external insulation system of both building roof and exterior wall, non-combustible material shall be adopted to set fire isolation belt with width not less than 500mm to separate roof from exterior wall.

6.7.11 The electric circuit shall not cross or be laid in Class B_1 or B_2 insulation material; if inevitable, fire protection measures, such as threading in metallic pipe and isolating it by non-combustible insulation material, shall be taken. Fire protection measures, such as adopting non-combustible insulation material for fire isolation, shall be taken surrounding the positions set with switch, socket and other electric accessories.

6.7.12 Class A material shall be adopted for the decoration layer of exterior wall; however when the building height is not greater than 50m, Class B_1 material may be adopted.

7 Fire Fighting and Rescue Facilities

7.1 Fire Lane

7.1.1 The roads in blocks shall consider the pass of fire vehicle and the distance between the road center lines should not be greater than 160m.

When the length of building along street is greater than 150m or its total length is greater than 220m, fire lane across the building shall be arranged. If it is difficult, circular fire lane shall be arranged.

7.1.2 As for high-rise civil buildings and such single- or multi-storey public buildings as gymnasiums with over 3,000 seats, assembly halls with over 2,000 seats and store buildings and exhibition halls with over 3,000m^2 floor area, the circular fire lane shall be arranged. If it is difficult, fire lane may be arranged along the two long sides of those buildings; as for high-rise residential buildings and the high-rise civil buildings nearby hilly land or watercourse, fire lane may be arranged along one long side of those buildings, but the facade of building with such long side shall be the ascending operation surface of fire vehicle.

7.1.3 Fire lane shall be arranged in factories and storages.

As for high-rise factory buildings, Categories A, B and C factory buildings with over 3,000m^2 floor area as well as Categories B and C storages with over 1,500m^2 floor area, the circular fire lane shall be arranged. If it is difficult, fire lane shall be arranged along the two long sides of those buildings.

7.1.4 As for buildings with enclosed garth or courtyard, if the length of the short side of garth or courtyard is greater than 24m, the fire lane leading to the garth or courtyard should be arranged; if the buildings are located along street, the pedestrian passageway connecting street and garth shall be arranged (through staircase) and their spacing should not be greater than 80m.

7.1.5 Facilities hindering the pass of fire vehicle or the safe evacuation of personnel shall not be arranged on neither side of fire lane across building or leading to its garth.

7.1.6 As for open stackyard for combustible material, LPG tank farm, Class A, B, C liquid tank farms as well as combustible gas tank farm, the fire lane shall be arranged. The arrangement of fire lane shall meet the following requirements:

1 As for stackyards and tank farms with the storage volume greater than those specified in Table 7.1.6, the circular fire lane should be arranged.

Table 7.1.6 Storage Volume of Stackyards or Tank Farms

Name	Cotton, linen, wool and chemical fiber (t)	Straw and reed (t)	Timber (m^3)	Class A, B, C liquid tanks (m^3)	LPG tank (m^3)	Combustible gas tank (m^3)
Storage volume	1,000	5,000	5,000	1,500	500	30,000

2 As for stackyard for combustibles with over 30,000m^2 floor area, the intermediate fire lane connected with the circular fire lane shall be arranged; the spacing between fire lanes should not be greater than 150m. Connected fire lane should be arranged between the circular fire lanes in LPG tank farm, Class A, B, C liquid tank farms and combustible gas tank farm.

3 The distance from the edge of fire lane to the combustible material stack shall not be less than 5m.

7.1.7 Fire lane shall be arranged for natural water source and fire pool for supplying water for fire vehicle. The distance from the edge of fire lane to the water-intaking point should not be greater than 2m.

7.1.8 The fire lane shall meet the following requirements:

1 Neither the clear width nor clear height of the vehicle access shall be less than 4.0m.

2 The turning radius shall meet the requirements of fire vehicle turning.

3 Trees, overhead pipelines and other obstacles hindering the fire vehicle operation shall not be arranged between the fire lane and building.

4 The distance from the side edge of fire lane close to the exterior wall to the exterior wall should not be less than 5m.

5 The gradient of fire lane should not be greater than 8%.

7.1.9 At least two positions of the circular fire lane shall be connected with other accesses. The stub-end fire lane shall be arranged with loop or turnaround and the area of turnaround shall not be less than 12m×12m; as for high-rise building, the area of turnaround should not be less than 15m×15m; as for heavy fire vehicle, the area of turnaround should not be less than 18m×18m.

The pavement of fire lane, rescue site as well as the pipe and underdrain below the fire lane and rescue site shall be able to bear the pressure from heavy fire vehicle.

Urban and rural roads may be used as fire lane, but such roads shall meet the passing, turning and parking requirements of fire vehicle.

7.1.10 The fire lane should not cross levelly with the main track of railway. If they must cross with each other levelly, standby access shall be arranged and the spacing between two accesses shall not be less than the length of one train.

7.2 Field for Fire Fighting

7.2.1 As for high-rise building, the ascending operation site of fire vehicle shall be arranged continuously at least along one long side or one bottom side of 1/4 the peripheral length and not less than the length of one long side. The podium depth in such scope shall not be greater than 4m.

If it's difficult to arrange the ascending operation site of fire vehicle continuously for not greater than 50m high buildings, it may be arranged at certain interval, but the interval should not be greater than 30m and the total length of the ascending operation site of fire vehicle shall meet the above requirements.

7.2.2 The ascending operation site of fire vehicle shall meet the following requirements:

1 Trees, overhead pipelines and other obstacles and garage exit and entrance hindering the fire vehicle operation shall not be arranged between the site and the factory building, storage or civil building.

2 The length and width of site shall not be less than 15m and 10m respectively. As for buildings with height greater than 50m, the length and width of site shall not be less

than 20m and 10m respectively.

3 The site as well as the building structure, pipe and underdrain below it shall be able to bear the pressure from heavy fire vehicle.

4 The site shall be connected to the fire lane; the distance from the side close to exterior wall of site to the exterior wall should not be less than 5m and shall not be greater than 10m; and the site gradient should not be greater than 3%.

7.2.3 As for the building scope corresponding to the ascending operation site of fire vehicle, the stairs directly leading to outdoor or entrance directly leading to staircase shall be arranged.

7.2.4 The exterior walls of factory building, storage and public building shall be arranged with windows for fire-fighting and rescue personnel to enter at the proper position of each storey.

7.2.5 The clear height and clear width of windows for fire-fighting and rescue personnel entering shall not be less than 1.0m respectively and the distance from its lower edge to indoor ground should not be greater than 1.2m. The spacing between them should not be greater than 20m and at least 2 windows shall be arranged for each fire compartment, with their arrangement positions opposite to the ascending operation site of fire vehicle. The window glass shall be easy to break and visible signs shall be arranged outdoor.

7.3 Fire Elevator

7.3.1 Fire elevator shall be arranged for the following buildings:

1 Over 33m high residential buildings;

2 Category I high-rise public buildings and over 32m high Category II high-rise public buildings;

3 Basement and semi-basement in buildings with fire elevator, as well as other underground or semi-underground buildings (basements and semi-basements) with the buried depth greater than 10m and the total building area greater than 3,000m^2.

7.3.2 The fire elevator shall be arranged in different fire compartments respectively and at least one fire elevator shall be arranged in each fire compartment.

7.3.3 As for over 32m-high high-rise factory building (storage) with elevator, one fire elevator should be arranged in each fire compartment. Fire elevator may not be arranged for buildings meeting the following requirements:

1 Over 32m-high high-rise tower with elevator, if the number of personnel on the operating platform at any floor is not greater than 2;

2 Categories D and E factory buildings with partial height over 32m and the building area on any floor of the part higher than 32m not greater than 50m^2.

7.3.4 The passenger elevator or cargo elevator which meets the requirements of fire elevator may also be used as fire elevator.

7.3.5 Except for fire elevators set in storage vestibule, refrigeration storage hallway or operation tower of cereal silo, other fire elevators shall be set with front room and shall meet the following requirements:

1 The front room should be close to the exterior wall and shall directly lead to outdoor at the first floor or lead to outdoor through not greater than 30m long passageway;

2 The utilization area of front room shall not be less than 6.0m^2; the front room shared with smoke-proof staircase shall meet the requirements of 5.5.28 and 6.4.3 in this code;

3 Except for entrance/exit of front room, positive pressure air supply outlet arranged in front room and entry door specified in 5.5.27 of this code, other doors, windows or openings shall not be arranged in the front room;

4 Class B fire door shall be adopted for front room or shared front room, but roller shutter shall not be arranged.

7.3.6 Fire partition wall with fire resistance rating not less than 2.00h shall be arranged between fire elevator shafts, machine rooms and adjacent elevator shafts and machine rooms; Class A fire door shall be adopted for door in partition wall.

7.3.7 Drainage facilities shall be arranged at the bottom of fire elevator shaft. The capacity of drainage shaft shall not be less than 2m^3 and the discharge of drainage pump shall not be less than 10L/s. Water retaining facilities should be arranged at the doorway of the front room of fire elevator room.

7.3.8 The fire elevator shall meet the following requirements:

1 The elevator shall be able to stop at each floor;

2 The load capacity of the elevator shall not be less than 800kg;

3 The running time of the elevator from the first floor to the top floor should not be greater than 60s;

4 Water-proof measures shall be taken for the power and control cable, electric wire as well as control panel of the elevator;

5 Special operating button for fireman shall be arranged at the entrance of fire elevator on the first floor;

6 Non-combustible material shall be adopted for the internal decoration of elevator car;

7 Special fire talkback shall be arranged in the elevator car.

7.4 Helicopter Landing Pad

7.4.1 As for over 100m high public buildings with the building area of standard storey greater than 2,000m^2, the helicopter landing pad or rescue facilities for helicopter should be arranged on their roofs.

7.4.2 The helicopter landing pad shall meet the following requirements:

1 If arranged on the roof deck, the helicopter landing pad shall be at least 5m away from equipment room, elevator machine room, water tank room as well as projections like common antenna;

2 At least two building exits leading to the landing pad shall be arranged and the width of each exit should not be less than 0.90m;

3 Aircraft obstruction lamp and emergency lighting shall be arranged around the landing pad;

4 Fire hydrant shall be arranged at a proper position on the landing pad;

5 The other requirements shall comply with the relevant current standards of the nation on aviation management.

8 Arrangement of Fire-fighting Facilities

8.1 General Requirements

8.1.1 The fire water supply as well as fire-fighting facilities shall be determined comprehensively according to such factors as the purpose and significance of buildings, fire hazard, fire characteristics and ambient conditions.

8.1.2 In cities and towns (including residential district, business district, development area and industrial district, etc.), municipal fire hydrant system shall be arranged along street on which fire vehicle can pass.

Outdoor fire hydrant system shall be arranged surrounding the civil buildings, factory buildings, storages, tanks (farm) and stackyards.

The roof for parking rescue and fire vehicle shall be arranged with outdoor fire hydrant system.

Note: Outdoor fire hydrant system may not be arranged for not greater than 3,000m^3 Category E factory buildings with not less than Class II fire resistance rating as well as residential district with not greater than two storeys and 500 residents.

8.1.3 Fire pump adapter shall be arranged for such systems as sprinkler system, water spray extinguishing system, foam extinguishing system and fixed fire monitor extinguishing system as well as the water supply system of indoor fire hydrant of the following buildings:

1 Over 5-storey public buildings;

2 Over 4-storey factory buildings or storages;

3 Other high-rise buildings;

4 Over 2-storey underground buildings (rooms) or those with over 10,000m^2 building area.

8.1.4 The tanks in Class A, B, C liquid tanks (tank farm) shall be arranged with movable hose or fixed water cooling facilities. As for Class A, B, C overground liquid tanks with height greater than 15m or with single tank volume greater than 2,000m^3, the fixed water cooling facilities should be adopted.

8.1.5 As for LPG tanks (tank farm) with total volume greater than 50m^3 or single tank volume greater than 20m^3, the fixed water cooling facilities shall be arranged. As for embedded LPG tanks, the fixed spray cooling devices may not be arranged. As for LPG tanks (tank farm) with total volume not greater than 50m^3 or single tank volume not greater than 20m^3, the movable hose shall be arranged.

8.1.6 The arrangement of fire pump room shall meet the following requirements:

1 The independent fire pump room shall reach at least Class II fire resistance;

2 The fire pump room in buildings shall not be arranged on the third underground floor or below or the underground floor where the height difference between the indoor ground and the outdoor exit and entrance flooring is greater than 10m;

3 The evacuation door shall directly lead to outdoor or safety exit.

8.1.7 Fire control room shall be arranged for buildings (groups) with fire alarm system and

fire-fighting facilities requiring linkage control. The arrangement of fire control room shall meet the following requirements:

1 The independent fire control room shall reach at least Class II fire resistance;

2 The fire control room in buildings should be arranged on the first floor or first underground floor and at a position close to the exterior wall;

3 The fire control room shall not be arranged nearby rooms which are subject to strong electromagnetic field interference or may affect the normal operation of fire control equipment;

4 The evacuation door shall directly lead to outdoor or safety exit.

5 The equipment constitution in fire control room and its control and display function on building fire-fighting facilities as well as the function of transmitting relevant information to remote monitoring system shall meet the requirements of the current national standards "Code for Design of Automatic Fire Alarm System" (GB 50116) and "General Technical Requirements for Fire Control Center" (GB 25506).

8.1.8 Technical measures protecting against flood shall be taken for fire pump room and fire control room.

8.1.9 The smoke proof and exhaust fan set in buildings shall be arranged in different special machine rooms, and the relevant fire separation measures shall meet the requirements of 6.2.7 in this code.

8.1.10 Fire extinguisher shall be arranged at the public positions of high-rise residential buildings and in the public buildings, and fire extinguisher should be arranged at the public positions of other residential buildings.

Fire extinguishers shall be arranged at the factory buildings, storages, tanks (tank farm) and stackyards.

8.1.11 If the exterior wall is arranged with glass curtain wall or made from decorative material or construction which may cause the falling-off of wall in case of fire, the outdoor fire-fighting facilities (such as pump adapter and outdoor fire hydrant) for fire-fighting and rescue shall be arranged at the position with a relatively safe distance from the exterior wall or be provided with safety protection measures.

8.1.12 The fire-fighting facilities arranged inside or outside buildings for personnel to operate or use shall be arranged with visible signs which can be distinguished from the environment.

8.1.13 The design of fire-fighting system and facilities shall meet the requirements of the current national standards "Technical Code for Fire Protection Water Supply and Hydrant Systems" (GB 50974), "Code of Design for Sprinkler Systems" (GB 50084) and "Code for Design of Automatic Fire Alarm System" (GB 50116).

8.2 Indoor Fire Hydrant System

8.2.1 Indoor fire hydrant system shall be arranged for the following buildings or locations:

1 Factory buildings and storages with over 300m^2 floor area;

2 High-rise public buildings and over 21m-high residential buildings;

Note: If it is difficult to arrange indoor fire hydrant system for residential building with height not higher than 27m,

only the dry fire standpipe and *DN*65 indoor fire hydrant without fire hydrant box may be arranged.

3 Over 5,000m^3 single-/multi-storey buildings such as waiting buildings in stations, wharfs and airports, exhibition buildings, store buildings, hotel buildings, medical buildings and library buildings, etc.;

4 Single-/multi-storey buildings such as special class and first class theatres, other classes of theatres and cinemas with over 800 seats, as well as auditoriums and gymnasiums with over 1,200 seats, etc.;

5 Over 15m high or over 10,000m^3 office buildings, teaching buildings as well as other single-/multi-storey civil buildings.

8.2.2 Indoor fire hydrant system may not be arranged for buildings or locations not specified in 8.2.1 of this code as well as the following buildings or locations which meet the requirements of 8.2.1 in this code, but the fire hose reel or portable fire hose should be arranged:

1 Single-/multi-storey Categories D and E factory buildings (storages) with Class I or II fire resistance rating and few combustible.

2 Not greater than 3,000m^3 Category D factory buildings with Class III or IV fire resistance rating; not greater than 5,000m^3 Category E factory buildings (storages) with Class III or IV fire resistance rating.

3 Grain storages, treasuries as well as unattended independent buildings far away from cities and towns.

4 Buildings with articles which may cause combustion and explosion if exposed to water.

5 Other not greater than 5,000m^3 buildings without indoor production and domestic water pipelines and with outdoor fire water supply tanks.

8.2.3 Indoor fire hydrant system should be arranged for key brick-timber structure or timber structure antique buildings of national relic protection units.

8.2.4 Fire hose reel or portable fire hose shall be arranged for crowded public buildings, as well as over 100m high and greater than 200m^2 commercial facilities. Portable fire hose should be arranged inside the high-rise residential buildings.

8.3 Automatic Fire Extinguishing System

8.3.1 Unless otherwise stated in this code and except the locations where water should not be applied for protection or fire extinguishment, the automatic fire extinguishing system shall be set at the following factory buildings or production positions, and sprinkler system should be adopted:

1 The unpacking and blowing workshops of the cotton mill with no less than 50,000 spindles, the sorting and carding workshops of flax mill with no less than 5,000 spindles, and the splint scorching and screening positions of match factory;

2 The single-/multi-storey factory buildings with floor area larger than 1,500m^2 or total building area larger than 3,000m^2 for the similar production purposes such as shoemaking, clothing making, toys and electronics;

3 Woodenware factory building with floor area larger than 1,500m^2;

4 The pre-foaming, forming, slicing and embossing positions of foam plastic

factory;

5 High-rise Categories B and C factory buildings;

6 Underground or semi-underground Category C factory buildings with building area larger than 500m^2.

8.3.2 Unless otherwise stated in this code and except the storages where water should not be applied for protection or fire extinguishment, the automatic fire extinguishing system shall be set at the following storages, and sprinkler system should be adopted:

1 Storages of cotton, wool, silk, linen, chemical fiber, fur and their products, with the floor area larger than 1,000m^2 ;

Note: As for the cotton storeroom with single-storey floor area no larger than 2,000m^2, the sprinkler system may not be set.

2 Match storage with floor area larger than 600m^2;

3 Empty post bag storage with building area larger than 500m^2 in the post building;

4 High rack/high-rise storages of combustible and difficult-combustible articles;

5 High rack refrigeration storage with design temperature higher than 0℃ or non-high rack refrigeration storage with design temperature higher than 0℃ and building area of each fire compartment larger than 1,500m^2;

6 Underground storage of combustible articles with total building area larger than 500m^2;

7 Other single- or multi-storey Category C article storages with floor area larger than 1,500m^2 or total building area larger than 3,000m^2.

8.3.3 Unless otherwise stated in this code and except the locations where water should not be applied for protection or fire extinguishment, the automatic fire extinguishing system shall be set in the following high-rise civil buildings or locations, and sprinkler system should be adopted:

1 Category I high-rise public buildings (except swimming pool and skating rink) and their basements and semi-basements;

2 The public activities rooms, passageways, offices, hotel guest rooms, combustible article storerooms, and bottoms of escalators in Category II high-rise public buildings and in their basements and semi-basements;

3 The singing and dancing entertainment and show venues in high-rise civil buildings;

4 Residential building with building height larger than 100m.

8.3.4 Unless otherwise stated in this code and except the locations where water should not be applied for protection or fire extinguishment, the automatic fire extinguishing system shall be set in the following single-/multi-storey civil buildings or locations, and the sprinkler system should be adopted:

1 The special-class and first-class theatres, theatres of other classes with more than 1,500 seats, assembly halls or auditoriums with more than 2,000 seats, gymnasiums with more than 3,000 seats, and the indoor rest rooms, equipment rooms and the like of stadiums which can hold more than 5,000 people;

2 The exhibition, store, catering service and hotel buildings with the building area of any floor larger than 1,500m^2 or the total building area larger than 3,000m^2, and the

inpatient building, outpatient building and operation department of the same building scale in hospital;

3 The office buildings with total building area larger than 3,000m^2 and with central air conditioning system for supply and return air ducts (pipes);

4 Library with collection of books exceeding 500,000;

5 Large and medium size kindergartens, and senior citizen building with the total building area larger than 500m^2;

6 Underground or semi-underground stores with total building area larger than 500m^2;

7 The singing and dancing entertainment and show venues (except the swimming locations) being arranged underground or semi-underground or on the fourth floor overground or above, and the overground singing and dancing entertainment and show venues (except the swimming locations) being arranged on the first, second or third floor and with the building area of any storey larger than 300m^2.

8.3.5 For the exhibition halls, audience halls and other crowded locations as well as the Category C production workshops, storerooms and other larger-space locations where are difficult to set sprinkler system, other automatic fire extinguishing systems shall be set, and the fixed fire monitors and other fire extinguishing systems should be adopted.

8.3.6 Water curtain system should be set at the following positions:

1 The proscenium arches as well as the openings of such side stages and back stages connecting with the proscenium in the special-class and first-class theatres, the theatres of other classes with more than 1,500 seats, the assembly halls or auditoriums with more than 2,000 seats and the theatres or auditoriums with more than 800 seats in the high-rise civil buildings;

2 Partial opening positions where the fire separators such as fire walls shall be arranged but unable to be arranged;

3 The upper part of fire roller shutter or fireproof curtain in need of cooling prevention.

Note: Fireproof curtain shall also be adopted for the separation at the proscenium arch, and Class B fire doors and windows should be arranged at the smaller openings of side stage and back stage.

8.3.7 Deluge sprinkler system shall be arranged in the following buildings and at the following positions:

1 Potassium chlorate grinding factory buildings of match factories, and the factory buildings with the building area larger than 100m^2 and used for the production or application of nitrocotton, paint spray cotton, collodion, xylonite rubber sheet and nitrocellulose;

2 Rolled compact, sectioning, ball-grinding and ball separation inspection positions of table tennis factories;

3 The storages of nitrocotton, paint spray cotton, collodion, xylonite rubber sheet and nitrocellulose, with the building area larger than 60m^2 or storage volume larger than 2t;

4 The cylindering rooms and solid cylinder storages in the LPG storage and distribution station with daily cylindering quantity exceeding 3,000;

5 The lower part of stage grid in special-class and first-class theatres, the theatres of other classes with more than 1,500 seats and the assembly halls or auditoriums with

more than 2,000 seats;

6 The studio with building area no less than 400m^2 and movie studio with building area no less than 500m^2.

8.3.8 The automatic fire extinguishing system shall be set in the following locations, and the water spray extinguishing system should be adopted:

1 The oil immersed transformer of the factories with single capability at 40MV·A or above, the oil immersed transformer of power plant with single capability at 90MV·A or above and the oil immersed transformer of independent substation with single capability at 125MV·A or above;

2 The trial run position of aircraft engine test bench;

3 High voltage capacitor and heavy oil switch room filled with combustible oil and arranged in high-rise civil buildings.

Note: As for the indoor oil immersed transformer and the high voltage capacitor and heavy oil switch room filled with combustible oil, the water mist spray fire extinguishing system may be adopted.

8.3.9 The automatic fire extinguishing system shall be set in the following locations and the gas fire extinguishing system should be adopted:

1 The microwave machine rooms, decimetric wave machine rooms, metric wave machine rooms, power transformation and distribution rooms and uninterrupted power supply (UPS) rooms in broadcast television launching towers at national and provincial levels as well as those of cities with population of more than 1 million;

2 Long-distance SPC exchange (stored program control exchange) rooms, control rooms and signalling transfer point rooms of the international telecommunication offices, regional centers, provincial centers and the district centers with more than 10,000 routes;

3 The SPC exchange rooms, control rooms and signalling transfer point rooms of local tandem offices with more than 20,000 lines and local end offices with more than 60,000 entries;

4 Communication rooms and control rooms in the public security and disaster prevention dispatch control centers at central and provincial levels as well as those in power dispatch control centers of large-scale or above;

5 The main machine rooms of Classes A and B electronic information system machine rooms and the logged magnetism (paper) media storages in the basic workshops;

6 The audiovisual products storerooms with building area not less than 120m^2 in the central and provincial broadcast & television centers;

7 The special collection storages of the national and provincial libraries or libraries with the collection of books more than 1 million; the storages for precious files and non-paper files in the central and provincial archives; treasure storages in the large and medium scale museums; the showroom of Grade I paper and thin-silk cultural relics;

8 Other special important equipment rooms.

Notes:

1 Water mist spray fire extinguishing system may be adopted at the positions specified in Items 1, 4, 5 and 8 of this article.

2 When there are standby main machine and standby logged magnetism (paper) media, which are arranged in different buildings or different fire compartments in the same building, the preact sprinkler system may be adopted at the positions specified in Item 5 of this article.

8.3.10 The fire extinguishing systems for Class A, B, C liquid tanks shall be set according to the following requirements:

1 Fixed foam extinguishing system shall be set for the fixed roof tank with single capacity larger than 1,000m^3;

2 Mobile foam fire extinguishing system may be adopted for the storage tank with the wall height less than 7m or capacity not larger than 200m^3;

3 Semi-fixed foam extinguishing system should be adopted for other storage tanks;

4 The fire extinguishing system for Class A, B, C liquid tanks in the oil depot, petrochemical industry and petroleum gas engineering shall be set according to the requirements of the current national standard "Code for Design of Oil Depot" (GB 50074) and other relevant standards.

8.3.11 As for the restaurants or canteens with the building area of dining room larger than 1,000m^2, the automatic fire extinguishers shall be equipped at the fume exhaust covers and cooking positions in the cooking rooms, and the automatic disconnecting devices linked with the automatic fire extinguishers shall be installed on the gas or fuel pipes.

Automatic fire extinguishers should be arranged at the food processing positions with open fire work or high temperature edible oil in the food industry processing locations.

8.4 Fire Alarm System

8.4.1 Fire alarm system shall be set for the following buildings or locations:

1 Factory buildings with building area of any floor larger than 1,500m^2 or the total building area larger than 3,000m^2 and for the similar production purposes such as shoemaking, clothing making, toys and electronics;

2 Storages of cotton, wool, silk, linen, chemical fiber and their products, with the floor area larger than 1,000m^2; cigarette storages with floor area larger than 500m^2 or total building area greater than 1,000m^2;

3 Buildings for such similar purposes as stores, exhibition, finance and trade, passenger transport and freight, with the building area of each floor larger than 1,500m^2 or total building area larger than 3,000m^2; underground or semi-underground stores with total building area larger than 500m^2;

4 Storages for precious books or cultural relics, libraries with the collection of books more than 500 thousand, and important archives;

5 Prefecture-level or above broadcast & television buildings, post buildings and telecommunication buildings; urban or regional commanding and dispatching buildings of electricity, transportation and disaster prevention;

6 Special-class and first-class theatres; theatres or cinemas of other classes with more than 1,500 seats; assembly halls or auditoriums with more than 2,000 seats; gymnasiums with more than 3,000 seats;

7 Children rooms and other locations of large or medium size kindergartens;

senior citizen buildings; sanatorium inpatient buildings, hotel buildings and other children playgrounds with the building area of any floor larger than 1,500m^2 or total building area larger than 3,000m^2; outpatient buildings, inpatient buildings and operation departments of hospitals with at least 200 beds;

8 Singing and dancing entertainment and show venues;

9 Technical mezzanine containing much combustibles and with clear height greater than 2.6m; interior of the blind ceiling or suspended ceiling containing combustibles and with clear height greater than 0.8m;

10 Main machine rooms of electronic information systems and their control rooms and recording medium storages; rooms of machinery, meters and instruments of special value or larger fire hazard as well as storages of valuables;

11 Storages for combustibles with the building area larger than 50m^2 or business halls with the building area larger than 500m^2 in Category II high-rise public buildings;

12 Other Category I high-rise public buildings;

13 Locations or positions where are set with mechanical smoke exhaust, smoke control system, deluge or preact sprinkler system, fixed fire water monitor extinguishing system and gas fire extinguishing system which are under interlocking operation with fire alarm system.

8.4.2 The residential buildings with the building height larger than 100m shall be equipped with fire alarm system.

Fire alarm system shall be set at the public positions of residential buildings with the building height of 54 ~ 100m; fire detectors should be arranged inside.

Fire alarm system should be set at the public positions of high-rise residential buildings with the building height not greater than 54m. When the fire-fighting facilities in need of linkage control are installed, the fire alarm system shall be set at the public positions.

Alarm devices or emergency fire broadcast provided with voice function shall be set at the public positions of high-rise residential buildings.

8.4.3 Combustible gas alarm devices shall be set at the locations where may emit combustible gases or vapors in a building.

8.5 Smoke Control and Smoke Exhaust System

8.5.1 Smoke control facilities shall be installed at the following locations or positions of the building:

1 Smoke-proof staircase and its front room;

2 Front room or shared front room of a fire elevator room;

3 Front room or refuge floor (room) of exit passageway.

As for the public buildings, factory buildings and storages with the building height not greater than 50m and the residential buildings with the building height not greater than 100m, when the front room or shared front room of their smoke-proof staircase meets one of the following conditions, the smoke control system may not be arranged in the staircase:

1 The front room or shared front room adopts open balcony and concave corridor;

2 The front room or shared front room is provided with openable external windows in different orientations and the area of such windows meets the area requirements of natural smoke vent.

8.5.2 Smoke exhaust facilities shall be installed at the following locations or positions of factory building or storage:

1 Category C production places with large number of people or combustibles; The overground rooms with the building area larger than 300m^2 and being frequently visited by people and containing many combustibles in Category C factory buildings;

2 The Category D production workshops with building area greater than 5,000m^2;

3 The Category C storages with the floor area greater than 1,000m^2;

4 The evacuation passageways with length larger than 20m in such high-rise factory buildings (storages) with height larger than 32m; the evacuation passageways with length larger than 40m in other factory buildings (storages).

8.5.3 The smoke exhaust facilities shall be installed at the following locations or positions of civil buildings:

1 The singing and dancing entertainment and show venues arranged on the first, second or third floor and with the building area greater than 100m^2, or those arranged on the fourth floor or above as well as the underground or semi-underground ones;

2 The atriums;

3 The overground rooms with building area larger than 100m^2 and frequently visited by people in public buildings;

4 The overground rooms with building area larger than 300m^2 and containing many combustibles in public buildings;

5 The evacuation passageways with length greater than 20m in buildings.

8.5.4 As for the underground or semi-underground buildings (basements or semi-basements) and the rooms without window in overground buildings, when the total building area is larger than 200m^2 or the building area of one room is larger than 50m^2 and they are frequently visited by people or contain many combustibles, the smoke exhaust facilities shall be arranged.

9 Heating, Ventilating and Air Conditioning

9.1 General Requirements

9.1.1 The heating, ventilating and air conditioning systems shall be taken with proper fire prevention measures.

9.1.2 The air in Categories A and B factory buildings shall not be recycled.

The air containing dusts or fibers of combustion or explosion hazard in Category C factory buildings shall be purified before recycling, and the particle concentration in such air shall be 25% lower than its lower explosion limit.

9.1.3 Air supply and exhaust equipment serving for Categories A and B factory buildings shall be arranged in different ventilation houses respectively; exhaust equipment shall not be arranged in the same ventilation house with the air supply/exhaust equipment of other rooms.

9.1.4 Natural ventilating or independent mechanical ventilating facilities shall be adopted for the rooms containing materials of fire or explosion hazard in civil buildings, and such air shall not be recycled.

9.1.5 When the air contains lighter combustible gases, the whole horizontal air exhaust pipe shall be laid by upward slope along the airflow direction.

9.1.6 The combustible gas pipelines and the pipelines of Class A, B, C liquid shall not pass through any ventilation house or ventilating pipe, and shall not be laid near to the outer wall of ventilating pipe.

9.2 Heating

9.2.1 The average surface temperature of radiators in the factory buildings which emit combustible dusts and fibers shall not be greater than 82.5 ℃ ; and the average surface temperature of radiators at coal handling corridors shall not be greater than 130℃.

9.2.2 The open fire and electric heat radiators for heating are strictly forbidden in Categories A and B factory buildings (storages).

9.2.3 Non-recycling warm air heating shall be adopted for the following factory buildings:

1 Factory buildings which emit combustible gases, vapor, dusts or fibers in the production process and may cause combustion by the contact with surfaces of heating pipelines and radiators;

2 Factory buildings which emit dusts in the production process and may cause spontaneous ignition, explosion or generate explosive gases under the action of water or water vapor.

9.2.4 Heating pipelines shall not pass through the rooms containing such gases, vapors or dusts that may cause combustion or explosion by contacting with heating pipelines, and the non-combustible materials shall be adopted for heat insulation if they must pass through these rooms.

9.2.5 Certain distance shall be kept between heating pipeline and combustibles, and shall meet the following requirements:

1 When the surface temperature of heating pipeline is greater than 100℃, the distance shall not be less than 100mm or the non-combustible materials shall be adopted for heat insulation;

2 When the surface temperature of heating pipeline is not greater than 100℃, the distance shall not be less than 50mm or the non-combustible materials shall be adopted for heat insulation.

9.2.6 The thermal insulating materials for heating pipelines and equipment in buildings shall meet the following requirements:

1 As for Categories A and B factory buildings (storages), non-combustible materials shall be adopted;

2 As for other buildings, non-combustible materials should be adopted and combustibles shall not be adopted.

9.3 Ventilating and Air Conditioning

9.3.1 As for ventilating and air conditioning systems, fire compartments should be arranged horizontally, while the vertical arrangement should not exceed 5 floors. When backflow preventers or fire dampers are adopted for pipelines, the pipeline arrangement may not be limited by the above-mentioned condition. The vertical air ducts shall be arranged in pipe wells.

9.3.2 Air exhaust pipelines used at the explosion hazardous locations of factory buildings are strictly forbidden to pass through fire walls or the room partition walls with explosion hazard.

9.3.3 Air supply/exhaust pipelines within Categories A, B and C factory buildings should be arranged in layers. When fire dampers are arranged at the positions which horizontal or vertical air supply pipelines enter into the production workshop, an air supply system may be shared by the vertical air supply pipelines of all layers.

9.3.4 As for rooms containing combustible or explosive materials in the air, the explosion-proof ventilating equipment shall be adopted for the air supply/exhaust system. Common ventilating equipment may be adopted when the air feeder is arranged in separated ventilation room and backflow preventer is set on the main air supply pipeline.

9.3.5 The air containing dusts of combustion and explosion hazard shall be treated by non-scintillant deduster before entering into the exhaust blower. As for dusts which may explode on meeting water, it is strictly forbidden to adopt the wet dedusters.

9.3.6 The deduster and exhaust blower handling the dusts with explosion hazard shall be set separately from other common blowers and dedusters, and should be set according to single dust group.

9.3.7 Dry dedusters and filters purifying the explosion-hazardous dusts should be arranged in the independent buildings outside the factory buildings, and the fire separation distance between the exterior walls of buildings and the factory buildings shall not be less than 10m.

The dry dedusters and filters which are provided with continuous deashing function or provided with periodical deashing function and with air volume no greater than 15,000 m^3/h and dust storage of dust hopper less than 60kg may be arranged in separate rooms in the factory buildings, but shall be separated from other positions by adopting with fire partition

walls with fire resistance rating not less than 3.00h and floor slabs with fire resistance rating not less than 1.50h.

9.3.8 Pressure relief devices shall be set for all the dedusters, filters or pipelines purifying or transmitting explosive dusts and chips.

Dry dedusters and filters purifying explosive dusts shall be arranged at the negative pressure section of the system.

9.3.9 The air exhaust system exhausting combustible or explosive gases, vapor and dusts shall meet the following requirements:

1 The air exhaust system shall be set with grounding device to conduct or remove static;

2 Air exhaust equipment shall not be arranged in underground or semi-underground buildings (basement or semi-basement);

3 Exhaust pipelines shall adopt metal pipelines and shall be led to the outdoor safe places; they shall not be concealed.

9.3.10 As for pipelines exhausting or transmitting air or other gases and combustible chips with temperature greater than 80℃, the clearance between them and the combustible or difficult-combustible objects shall not be less than 150mm, or non-combustible materials with thickness not less than 50mm shall be adopted for heat insulation; when the pipelines are arranged up and down, the ones with higher surface temperature shall be arranged at the upper position.

9.3.11 Air pipes of ventilating and air conditioning systems shall be set with the fire dampers with nominal operating temperature of 70℃ at the following positions:

1 The positions passing through the fire compartment;

2 The positions passing through the room partition walls and floor slabs of ventilating and air conditioning rooms;

3 The positions passing through the room partition walls and floor slabs of important locations or locations with higher fire hazard;

4 Both sides of the deformation joints passing through the fire separation place;

5 On the horizontal pipe section jointed by vertical air pipe and horizontal air pipe of each layer.

Note: When the ventilating and air conditioning systems of each fire compartment in the building are set independently, the joints of horizontal air pipes and vertical main pipes may not be set with fire dampers.

9.3.12 For the vertical exhaust pipes in bathrooms, toilets and kitchens of public buildings, the measures to prevent backflow shall be taken and the fire dampers with nominal operating temperature of 70℃ should be set on the branch pipes.

The oil-fume exhaust pipes of kitchens in public buildings should be set according to fire compartments, and the fire dampers with nominal operating temperature of 150℃ shall be set at the joints of vertical exhaust pipes with branch pipes.

9.3.13 The arrangement of fire dampers shall meet the following requirements:

1 The fire dampers should be set close to the fire separation place;

2 When the fire dampers are installed in a concealed way, manhole for convenient maintenance shall be arranged at the installation position;

3 The air pipes and heat insulating materials within 2.0m on both sides of the fire dampers shall be made of non-combustible materials;

4 The fire dampers shall meet the requirements of the current national standard "Fire Dampers for Building-venting and Smoke-venting System" (GB 15930).

9.3.14 The air pipes of ventilating and air conditioning systems shall be made of non-combustible materials, unless:

1 The air pipes and flexible joints contacting with corrosive media may be made of difficult-combustible materials;

2 As for the air pipes of ventilating and air conditioning systems in such large-space buildings such as gymnasiums, exhibition halls and departure (waiting) buildings, single-/multi-storey office buildings and Categories C, D and E factory buildings, if they do not through the fire compartment and are set with fire dampers at the positions passing through room partition walls, they may be made of difficult-combustible materials.

9.3.15 The heat insulating materials of equipment and air pipes and the humidifying materials, deadeners and binders for humidifiers shall adopt non-combustible materials, and they may adopt difficult-combustible materials if it is indeed difficult to adopt non-combustible materials.

When the electric heater is set in the air pipe, the on-off of electric heater shall be interlocked and controlled with the start/stop of blower. For the air pipes within 0.8m before and after the electric heater and those passing through the rooms easy to be on fire due to high temperature and ignition source, the non-combustible materials shall be adopted.

9.3.16 Natural ventilating or mechanical ventilating facilities shall be arranged in the fuel- or gas-fired boiler houses. The gas-fired boiler house shall be set with explosion-proof emergency exhaust blower. If mechanical ventilation is adopted, the mechanical ventilating facilities shall be equipped with grounding devices to conduct or remove static, and the ventilation volume shall meet the following requirements:

1 The normal ventilation volume of oil-fired boiler house shall be determined according to ventilation rate not less than 3 times/h; while the emergency exhaust volume shall be determined according to ventilation rate not less than 6 times/h;

2 The normal ventilation volume of gas-fired boiler house shall be determined according to ventilation rate not less than 6 times/h; while the emergency exhaust volume shall be determined according to ventilation rate not less than 12 times/h.

10 Electric System

10.1 Fire Power Supply and Distribution

10.1.1 The fire power in the following buildings shall be supplied according to Class I load:

1 Categories B and C factory buildings and Category C storages building height higher than 50m;

2 Category I high-rise civil buildings.

10.1.2 The fire power in the following buildings, tanks (tank farm) and stockyards shall be supplied according to Class II load:

1 Factory buildings (storages) with outdoor fire demand greater than 30L/s;

2 Combustibles stackyards, combustible gas tanks (tank farm) and Class A,B liquid tanks (tank farm) with outdoor fire demand greater than 35L/s;

3 Grain depots and grain siloes;

4 Category II high-rise civil buildings;

5 Cinemas and theaters with more than 1,500 seats, gymnasiums with more than 3,000 seats, stores and exhibition buildings with the building area of any floor greater than 3,000m^2. Broadcast& television, telecommunication, finance and trade buildings at provincial (municipal) level or above, other public buildings with outdoor fire demand greater than 25L/s.

10.1.3 The fire power in the buildings, tanks (tank farm) and stockyards not specified in 10.1.1 and 10.1.2 of this code shall be supplied according to Class III load.

10.1.4 As for buildings, in which the fire power is supplied according to Class I or II load, if self-provided generating equipment is adopted as standby power supply, the self-provided generating equipment shall be arranged with automatic and manual startup device. If automatic startup is adopted, it shall guarantee to supply power within 30s.

Power supply with different class load shall meet the requirements of the current national standard "Code for Design of Electric Power Supply Systems" (GB 50052).

10.1.5 The continuous serving time of the standby power supply for fire emergency lighting and evacuation indicating sign in buildings shall meet the following requirements:

1 As for civil buildings higher than 100m, the continuous serving time shall not be less than 1.5h;

2 As for medical buildings, buildings for the aged, public buildings with total building area greater than 100,000m^2 and underground & semi-underground buildings with total building area greater than 20,000m^2, the continuous serving time shall not be less than 1.0h;

3 The continuous serving time for other buildings shall not be less than 0.5h.

10.1.6 Dedicated power supply circuit shall be adopted for fire-fighting electric equipment; when the production and living power in building is cut off, the fire power shall be guaranteed.

The serving time and capacity of standby fire power supply shall meet the

requirements of each fire-fighting electric equipment during the fire.

10.1.7 The fire-fighting distributing main should be classified according to fire compartment, and the fire-fighting distribution branch should not pass through the fire compartment.

10.1.8 As for the power supply for electric equipment and fire elevators within fire control room, fire pump room and smoke control & smoke exhaust fan room, automatic switchover devices shall be arranged at the last stage distribution box of the distribution line.

10.1.9 As for fire-fighting equipment powered according to Class I or II load, the distribution box shall be arranged separately; while for the fire-fighting equipment powered according to Class III load, the distribution box should be arranged separately.

Clear marks shall be arranged for fire-fighting distribution equipment.

10.1.10 The fire-fighting distribution lines shall meet the demands of consecutive power supply during fire and thereof the laying shall meet the following requirements:

1 Where laying is conducted in an exposed way (including laying in the suspended ceiling), metal conduits or closed metal slots shall be adopted for protection and fire protection measures shall be adopted for such metal conduits or closed metal slots; where flame-retardant or fire-proof cables are adopted and laid in cable shaft and trench, protection by threading in metal conduits or closed metal slots; where mineral insulation type non-combustible cables are adopted, the lines may be directly laid in an exposed way.

2 Where laying is conducted in a concealed way, pipes shall be adopted and laid in the non-combustible structure with protection layer thickness not less than 30mm;

3 The fire-fighting distribution lines should be laid separately from other distribution lines in different cable shafts or trench; where they must be laid in the same cable shaft or trench, they shall be arranged in different side. Moreover, mineral insulation type non-combustible cables shall be adopted for fire-fighting distribution lines.

10.2 Power Line and Electric Equipment

10.2.1 The smallest horizontal distance between the overhead power line and Categories A and B factory buildings (storages), stacking of combustibles, Classes A, B and C liquid tanks, LPG tanks or combustible and combustion-supporting gas tanks shall be in accordance with those specified in Table 10.2.1.

The smallest horizontal distance between 35kV or above overhead power line and the LPG tanks (tank farm) with single tank volume greater than 200m^3 or total volume greater than 1,000m^3 shall not be less than 40m.

Table 10.2.1 Smallest Horizontal Distance between Overhead Power Line and Categories A and B Factory Buildings (Storages) or Stacking of Combustibles (m)

Name	Overhead power line
Categories A and B factory buildings (storages); stacking of combustibles; Classes A, B liquid tanks; LPG tanks, combustible and combustion-supporting gas tanks	1.5 times of the height of power pole (tower)
Directly-buried Classes A and B liquid tanks and combustible gas tanks	0.75 times of the height of power pole (tower)
Class C liquid tanks	1.2 times of the height of power pole (tower)
Directly-buried Class C liquid tanks	0.6 times of the height of power pole (tower)

10.2.2 The power cables shall not be laid in the same pipe trench with Classes A, B, C fluid pipelines, combustible gas pipelines and heating pipelines.

10.2.3 The distribution lines must not pass through the inner cavity of ventilating pipelines or be laid in the external wall of ventilating pipelines; the distribution lines threaded in metal pipes may be laid closely clinging to the external wall of ventilating pipelines.

Where the distribution lines are laid in blind ceiling or suspended ceiling with combustibles, fire protection measures such as threading in metal pipe or using closed metal slot shall be adopted.

10.2.4 Where switches, sockets and lighting fixtures are close to the combustibles, fire protection measures, such as heat insulation and heat dissipation measures, shall be taken.

As for the ceiling lamp, recessed lamp and embedded lamp of tungsten halogen lamp or incandescent lamp with a rated power of not less than 100W, non-combustible materials such as porcelain pipe and mineral wool shall be adopted for the heat insulation of their leading wires.

The incandescent lamp, tungsten halide lamp, high voltage sodium lamp, metal halide lamp and fluorescent high-voltage mercury lamp (including inductive ballast) with rated power not less than 60W shall not be directly mounted onto the combustibles, or other fire control measures shall be taken.10.2.5 Low temperature lighting fixtures should be applied within combustibles storages, and heat insulation and other fire protection measure shall be taken for the heating elements of lighting fixtures; high temperature lighting fixtures such as tungsten halide lamp shall not be used.

Distribution box and switch shall be arranged outside the storages.

10.2.6 The design of electrical installations in explosive atmospheres shall meet the requirements of the current national standard "Code for Design of Electrical Installations in Explosive Atmospheres" (GB 50058).

10.2.7 Electric fire monitor system should be arranged for the non-fire power load in the following buildings or locations:

1 Categories B and C factory buildings and Category C storages with height higher than 50m; factory buildings (storages) with outdoor fire demand greater than 30L/s;

2 Category I high-rise civil buildings;

3 Cinemas and theaters with more than 1,500 seats, gymnasiums with more than 3,000 seats, stores and exhibition buildings with the building area of any floor greater than 3,000m^2, broadcast& television, telecommunication, finance and trade buildings at provincial

(municipal) level or above, other public buildings with outdoor fire demand greater than 25L/s;

4 Key historic buildings of brick-wood or timber structure of country-level cultural relic protection units.

10.3 Fire Emergency Lighting and Evacuation Indicating Sign

10.3.1 Except for the residential buildings with a height less than 27m, evacuation lighting shall be arranged at the following positions of civil buildings, factory buildings and Category C storages:

1 Enclosed staircase, smoke-proof staircase and its front room, front room or shared front room of fire elevator room, exit passageway and refuge floor (room);

2 Crowded locations such as auditorium, exhibition hall, multi-function hall as well as business hall, canteen and studio with building area greater than 200m^2;

3 Public places of underground or semi-underground with building area greater than 100m^2;

4 Evacuation passageway in public buildings;

5 Production sites and evacuation passageway in crowded factory buildings.

10.3.2 The minimum floor horizontal illumination of evacuation lighting within buildings shall meet the following requirements:

1 As for the evacuation passageway, the minimum floor horizontal illumination shall not be less than 1.0lx.

2 As for crowded locations and refuge floor (room), the minimum floor horizontal illumination shall not be less than 3.0lx; as for refuge room of inpatient buildings or operation departments, the minimum floor horizontal illumination shall not be less than 10.0lx.

3 As for the staircase, front room (shared front room) and exit passageway, the minimum floor horizontal illumination shall not be less than 5.0lx.

10.3.3 Stand-by lighting shall be arranged for fire control room, fire pump room, house generator room, power distribution room, smoke control/exhaust machine room and fire-fighting equipment room which need normal operation in case of fire, the minimum illumination on the working plane shall not be less than the normal lighting illumination.

10.3.4 Evacuation lighting fixtures shall be arranged on the top of exit, the upper part of wall surface or the ceiling; the stand-by lighting fixtures shall be arranged on the upper part of wall surface or the ceiling.

10.3.5 Lighting and evacuation indicating signs shall be arranged in public buildings, residential buildings with height greater than 54m, high-rise factory buildings (storerooms) and Categories A, B and C single-/multi-storey factory buildings, and shall meet the following requirements:

1 It shall be arranged right above the safety exit and the evacuation door of crowded locations.

2 It shall be arranged in the wall surface of the evacuation passageway and the corner, at a position less than 1.0m from the ground or on the ground. The spacing between lighting

and evacuation indicating signs shall not be greater than 20m; such spacing shall not be greater than 10m for dead end while not be greater than 1.0m for the corner of passageway.

10.3.6 Lighting and evacuation indicating sign or light-storing evacuation indicating sign to ensure the visual continuity shall be added to the floor of the evacuation passageway and main evacuation route within the following buildings or locations:

1 Exhibition buildings with total building area larger than 8,000 m^2;

2 Overground stores with total building area larger than 5,000m^2;

3 Underground or semi-underground stores with total building area larger than 500m^2;

4 Entertainment venues for singing, dancing and broadcasting;

5 Cinemas or theaters with more than 1,500 seats as well as gymnasiums, assembly halls or auditoriums with more than 3,000 seats;

6 Waiting rooms with building area greater than 3,000m^2 in bus station, wharf structure and civil airport terminal as well as public areas in terminal.

10.3.7 The fire evacuation indicating sign and fire emergency lighting fixtures arranged in buildings shall not only meet those specified in this code but also meet the requirements of the current national standards "Fire Safety Signs" (GB 13495) and "Fire Emergency Lighting and Evacuate Indicating System" (GB 17945).

11 Timber Buildings

11.0.1 The fire protection design of timber buildings may comply with this chapter. The combustion performance and fire resistance rating of building elements shall be in accordance with those specified in Table 11.0.1.

Table 11.0.1 Combustion Performance and Fire Resistance Rating of Timber Building Elements

Element name	Combustion performance and fire resistance rating (h)
Fire wall	Non-combustible 3.00
Load-bearing wall; walls and separating walls between units of residential buildings; walls of staircase	Difficult-combustible 1.00
Walls of elevator shaft	Non-combustible 1.00
Non-load-bearing exterior wall; partition walls on both sides of evacuation passageway	Difficult-combustible 0.75
Partition wall between rooms	Difficult-combustible 0.50
Load-bearing column	Combustible 1.00
Beam	Combustible 1.00
Floor slab	Difficult-combustible 0.75
Roof load-bearing elements	Combustible 0.50
Evacuation stairs	Difficult-combustible 0.50
Suspended ceiling	Difficult-combustible 0.15

Notes:

1 Unless otherwise stated in this code, when a timber building has roofs of different height, combustible elements shall not be adopted for the roof load-bearing elements and roofs of the lower part, and if the difficult-combustible roof load-bearing elements are adopted, their fire resistance rating shall not be less than 0.75h.

2 As for the roof of light timber building, all parts other than the waterproof layer, insulation layer and roof slab shall be regarded as roof load-bearing elements and shall not adopt combustible elements, and the fire resistance rating shall not be less than 0.50h.

3 When the number of storeys is less than or equal to 2 and the building area and length between fire walls are less than 600m^2 and 60m respectively, the combustion performance and fire resistance rating of building elements may be determined according to the requirements for such buildings with Class IV fire resistance as specified in this code.

11.0.2 If the partitions with timber framework are adopted for buildings, the following requirements shall be met:

1 As for residential buildings not higher than 18m, office buildings not higher than 24m and Categories D and E factory buildings (storerooms), the partition walls between rooms and the non-load-bearing exterior walls may adopt the partitions with timber framework, and the non-load-bearing exterior walls of other buildings shall not adopt partitions with timber framework;

2 The combustion performance of wall filling materials shall be Class A;

3 The combustion performance and fire resistance rating of partitions with timber framework shall be in accordance with those specified in Table 11.0.2, and other requirements shall meet those specified in the current national standard "Technical Code for Partitions with

Timber Framework" (GB/T 50361).

Table 11.0.2 Combustion Performance and Fire Resistance Rating (h) of Partitions with Timber Framework

Element name	Fire resistance rating or type of buildings				
	Class I	Class II	Class III	Timber buildings	Class IV
Non-load-bearing exterior wall	Not allowed	Difficult-combustible 1.25	Difficult-combustible 0.75	Difficult-combustible 0.75	No requirement
Partition wall between rooms	Difficult-combustible 1.00	Difficult-combustible 0.75	Difficult-combustible 0.50	Difficult-combustible 0.50	Difficult-combustible 0.25

11.0.3 Timber buildings or timber combined buildings shall not be adopted for Categories A, B and C factory buildings (storerooms). When timber buildings or timber combined buildings are adopted for Categories D and E factory buildings (storerooms) and civil buildings, their permissible number of storeys and building height shall be in accordance with those specified in Table 11.0.3-1, and the permissible building length and the maximum permissible building area of each floor between fire walls in timber buildings shall be in accordance with those specified in Table 11.0.3-2.

Table 11.0.3-1 Permissible Number of Storeys and Permissible Building Height of Timber Buildings or Timber Combined Buildings

Type of timber buildings	Ordinary timber building	Light timber building	Glued timber building		Timber combined building
Permissible number of storeys (storey)	2	3	1	3	7
Permissible building height (m)	10	10	Not limited	15	24

Table 11.0.3-2 Permissible Buildings Length and Maximum Permissible Building Area of Each Floor between Fire Walls of Timber Buildings

Number of storeys (storey)	Permissible building length between fire walls (m)	Maximum permissible building area of each floor between fire walls (m^2)
1	100	1,800
2	80	900
3	60	600

Notes:

1 When sprinkler system is set, the permissible building length and maximum permissible building area of each floor between fire walls may be increased by 1.0 times according to those specified in this table; as for Categories D and E overground factory buildings, the maximum permissible building area of each floor between fire walls is not limited.

2 For the large space buildings like sports venues, the building height and area may be increased properly.

11.0.4 If the accommodation part of senior citizen buildings and the children rooms and activity places in nurseries and kindergartens are arranged in the timber buildings, they shall be arranged on the first or second floor.

Single-story timber building shall be adopted for stores, gymnasiums and Categories D and E factory buildings (storerooms).

11.0.5 Except the residential buildings, the arrangement and fire protection requirements of the generator rooms, power distribution rooms and boiler houses in buildings shall meet the requirements of 5.4.12~5.4.15 and 6.2.3 ~6.2.6 of this code.

11.0.6 For the mobile garage, generator room, power distribution room and boiler house arranged in timber residential buildings, they shall be separated from other parts with fire

partition walls and non-combustible floor slabs with fire resistance rating not less than 2.00h and 1.00h respectively, and they should not be set with doors, windows or openings leading to the rooms; if they must be opened, one single-leaf Class B fire door not directly leading to the bedroom can be opened. The building area of mobile garage should not be greater than 60m^2.

11.0.7 The safe evacuation design of civil timber buildings shall meet the following requirements:

1 The arrangement for safety exits and room evacuation doors of buildings shall meet the requirements of 5.5 in this code. If the building area of each floor of timber building is less than 200m^2 and the sum of population on the second and third floors is not greater than 25, one evacuation stair may be built.

2 The linear distance between the evacuation door directly leading the room to evacuation passageway and the nearest safety exit shall not be greater than those specified in Table 11.0.7-1.

Table 11.0.7-1 Linear Distance between Evacuation Door Directly Leading the Room to Evacuation Passageway and the Nearest Safety Exit (m)

Name	Evacuation door located between two safety exits	Evacuation door located at both sides or terminals of dead end
Nursery, kindergarten and senior citizen building	15	10
Singing and dancing entertainment and show venues	15	6
Hospital and sanatorium buildings and teaching buildings	25	12
Other civil buildings	30	15

3 The linear distance between any point in the room and the evacuation door directly leading this room to evacuation passageway shall not be greater than that between the evacuation door located at both sides or terminals of dead end and the nearest safety exit specified in Table 11.0.7-1.

4 The clear width of the evacuation passageway, safety exit, evacuation stair and room evacuation door in buildings shall be determined through calculation based on the number of evacuees according to that the minimum clear width for evacuation of every 100 persons is not less than that specified in Table 11.0.7-2.

Table 11.0.7-2 Minimum Clear Evacuation Width for Every 100 Persons of Evacuation Passageway, Safety Exit, Evacuation Stair and Room Evacuation Door (m/100 Persons)

Number of storeys	The 1sth and 2nd floors overground	The 3rd floor overground
Clear evacuation width for every 100 persons (m/100 persons)	0.75	1.00

11.0.8 The evacuation distances from any point in Categories D and E timber factory buildings to the nearest safety exits shall not be greater than 50m and 60m respectively, and other safe evacuation requirements shall meet those specified in 3.7 of this code.

11.0.9 When the pipeline and electric circuit are laid in wall or through floor slab or wall, the fire protection measures shall be taken, and the gaps between them and wall or floor slab shall be filled firmly with firestop materials.

Fire protection and heat insulation measures shall be taken for open flame or high

temperature positions and oil-fume exhaust pipes of kitchens in residential buildings.

11.0.10 The fire separation distance between civil timber buildings or between civil timber building and other civil buildings shall not be less than that specified in Table 11.0.10.

The fire separation distance between civil timber buildings and factory buildings (storages) or the like, between timber factory buildings (storages) or between timber factory buildings (storages) and other civil buildings shall meet the requirements on buildings with Class IV fire resistance class as stated in Chapters 3 and 4 of this code.

Table 11.0.10 Fire Separation Distance (m) between Civil Timber Buildings as well as between Civil Timber Buildings and Other Civil Buildings

Fire resistance class or category of buildings	Classes I and II	Class III	Timber buildings	Class IV
Timber buildings	8	9	10	11

Notes:

1 If there is no door, window or opening on the exterior walls between two timber buildings or between timber building and other civil buildings, the fire separation distance may be set as 4m; if the door, window and opening on the exterior wall are not over against each other and the total opening area is not larger than 10% of exterior wall area, the fire separation distance may be reduced by 25% according to those specified in this table.

2 If one of the adjacent exterior walls is fire wall, or a fire wall is set between buildings with the wall body cutting off the non-combustible roof or towering above the difficult-combustible or combustible roof by not less than 0.5m, the fire separation is not limited.

11.0.11 Fire separation measures shall be taken for wall, floor slab, enclosed suspended ceiling or enclosed space under roof of the timber buildings with horizontal separating length or width not greater than 20m, building area not greater than 300m^2 and the vertical separating height of wall not greater than 3m.

Fire separation measures shall be taken at the stair beam of each floor in light timber buildings.

11.0.12 When timber buildings are constructed in combination with other steel, reinforced concrete or masonry structures, the following requirements shall be met:

1 The timber part shall not exceed 3 storeys and shall be arranged at the upper part of the building in case of vertical combined construction; non-combustible floor slab with fire resistance rating not less than 1.00h should be adopted to separate timber part from other parts.

Fire wall should be adopted to separate timber part from other parts in case of horizontal combined construction.

2 If the fire separation is made between the timber part and other parts according to the requirements of Item 1, the fire protection design of timber part and other parts shall respectively meet the requirements for timber buildings and other buildings in this code; under other conditions, the fire protection design of buildings shall meet the requirements for timber buildings as specified in this code.

3 The indoor fire water supply shall be determined according to the overall height, volume, storeys and purpose of the building as well as the requirements of Chapter 8 in this code and the current relevant standards of the nation; the outdoor fire water supply shall be determined according to requirements for buildings with Class IV fire resistance class as

specified in this code.

11.0.13 For the timber public buildings with total building area larger than 1,500m^2, the fire alarm system shall be installed, and in the timber residential buildings, the fire detection and alarm devices shall be installed.

11.0.14 Other fire protection design of timber buildings shall meet the requirements for buildings with Class IV fire resistance class as specified in this code; the requirements for fireproof construction shall meet the requirements of this code and the current national standard "Code for Design of Timber Structures" (GB 50005).

12 City Road Tunnel

12.1 General Requirements

12.1.1 As for the fire protection design of city road tunnel (hereinafter referred to as tunnel), the traffic composition in tunnel as well as the function, natural conditions and length of the tunnel shall be comprehensively considered.

12.1.2 Single-bore and twin-bore tunnels shall be divided into Categories I, II, III and IV according to their enclosed length and traffic situations, and shall meet those specified in Table 12.1.2.

Table 12.1.2 Categorization of Single-bore and Twin-bore Tunnels

Function	Category I	Category II	Category III	Category IV
	The enclosed length of tunnel L (m)			
Allowing motor vehicles with dangerous chemicals to pass	L>1,500	500<L≤1,500	L≤500	-
Only allowing motor vehicles with non-dangerous chemicals to pass	L>3,000	1,500<L≤3,000	500<L≤1,500	L≤500
Only allowing pedestrians or non-motor vehicles to pass	-	-	L>1,500	L≤1,500

12.1.3 The fire resistance rating of load-bearing structure of the tunnel shall meet the following requirements:

1 As for Categories I and II tunnels as well as Category III tunnels allowing motor vehicles to pass, the determination of the fire resistance rating of their load-bearing structures shall meet those specified in Appendix C of this code; as for Categories I and II tunnels, RABT standard temperature-rise curve specified in C.0.1 in Appendix C of this code shall be adopted as the fire temperature-rise curve, and the fire resistance rating shall not be less than 2.00h and 1.50h respectively; as for Category III tunnels allowing motor vehicles to pass, HC standard temperature-rise curve specified in C.0.1 in Appendix C of this code shall be adopted as the fire temperature-rise curve, and the fire resistance rating shall not be less than 2.00h.

2 As for tunnels of other categories, the determination of the fire resistance rating of their load-bearing structures shall meet the requirements of the current national standard "Fire-resistance Tests - Elements of Building Construction - Part 1: General Requirements" (GB/T 9978.1); as for Category III tunnels, the fire resistance rating shall not be less than 2.00h; as for Category IV tunnels, the fire resistance rating is not limited.

12.1.4 The fire resistance class of underground equipment rooms, air shafts, fire rescue exits and entrances in tunnels shall be Class I; the fire resistance class of the ground important equipment rooms, operation and management centers as well as other ground auxiliary rooms shall not be inferior to Class II.

12.1.5 Except the joint materials, non-combustible materials shall be adopted for the internal decoration of tunnels.

12.1.6 As for the twin-bore tunnels allowing motor vehicles to pass, the arrangement of cross aisles or evacuation passageways for vehicles shall meet the following requirements:

1 Cross aisle or evacuation passageway for vehicles should be arranged in the subaqueous tunnels; the spacing between the cross aisles for vehicles and that between the

tunnel and the entrance of evacuation passageway for vehicles should be 1,000m~1,500m.

2 Cross aisle or evacuation passageway for vehicles shall be arranged in the non-subaqueous tunnels; the spacing between the cross aisles for vehicles and that between the tunnel and the entrance of evacuation passageway for vehicles should not be greater than 1,000m.

3 The cross aisle for vehicles shall be arranged in direction perpendicular to the tunnel length and lead to the adjacent tunnel; the evacuation passageway for vehicles shall be arranged between the two bores in direction perpendicular to the tunnel length and directly lead to the outside of the tunnel.

4 As for the cross aisle and evacuation passageway for vehicles, the clear width shall not be less than 4.0m and the clear height shall not be less than 4.5m.

5 Fire separation measures shall be taken at the joints of tunnels and cross aisles or evacuation passageways for vehicles.

12.1.7 Cross aisle or evacuation passageway for pedestrians shall be arranged in twin-bore tunnel and shall meet the following requirements:

1 The spacing between cross aisles for pedestrians and that between the tunnel and the entrance of the evacuation passageway for pedestrians should be 250m ~300m.

2 The cross aisle for pedestrians shall be arranged in direction perpendicular to the twin-bore tunnel length and lead to the adjacent tunnel; the evacuation passageway for pedestrians shall be arranged between the two bores in direction perpendicular to the tunnel length and directly lead to the outside of the tunnel.

3 The cross aisles for vehicles may be used for pedestrians.

4 As for the cross aisle or evacuation passageway for pedestrians, the clear width shall not be less than 1.2m and the clear height shall not be less than 2.1m.

5 Fire separation measures shall be taken at the joints of tunnels and cross aisle or evacuation passageway for pedestrians, and Class B fire doors shall be adopted.

12.1.8 Refuge facilities such as personnel evacuation exit directly leading to outdoors or separated refuge should be arranged in single-bore tunnels.

12.1.9 Fire separation measures shall be taken to separate the substation, pipe rack, specialized evacuation passageway, ventilation house and other auxiliary rooms in the tunnel from the vehicle tunnels with fire separation walls with fire resistance rating not less than 2.00h as well as Class B fire doors.

12.1.10 The maximum permissible building area of each fire compartment of underground equipment room in the tunnel shall not be greater than 1,500m^2; the number of safety exits of each fire compartment shall not be less than 2; the exits leading to lanes or other fire compartments may be used as the secondary safety exits, but at least one safety exit directly leading to outdoors must be arranged. As for unmanned equipment room with building area not greater than 500m^2, one safety exit directly leading to outdoors may be arranged.

12.2 Fire Water Supply and Fire Extinguishing Equipment

12.2.1 During urban traffic planning and design, fire water supply system shall also be designed. Category IV tunnels as well as the Category III tunnels allowing pedestrians or non-motor vehicles to pass may not be set with fire water supply system.

12.2.2 The arrangement of fire water supply system shall meet the following requirements:

1 The fire water source and water supply network shall comply with the relevant current standards of the nation.

2 The fire demand shall be determined through calculation according to the fire duration in tunnel and the situation that the full tunnel is involved in a fire at the same time. The fire duration of Categories I and II tunnels shall not be less than 3.0h, and that of Category III tunnels shall not be less than 2.0h.

3 The fire demand in tunnel shall be calculated according to the total water consumption when all fire extinguishing equipment are started.

4 Independent fire water supply system should be arranged in the tunnel. Anti-freezing measures shall be taken for fire water supply pipelines and outdoor fire hydrants in severe cold and cold zones; when dry-type water supply system is adopted, automatic air valve shall be installed on the highest position of pipe network and the filling time of pipeline should not be greater than 90s.

5 The water demand of fire hydrants inside tunnel shall not be less than 20L/s; and that of fire hydrant outside the tunnel shall not be less than 30L/s. As for Category III tunnels with length less than 1,000m, the water demand of fire hydrants inside and outside the tunnel may be 10L/s and 20L/s respectively.

6 As for the fire water supply pressure in pipeline, it shall guarantee that the full water spout of water gun at the most unfavorable point shall not be less than 10.0m when the water demand reaches the maximum value; when the outflow pressure at fire hydrant mouth is greater than 0.5MPa, pressure-reducing facilities shall be equipped.

7 Fire pump adapters and outdoor fire hydrants shall be arranged at the exit and entrance of tunnel.

8 The spacing of fire hydrants in tunnel shall not be greater than 50m; the height of fire hydrant mouth above the ground should be 1.1m.

9 As for tunnels with water supply facilities as fire pumps, the start button of fire pump shall be arranged in the hydrant cabinet.

10 Indoor fire hydrant cabinets shall be arranged on one side of the tunnel; fire hydrant cabinet shall be equipped with a water gun with the diameter of jet hole of 19mm, a disc of water hose with length of 25m and diameter of 65mm, and fire hose reel.

12.2.3 Drainage facilities shall be arranged in tunnel with the consideration of discharging seeped water, rainwater and tunnel cleaning water as well as the fire demand, and measures to prevent combustible or harmful liquids from flowing along the tunnel during an accident shall be taken.

12.2.4 ABC fire extinguishers shall be equipped in tunnel and shall meet the following requirements:

1 As for Categories I and II tunnels allowing motor vehicles to pass as well as Category III tunnels allowing motor vehicle to pass and being arranged with 3 or more lanes, fire extinguishers shall be equipped on both sides of the tunnel, and the number of fire extinguishers at each set point shall not be less than 4;

2 As for other tunnels, fire extinguishers may be equipped on one side, and the number of fire extinguishers at each set point shall not be less than 2;

3 The spacing of points equipped with fire extinguishers shall not be greater than

100m.

12.3 Ventilating and Smoke Exhaust System

12.3.1 Smoke exhaust facilities shall be arranged for Categories I, II and III tunnels allowing motor vehicles to pass.

12.3.2 The arrangement of mechanical smoke exhaust system in the tunnel shall meet the following requirements:

1 Longitudinal segment smoke exhaust or key point smoke exhaust should be adopted for tunnels with length greater than 3,000m;

2 As for single-bore one-way traffic tunnels with length not greater than 3,000m, the longitudinal smoke exhaust should be adopted;

3 As for single-bore two-way traffic tunnels, the key point smoke exhaust should be adopted.

12.3.3 Mechanical smoke exhaust system and ventilating system of tunnel should be arranged separately. Where they are used together, the ventilating system shall be possessed of quick switching function during a fire and shall meet the requirements of mechanical smoke exhaust system.

12.3.4 The mechanical smoke exhaust system arranged in tunnel shall meet the following requirements:

1 If transverse and semi-transverse ventilation modes are adopted, smoke may be exhausted through exhaust duct.

2 If longitudinal smoke exhaust mode is adopted, it shall be able to rapidly organize air flow and effectively exhaust smoke; its smoke exhaust velocity shall be determined according to the scale of the most unfavorable fire, and the longitudinal air flow speed shall not be less than 2m/s and shall be greater than the critical wind speed.

3 The smoke exhausters as well as auxiliary equipment such as air valves, silencers, soft joints flowed by smoke shall be able to bear the designed fire smoke exhaust temperature of the tunnel and keep consecutive normal operation for no less than 1.0h at 250℃. The fire resistance rating of smoke exhaust pipeline shall not be less than 1.00h.

12.3.5 Independent mechanical pressurized air supply system shall be set in the refuge facilities of tunnel, thereof the residual pressure value of air supply shall be 30Pa ~ 50Pa.

12.3.6 At least a set of standby jet fan shall be equipped in the tunnel for fire smoke exhaust.

12.4 Fire Alarm System

12.4.1 Alarm signal devices shall be arranged at position 100m~150m to the tunnel entrance to warn "no entrance" for vehicles when there is a fire in the tunnel.

12.4.2 Fire alarm system shall be set for Categories I and II tunnels and should be arranged for Category III tunnels allowing motor vehicles to pass. The arrangement of fire alarm system shall meet the following requirements:

1 Fire automatic detection devices shall be equipped;

2 Alarm telephones and alarm buttons shall be arranged at the tunnel exit and entrance

as well as every 100m~150m in the tunnel;

3 Fire emergency broadcast shall be arranged or luminous alarm devices shall be arranged every 100m~150m.

12.4.3 Fire alarm system shall be arranged in tunnel cable channels and main equipment rooms.

12.4.4 Facilities guaranteeing smooth communication during fire extinguishment such as wireless communication shall be equipped for such tunnels where shielding may be generated.

12.4.5 Tunnels with enclosed length exceeding 1,000m should be arranged with fire control room; the building fire protection requirements of fire control room shall meet those specified in 8.1.7 and 8.1.8 of this code.

The design of fire alarm system in the tunnel shall meet the requirements of the current national standard "Code for Design of Automatic Fire Alarm System" (GB 50116).

12.5 Power Supply and Other Requirements

12.5.1 The power utilization for fire protection of Categories I and II tunnels shall be supplied according to the requirements of Class I load; the power utilization for fire protection of Category III tunnels shall be supplied according to the requirements of Class II load.

12.5.2 Other requirements of fire protection power as well as its power supply and power distribution lines of tunnel shall meet those specified in 10.1 of this code.

12.5.3 Evacuation lighting and evacuation indicating signs shall be arranged on both sides of the tunnel as well as above the cross aisles and evacuation passageway for pedestrians, and their height should not be greater than 1.5m.

The continuous power supply time of evacuation lighting and evacuation indicating signs in Categories I and II tunnels shall not be less than 1.5h while that for other tunnels shall not be less than 1.0h. Moreover, other requirements may be determined according to those specified in Chapter 10 of this code.

12.5.4 It is strictly forbidden to arrange combustible gas pipeline in the tunnel; the cable trunking shall be laid separately from other pipelines. Where high-voltage cable of 10kV or above is arranged, fire compartment with fire resistance rating not less than 2.00h shall be adopted to separate it from other areas.

12.5.5 Protection measures adapting to the environmental conditions in the tunnel shall be adopted for all fire-fighting facilities arranged in the tunnel; moreover, they shall be set with visible luminous indicating signs.

Appendix A Calculation Method of Building Height and Storeys

A.0.1 The calculation of building height shall meet the following requirements:

1 The building height shall be the average height from outdoor design ground to the cornice and roof ridge of the building when the building roof is a sloping roof.

2 The building height shall be the height from outdoor design ground to the roof covering of the building when the building roof is a flat roof (including flat roof with parapet wall).

3 When a building has multiform roofs, the building height shall be taken as the largest one among values respectively calculated according to above methods.

4 As for step-type terrace, when fire walls are arranged for separating in a building located on the terrace of different elevations and are respectively set with safety exits meeting the requirements of the specifications, and the through or stub-end fire lane may be arranged along the two long sides of the building, the respective building height may be calculated respectively. Otherwise, the building height shall be determined according to the largest height value.

5 The auxiliary rooms such as the watchtower, cooling tower, water tank rooms and microwave antenna rooms partially protruding out of the building roof or the facilities and elevator machine rooms, air exhaust and smoke exhaust rooms as well as the stair exit cubicles, accounting for less than 1/4 of the roof area, may not counted in the building height.

6 As for the residential buildings, the bicycle garages, the storerooms and open spaces arranged at the bottom and with the indoor height not greater than 2.2m, and the parts of building where the interior and exterior height difference is not greater than 1.5m or the height from the roof deck of basement or semi-basement of the building to the outdoor design ground is not greater than 1.5m, may not be counted in the building height.

A.0.2 The building storeys shall be calculated according to the natural storeys of the building, and the following spaces may not be counted in the building storeys:

1 Basement and semi-basement with indoor roof deck above the outdoor design ground by less than or equal to 1.5m;

2 The bicycle garages, storerooms or open spaces arranged at the bottom of building and with indoor height not greater than 2.2m;

3 The partial equipment rooms and staircases of buildings protruding out of the building roof.

Appendix B Calculation Method of Fire Separation Distance

B.0.1 The fire separation distance between buildings shall be calculated according to the smallest horizontal distance between exterior walls of adjacent buildings; in case of protruding combustible or difficult-combustible elements on the exterior wall, the fire separation distance shall be calculated starting from the outer edge of protruding parts.

The fire separation distance from buildings to storage tanks and stackyards shall be the smallest horizontal distance from the exterior wall of building to the outer wall of storage tanks or the outer edges of adjacent stacks in the stackyard.

B.0.2 The fire separation distance between storage tanks shall be the smallest horizontal distance between the outer walls of two adjacent storage tanks.

The fire separation distance between storage tank and stackyard shall be the smallest horizontal distance from the outer wall of storage tank to the outer edge of adjacent stacks in the stackyard.

B.0.3 The fire separation distances between stackyards shall be the smallest horizontal distances between the outer edges of adjacent stacks in two stackyards.

B.0.4 The fire separation distance between transformers shall be the smallest horizontal distance between the outer walls of adjacent transformers.

The fire separation distance from transformers to buildings, storage tanks or stackyards shall be the smallest horizontal distance from the outer wall of transformer to the exterior wall of building, outer wall of storage tank or the outer edge of adjacent stacks.

B.0.5 The fire separation distance from buildings, storage tanks or stackyards to the roads and railways shall be the smallest horizontal distance from the exterior wall of building, outer wall of storage tank or the outer edge of adjacent stacks to the nearest roadside of road or the center line of railway.

Appendix C Temperature-rise Curve for Fire Resistance Rating Test and Performance Criteria of Load-bearing Structure in Tunnel

C.0.1 RABT and HC standard temperature-rise curves shall meet the requirements of the current national standard "Fire Resistance Test for Elements of Building Construction - Alternative and Additional Procedures" (GB/T 26784).

C.0.2 Performance criteria of fire resistance rating shall meet the following requirements

1 When HC standard temperature-rise curve is adopted for test, the judgment criteria of the fire resistance rating shall be: after fire exposure, when the temperature of steel bars 25mm away from the concrete bottom surface is greater than 250℃, or the temperature of concrete surface is greater than 380℃, it is judged as having reached the fire resistance rating.

2 When RABT standard temperature-rise curve is adopted for test, the judgment criteria of the fire resistance rating shall be: after fire exposure, when the temperature of steel bars 25mm away from the concrete bottom surface is greater than 300℃, or the temperature of concrete surface is greater than 380℃, it is judged as having reached the fire resistance rating.

Explanation of Wording in This Code

1 Words used for different degrees of strictness are explained as follows in order to mark the differences in implementing the requirements in this code.

1) Words denoting a very strict or mandatory requirement:
"Must" is used for affirmation; "must not" for negation.

2) Words denoting a strict requirement under normal conditions:
"Shall" is used for affirmation; "shall not" for negation.

3) Words denoting a permission of a slight choice or an indication of the most suitable choice when conditions permit:
"Should" is used for affirmation; "should not" for negation.

4) "May" is used to express the option available, sometimes with the conditional permit.

2 "Shall comply with ..." or "shall meet the requirements of ..." is used in provisions to indicate that it is necessary to comply with the requirements stipulated in other relative standards.

List of Quoted Standards

Code for Design of Timber Structures	GB 50005
Code for Design of City Gas Engineering	GB 50028
Code for Design of Boiler Plant	GB 50041
Code for Design Electric Power Supply Systems	GB 50052
Code for Design of Electrical Installations in Explosive Atmospheres	GB 50058
Code for Design of Cold Store	GB 50072
Code for Design of Oil Depot	GB 50074
Code of Design for Sprinkler Systems	GB 50084
Code for Design of Automatic Fire Alarm System	GB 50116
Code for Design and Construction of Automobile Gasoline and Gas Filling Station	GB 50156
Code for Design of Fire Protection for Fossil Fuel Power Plants and Substations	GB 50229
Code for Design of Grain Steel Silos	GB 50322
Technical Code for Partitions with Timber Framework	GB/T 50361
Residential Building Code	GB 50368
Technical Code for Medical Gases Engineering	GB 50751
Code of Design on Fire Protection Water Supply and Hydrant Systems	GB 50974
Fire Resistance Tests - Door and Shutter Assemblies	GB/T 7633
Fire-resistance Tests - Elements of Building Construction - Part 1: General Requirements	GB/T 9978.1
Fire Resistant Doorsets	GB 12955
Fire Safety Signs	GB 13495
Fire Resistant Shutter	GB 14102
Fire Dampers for Building Venting and Smoke-venting System	GB 15930
Fire Resistant Windows	GB 16809
Fire Emergency Lighting and Evacuate Indicating System	GB 17945
General Technical Requirements for Fire Control Center	GB 25506
Fire Resistance Test for Elements of Building Construction - Alternative and Additional Procedures	GB/T 26784
Fire Resistance Test for Lift Landing Doors - Methods of Measuring Integrity, Thermal Insulation and Heat Flux	GB/T 27903