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GB 50089-2007

Safety Code for Design of Engineering of Civil Explosives Materials

民用爆破器材工程设计安全规范

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4 Enterprise Planning and External Separation Distance

4.1 Enterprise Planning

4.1.1 The location selection for the production and circulation enterprises and plants (warehouse) of civil explosives materials shall be in accordance with the corresponding provisions specified in the current national standard "Code for Design of General Plan of Industrial Enterprises" GB 50187.

4.1.2 The production enterprises of civil explosives materials shall be divided into areas according to such factors as the production variety, production performance and hazard level. The enterprises should be set with production area of dangerous goods (including the auxiliary production part), general warehouse area of dangerous goods, performance test yard, destruction yard and living area.

4.1.3 The planning of the zones in the production enterprises of civil explosives materials shall meet the following requirements:

1 The mutual positions of the areas shall be set according to such factors as the production, living, transportation and management of enterprises. The production area of dangerous goods should be set at moderate position, the general warehouse area of dangerous goods, the performance test yard and the destruction yard should be set at remote area or borderland.

2 The areas of the enterprise shall not be set on both sides of the state's railway line and arterial highway but should be planned at one same side of the transport line.

3 When the enterprise is located at mountainous area, its production area of dangerous goods shall not be arranged at such steep and narrow gully.

4 The auxiliary production part should be arranged near to the direction of living area.

5 Those irrelevant pedestrian flow and goods flow shall not pass through the production area and general storage warehouse area of dangerous goods. The transportation of dangerous goods shall not pass through the living area.

4.1.4 When setting dangerous goods warehouse area in the circulation enterprise of civil explosives materials, the warehouse location shall be selected in such far area away from the residential area and shall be in accordance with the provisions on the external separation distance of the general warehouse area of dangerous goods in Section 4.3 and the provision on the minimum allowable distance in the general warehouse area of dangerous goods in Section 5.3 of this code.

4.2 External Separation Distance of Dangerous Goods Production Area

4.2.1 The external separation distance from the dangerous goods building in the production area of dangerous goods to the border of the surrounding residential areas, highways, railways and town planning shall be determined by calculating according to the danger class and explosive quantity of buildings.

The external separation distance shall be calculated starting from the external wall surface of dangerous goods building.

with the dangerous goods warehouse may not be restricted according to the requirements specified in Article 5.3.2 and Article 5.3.3 of this code.

5.4 Protecting Barrier

5.4.1 The form of protecting barrier shall be determined according to such factors as general arrangement, means of transportation, and topographic condition.

The protecting barrier may be adopted with the forms of protecting earth dike or reinforced concrete retaining wall.

The installation of protecting barrier shall be able to play a protection role to this building and the buildings around. The protecting scope of protecting earth dike shall be determined according to Appendix D of this code.

5.4.2 The height of protecting barrier shall meet the following requirements:

1 When single-storied building exists in the protecting barrier, the height of protecting barrier shall not be less than the height of eave; when the building in the protecting barrier is of single pitched roof, the height of this protecting barrier shall not be less than the height of the lower eave.

2 When the building in the protecting barrier is very high so that it is difficult to build the protecting barrier up to the height of cornice, the height of this protecting barrier may be higher than the top surface of explosive material by 1m.

5.4.3 The width of protecting barrier shall meet the following requirements:

1 The top width of the protecting earth dike shall not be less than 1m, and the base width shall be determined according to the soil quality but shall not be less than 1.5 time of the height.

2 The top width and base width of the reinforced concrete protecting barrier shall be determined according to the design of explosive quantity.

5.4.4 The side slope of protecting barrier shall be stable, and the gradient shall be determined according to different materials. When adopting the excavated side slope as the protecting barrier, the surface of protecting barrier shall be even, the side slope shall be stable and also shall be adopted with measures on meeting weathered dangerous rock.

5.4.5 The horizontal distance between the inner foot of slope of protecting barrier and the outer wall of building should not be larger than 3m.

In the sections for transportation or those for special purposes, the above distance shall be determined according to the minimum operating requirement but shall not be larger than 15m. If the conditions permit, the height of the protecting barrier in this section should be raised by 2~3m.

5.4.6 The installation of protecting barrier shall comply with the requirements on production, transportation and safe evacuation, and it also shall comply with the following provisions:

1 When adopting the protecting earth dike as protecting barrier, the transport channel or transport tunnel shall be built. On requiring building retaining wall at ends of transport channel, the structure of the retaining wall should better be of reinforced concrete structure.

The transport channel and transport tunnel shall meet the transportation requirements and also shall minimize the neutral zone of protecting earth dike. The clear width of transport channel should not be larger than 5m. The clear width of motor transport tunnel should be 3.5m, and its clear height should not be less than 3m.

6 Technologies and Arrangement

6.0.1 In the technological design, the principle of reducing the workshop explosive quantity and the operating staff shall be persisted; the operating with combustion or explosion hazards shall be adopted with such reliable advanced technologies as isolation operation and automatic supervisory control.

6.0.2 The plane layout of the production workshop and warehouse of dangerous goods shall meet the following requirements:

1 The building plane of the production workshop of dangerous goods should be of single-layer rectangle but should be adopted with the enclosed □ type or Π type. If special requirements provided in the technology, the steel platform shall be adopted as much as possible.

2 The production workshop of dangerous goods shall not be built in basement or semi-basement.

3 The storerooms in the warehouse of dangerous goods shall be adopted the rectangle single-storied buildings.

4 The arrangement of equipment, pipelines, transportation plants and operating posts in the production workshop of dangerous goods shall be in convenient for the rapid evacuation of operating staff.

5 The staff escape route in the production workshop of dangerous goods shall not be arranged into such evacuation form that has to pass through other dangerous working chambers before exiting. When protecting barrier is set outside this workshop, the dedicated evacuation tunnel shall be built near to the protecting barrier.

6 The production workshops of priming materials should be designed into the single-sided corridor form. When arranging the walkway at the middle and the working chambers at both sides, those dangerous working chambers shall be arranged with safe emergency exit or safety window that direct leads to outdoors. The door or door openings of the working chambers at both sides leading to the walkway at middle shall not be arranged opposite to each other.

7 The temporary storage depot of dangerous goods in the production workshop shall be taken with measures to make the stock of dangerous goods insufficient to endanger other chambers, and this temporary storage depot should be arranged at the end of this building and should not be near to the access door and welfare room. The initiating explosives, explosives and initiating explosive devices temporarily stored in the production workshop of priming materials should be stored in the blast resistant chamber or the reliable protective installations. If required by the production process, they may also be stored in such prominent storage room that is arranged along the outer wall of the workshop, and this storage room shall not be near to the access door of the workshop.

8 As for the production workshop of dangerous goods that is allowed to be set with auxiliary room, this auxiliary room should be arranged at the end of the workshop.

9 The auxiliary room that has no direct connection with production in the dangerous goods production workshop shall be separated from the production workshop and shall be built with access door directly leading to the outside.

6.0.3 The transport corridor of dangerous goods shall meet the following requirements:

1 The transport corridor of dangerous goods should be adopted with the open or semi-open

type but should not be adopted with the enclosed type. If the enclosed type corridor is required by the technology, it shall be in accordance with the design requirements on corridor and tunnel as specified in Section 8.8 of this code.

2 When transporting the dangerous goods in corridor mechanically, proper facilities shall be adopted to prevent the dangerous goods from the sympathetic detonation.

3 The transport corridor of dangerous goods should not be built into straight line.

4 No enclosed type corridor shall be built between the transfer-storage of finished dangerous products and the production workshop of dangerous goods.

6.0.4 The procedures that may be in trouble easily in the workshop of Class 1.2 shall be arranged in the blast resistant chamber or protective installations.

6.0.5 The blast resistant chambers built in the production workshop of dangerous goods shall meet the following requirements:

1 No trench shall be built connecting the blast resistant chambers or the blast resistant chamber with its adjacent workshops.

2 The pipelines delivering such materials with combustion or explosion hazards shall not pass through or in and out of the blast resistant chamber when these pipelines are not set with fire and explosion insulating measures.

3 When the pipelines delivering the materials without combustion or explosion hazards passing through or being in and out of the blast resistant chamber, the sealing measures shall be adopted on the wall where the pipeline passes through.

4 The structure of the door, operating port, viewport and transferring window in the blast resistant chamber shall be able to meet the requirements on anti-detonation and no propagation of detonation.

5 The opening of the door in the blast resistant chamber shall be interlocked with the starting and stopping of the dynamical system of indoor equipment.

6 The blast resistant chamber (outside the explosion-venting surface) shall be built with the blast resistant shield yard.

6.0.6 The joint construction of the procedures in the production workshop of dangerous goods shall meet the following requirements:

1 The production building for goods of no danger with fixed operating staff shall not be constructed jointly with the dangerous goods production building of Class 1.1.

2 The mechanical tubing procedure during the manufacturing of industrial explosives shall not be arranged with fixed operating staff but shall be with automatic delivering function and shall be able to be jointly constructed with the loading procedure that abuts with the automatic charging machine.

3 When the charging and packing is constructed jointly during the manufacturing of explosives, and the explosives are mainly charged and packed manually, a partition wall no less than 250mm shall be built; the explosive transport channel between the charging room and the packing room shall not be directly opposite to the manual operating position.

4 The TNT crushing and mixing procedures in the production of powdery ammonium nitrate explosive (including the AN-TNT-Oil explosive) as well as the mixing procedure in the production of ANFO explosives with thermal processing method shall be set with independent workshops.

5 The charging and packing procedures in the production of powdery ammonium nitrate explosive (including AN-TNT-Oil explosive) may be constructed jointly with the screening and

maximum explosive quantity of single warehouse still shall be in accordance with those specified in Table 7.1.1 and Table 7.1.3 of this code. When storing the dangerous goods of the same danger class in one same warehouse, the total explosive quantity of this warehouse shall not exceed the allowable single warehouse maximum explosive quantity of one variety; when storing the dangerous goods of different danger classes, the total explosive quantity of this warehouse shall not exceed the allowable single warehouse maximum explosive quantity of the variety of the highest danger class. In addition, the danger class of this warehouse shall be determined based on the variety of the highest danger class.

3 In the general warehouse area and production area, the ammonium nitrate warehouse shall not be used to store any other articles.

4 Any wastes shall not be stored with finished products in the same warehouse.

5 When the dangerous goods of different varieties that meet the one warehouse storage requirement are stored in the transfer-storage of the dangerous goods production area, the partition wall shall be set in the transfer-storage for separating the dangerous goods.

7.1.7 The stacking of dangerous goods in warehouse shall meet the following requirements:

1 The dangerous goods shall be piled in stacks. The inspection access and handling access shall be set between stack and wall surface as well as between stack and stack, and the width of the inspection access and load and transport access respectively should not be less than 0.8m and 1.2m.

2 The total height of the stacks of explosives or cords shall not be more than 1.8m, and that of the stacks of detonators shall not be larger than 1.6m.

7.2 Transportation of Dangerous Goods

7.2.1 The dangerous goods should be adopted with the motor vehicle transport but shall not be adopted with the tricycle or animal-drawn transport. And they are strictly prohibited to be transported by tipper or other various trail cars.

7.2.2 The distance between the center line of the arterial road in the dangerous goods production area for transporting dangerous goods and various buildings shall meet the following requirements:

1 The distance to the buildings of Class 1.1 (1.1*) should not be less than 20m.

2 The distance to the buildings of Class 1.2 or 1.4 should not be less than 15m.

3 The distance to such locations where open flame or radiate sparkles exist should not be less than 30m.

7.2.3 The distance between the center line of the arterial road in the dangerous goods general warehouse area for transporting dangerous goods and various buildings shall not be less than 10m.

7.2.4 In the production area and general warehouse area of dangerous goods, the longitudinal gradient of the arterial road for transporting dangerous goods should not be larger than 6%, and the longitudinal gradient of the roads mainly for transporting ammonium nitrate should not be larger than 8%. The longitudinal gradient of the roads for transporting the dangerous goods with trolleys should not be larger than 2%.

7.2.5 The non-explosion-proof motor vehicles shall not enter into the dangerous goods building

8.3.6 Continuous closed steel ring beams shall be set on the steel-frame construction system along the column height of about 4m according to the up-thick down-sparse principle, the joints among ring beams and the connection between ring beams and columns shall be reinforced.

8.3.7 When adopting light laminated heated boards for the exterior-protected construction of steel-frame construction system, the total thickness of the heated boards shall not be less than 80mm, the thickness of the steel plates both at upper and lower layers shall not be less than 0.6mm, and the space among purlins shall not be larger than 1.5m.

8.3.8 The roof purlins of light steel-frame construction shall be designed according to simply supported purlins, two adjacent purlins at the supporting position shall be connected reinforcedly, and the purlins shall not be destroyed before the bulk cross-section yielding of the member.

8.3.9 The cold-formed laminated heated boards and the supporting member shall be connected by adopting the following methods according to the stress size:

- 1 Self-penetrating or self-tapping bolts of increased diameter with outsize washer.
- 2 The fusion welding or the plug welding with base plate of large size.
- 3 The board is fastened onto the supporting member with gasket, outsize washer and screw cap by welding it onto the bolt of supporting member.

8.4 Blast Resistant Chamber and Blast Resistant Shield Yard

8.4.1 The wall of blast resistant chamber shall be built with cast-in-situ reinforced concrete, and the wall thickness should not be less than 300mm. When the design quantity of explosive is less than 1kg, the thickness of the cast-in-situ reinforced concrete wall shall not be less than 200mm, however, the steel plate structure may also be adopted.

8.4.2 The roof of blast resistant chamber should be built with cast-in-situ reinforced concrete.

When detonation happens in the blast resistant chamber but the roof pressure relief results in no destruction to the adjacent workshops, the light fragile roof should be adopted, and the light relief roof also may be adopted.

8.4.3 The wall and roof (excluding the light windows and light fragile roof or light relief roof) of the blast resistant chamber shall meet the following requirements:

1 Under the local action of the air blasting wave and fragments happening during the detonation of design explosive quantity, collapsing, flying apart and penetrating shall not happen.

2 Under the entire action of the air blasting wave during the detonating of design explosive quantity, a certain residual deformation is allowed. The wall and roof of blast resistant chamber shall be designed according to the elastic or elasto-plastic theory.

8.4.4 The blast-resistant door and blast-resistant transferring window shall meet the following requirements:

1 The door and window shall not be penetrated under the action of fragments in explosion.

2 The door and window shall be able to prevent flame and air blasting wave from releasing when explosion happens in the blast resistant chamber.

3 The blast-resistant door shall be the single-leaf vertical-hinged door, and the door opening direction shall be able to turn into closing state under the action of air blasting wave.

8.6.5 In the production area of dangerous goods, the door and window glass of the buildings should be adopted with proper measures to avoid people getting hurt by glass cullets.

8.6.6 The dangerous goods building where combustible and explosive dust exists shall not be installed with skylight.

8.6.7 The floor in the production chamber of dangerous goods shall meet the following requirements:

1 When the dangerous goods in the production chambers will result in burning or explosion on meeting sparkles, the nonpyrophoric floor surface course shall be adopted.

2 When the dangerous goods in the production chambers are sensitive to impacting and rubbing effects, the nonpyrophoric flexible floor surface course shall be adopted.

3 When the dangerous goods in the production chambers are sensitive to electrostatic action, the anti-electrostatic floor surface course shall be adopted.

8.6.8 The interior decoration of the production chamber of dangerous goods shall meet the following requirements:

1 The inner wall surface of the production chamber of dangerous goods shall be plastered.

2 The inner wall surface and ceiling surface of the production chamber where combustible and explosive dust exists shall be even and smooth, all the concave corners should be smeared into circular arc.

3 The ceiling and inner wall of the production chamber that is washed frequently and is set with drenching device shall be painted wholly. As for the working chamber requiring clean products and being cleared frequently, the wainscot shall be painted; the wall surface above the wainscot shall be adopted with anti-scrubbing coatings. The colour of oil paints and coatings shall be different from the colour of dangerous goods.

8.6.9 The production chamber of dangerous goods should not be set with suspended ceiling. When the suspended ceiling is required by the production process, it shall be in accordance with the following conditions:

1 The bottom of the suspended ceiling shall be even, seamless and not easy to shed.

2 The access holes and pore spaces should not be set in the suspended ceiling. If they are set, the part around the pore spaces shall be adopted with sealing measures.

3 The partition wall among the production chambers of different danger classes within the scope of suspended ceiling shall be built up to the bottom of roof plate beam.

8.6.10 The platform in the production workshop of dangerous goods should be made up of steel or reinforced concrete material. The ladders should be adopted with steel ladders.

The surface course of the stair-steps of platform and steel ladder shall be in accordance with the floor surface course of production chamber.

8.7 Built-in Building

8.7.1 The built-in building shall be adopted with reinforced concrete structure. The wall at the side not covered with soil shall be determined according to the anti-detonation design.

8.7.2 As for the built-in buildings, the thickness of the soil layer covered at the outer side of wall crest shall not be less than 1.5m and that of the soil layer covered over the upper part of roof shall not be less than 0.5m.

8.7.3 The structure of built-in building shall meet the following requirements:

1 The wall at the part covered with soil shall be built with cast-in-situ reinforced concrete,

3 The fire pumps shall be prepared with stand-by power sources.

9.0.9 All the productions workshop of dangerous goods shall be installed with indoor fire hydrants and shall meet the following requirements:

1 The indoor fire hydrants shall be arranged at the obvious locations where they are easy to be reached and near the exits of the workshop.

2 The distance among the indoor fire hydrants shall be determined through calculation but shall not exceed 30m.

3 When the bay of the production workshop for combustible dangerous goods is small so that the water band is uneasy to be spread, the indoor fire hydrants may be mounted on the outdoor wall surface; however, they shall be adopted with proper anti-freezing measures.

9.0.10 During the production process, the following production procedures shall be installed with deluge system:

1 Mixing, screening, temperature control, charging, packing procedures of the production of powdery ammonium nitrate explosive and ANFO explosives, as well as the crushing procedure of TNT.

2 The pulverizing, discharging, charging and packing procedures in the production of powdery emulsion explosive.

3 Mixing, temperature control, charging and packing procedures in the production of expanded ammonium nitrate explosive

4 The melting and charging procedures in the production of black stibine grain.

5 Mixing of the three compositions of black powder, and drying, temperature control, screening and preparing of explosive, as well as the cord manufacturing in the production of primacord.

6 The screening, mixing and drying procedures of cyclotrimethylene trinitramine (RDX) or penthrite in the production of primacord.

7 The melting, mixing and charging procedures in the production of earthquake focus explosive grain.

9.0.11 The fire-fighting facilities such as deluge sprayers, closed sprinklers or water curtain pipes shall be installed in, above or around the following equipment:

1 The wheel mill, cooler and TNT ball mill used during the production of powdery ammonium nitrate explosive and ANFO explosives.

2 The wheel mill, crusher, mixer, and cooler used during the production of expanded ammonium nitrate explosive.

3 Ball mill of the three components in the production of ignition cords.

4 The auger conveyer equipment of powder explosive.

Note: The equipment installed in the blast resistant chamber may not be installed with deluge system.

9.0.12 The installation of deluge system shall meet the following requirements:

1 The deluge system shall be installed with the temperature sensing or light sensing detection automatic start-up facilities; meanwhile, it shall also be installed with the manual start-up facilities. When the explosive quantity in production procedures is small and the operation is under control on the spot, only the manual control deluge system may be installed. The manual control facilities shall be mounted at the locations where it is convenient to operate or near the emergency exits.

2 In the pipe network of deluge system the water pressure of the sprayer outlet at the most unfavorable point shall not be less than 0.05Mpa.

11 Heating, Ventilating and Air Conditioning

11.1 General Provisions

11.1.1 The heating, ventilating and air conditioning design of the civil explosive material engineering shall not only implement those specified in this Chapter, but also shall comply with those specified in the current national standards "Code of Design on Building Fire Protection and Prevention" GB 50016 and "Code for Design of Heating, Ventilation and Air Conditioning" GB 50019.

11.1.2 Except for those specified in this Chapter, the adoption of the ventilation and air conditioning equipment at hazardous locations still shall be in accordance with the relevant regulations specified in Section 12.2 of this code.

11.1.3 The air temperature and relative humidity in all levels of dangerous goods buildings in the production area of dangerous goods shall be in accordance with the relevant standards and regulations of the state. When special requirements are provided in the technical conditions of products, the temperature and relative humidity shall be determined according to the technical conditions of products.

11.2 Heating

11.2.1 In the dangerous goods building, the hot wind or radiator shall be adopted for heating, however, the open flame heating is strictly prohibited.

When heating by adopting with radiator, its heat medium shall be adopted the hot water with temperature $\leq 110^{\circ}\text{C}$ or the saturated vapor with pressure $\leq 0.05\text{MPa}$. However, the hot water with temperature no higher than 90°C shall be adopted as the heat medium when adopting radiator for the heating in the following workshops:

1 Workshops for mixing of the three compositions of black powder, and drying, cooling, screening and packing of explosive, as well as the black powder preparation and cord manufacturing in the production of primacord.

2 Workshops for the screening, mixing and drying procedures of cyclotrimethylene trinitramine (RDX) or penthrite in the production of primacord

3 Workshops for the milling, drying screening and mixing procedures of cyclotetramethylene tetranitramine (HMX) or cyclotrimethylene trinitramine (RDX) in the production of plastic nonel tube

4 Workshops for the drying, cooling and screening procedures of dinitrodiazophenol (including the reagents similar to acting and initiating explosives) in the production of detonators

5 Workshops for the pelleting, drying, screening and packing procedures of cyclotrimethylene trinitramine (RDX) or penthrite in the production of detonators

6 Workshops for explosive loading and pressing procedures of detonators in the productions of detonators

11.2.2 The design of the heating system of dangerous goods buildings shall meet the following requirements:

1 The radiators with the pipes of smooth surface or those easy to be scrubbed shall be

shall be same with that of the phase conductor, and the guard wire and phase conductor shall be laid in one same sheath or steel pipe. The rated voltage of the wires and cables used in the telephone lines shall not be less than 500V.

12.3.2 When adopting cables in the hazardous locations, the cables shall not have branches or transition joints except in the lighting branch circuit. The cables should be exposed laying, and the positions where may have mechanical damages shall be protected by passing through steel pipes. In addition, the cables also may be laid by adopting with steel cable bridges. The cables should not be laid in the cable trenches, if the cables must be laid in the cable trenches, the measures for preventing water or dangerous substances from entering into the trench shall be taken, the positions where the cables pass through the wall shall be set with spacer plates and the pore spaces also shall be plugged tightly.

12.3.3 When laying the cables by passing through steel pipes, the following requirements shall be met:

1 The steel pipes with wires passing through shall be adopted with the galvanized welded steel pipes with nominal bore diameter no less than 15mm, the threaded connection shall be adopted among the steel pipes, the connecting threads shall not be less than 6 coils, furthermore, the prevent loosening devices also shall be set in such locations with excessive vibration.

2 When the circuits with wires laid through steel pipes enters into the anti-explosion electrical equipment, the isolating and sealing devices shall be installed.

3 When laying the insulated conductors by passing through steel pipes, the electric circuit shall be adopted with exposed laying.

12.3.4 The electric circuits in the hazardous locations of Class F0 shall meet the following requirements:

1 In the hazardous locations of Class F0, the electric and lighting circuits shall not be laid; when it is indeed necessary to lay these circuits, the circuit of control buttons and instrumentation equipment that are used in this working chamber may be laid. The electric circuits of the light fittings that are mounted outside the windows shall be adopted with the insulated copper conductors with the cross-section of core wire no less than 2.5mm^2 by passing the conductors through galvanized welded steel pipes, or may be adopted with the metal armored copper cable with cross-section of the core wire no less than 2.5mm^2 .

2 When laying the wires by passing through steel pipes, the lectotype of junction box shall be consistent with the grade of explosion-proof equipment (instrumentation equipment). When adopting the armored cables, the parts where the cables are connected to the equipment shall be adopted with the seal joints of armored cables.

12.3.5 The electric circuits in the hazardous locations of Class F1 shall meet the following requirements:

1 The cross-section of the core wire of electric wires and cables shall be in accordance with those specified in Table 12.3.5.

Table 12.3.5 Selection of the Cross-section of Insulated Wires or Cable Conductors in Hazardous Locations

Technical requirement Class of hazardous location	Allowable minimum cross-section of insulated wire or cable conductor (mm^2)			Flexible connection
	Electricity	Lighting	Control button	

standard "Code for Design of Electric Power Supply Systems" GB 50052.

12.5.2 The general electric substation and general distribution substation installed in the production area of dangerous goods shall be of independent type. The electric substation in the warehouse area of dangerous goods may be adopted with the independent electrical substation or pole mounted substation, and they also may be attached to the non-dangerous goods building.

12.5.3 The design of electric substation not only shall implement this code, but also shall comply with the relevant regulations specified in the current national standard "Code for Design of 10kV & under Electric Substation" GB 50053.

12.5.4 The electric substation of workshop shall not be attached to the buildings of Class 1.1 (1.1*). When it is attached to the buildings of Class 1.2 or 1.4, it shall meet the following requirements:

1 The electric substation shall be of indoor type.

2 The electric substation shall be arranged at the safer end of the building, the partition walls adjoining to the hazardous locations shall be the non-combustible compact wall, and the partition walls shall have no doors or windows.

3 The doors and window of the transformer room and the high, low-voltage switch room shall be opened in the outer wall, the doors shall be opened outward.

4 The pipelines irrelevant to the electric substation shall not pass through the electric substation.

12.5.5 The switch room (including electrical room, electrical heating room, motor room and source chamber) may be attached to various dangerous goods buildings, the non-explosion-proof electric installations may be installed indoors. However, they shall meet the following requirements:

1 The partition wall of the switch room with the adjacent hazardous locations shall be the non-combustible compact wall. This wall shall not be opened with doors or window or be connected with the hazardous locations of Class F0, F1 or F2.

2 The doors and window of the switch room shall be opened in the outer wall of the building; the doors shall be opened outward. The distance between the doors and windows of the switch room and the doors and windows of the hazardous locations of Class F0 for producing black powder with dry method should not be less than 3m.

3 The irrelevant pipelines shall not pass through the switch room.

4 When the dangerous goods building is a multi storied factory building, the switch room with power supply leading in should be set in the first floor of the building and should not be set right above or right under the sites with explosion and fire hazards.

12.5.6 The earthing resistance at the neutral point of the power supply for independent electrical substation shall not be larger than 4Ω . As for the electric substations attached onto the dangerous goods buildings of Class 1.2 or 1.4 or onto other non-dangerous goods buildings, the earthing resistance of their electrical system shall be in accordance with those specified in Article 12.7.7 of this code.

12.6 Outdoor Electric Circuit

12.6.1 The laying of the low-voltage circuits under 1kV that are lead into the dangerous goods buildings shall meet the following requirements:

1 The metal armored cables shall be adopted and buried underground from the power

lead out from the main distribution board (cabinet) in buildings must be adopted with the TN-S system.

12.7.3 The electrical equipment in the dangerous goods buildings shall be adopted with equipotential connection. When only the general equipotential connection can not meet the requirement, the auxiliary equipotential connection still shall be adopted.

12.7.4 In hazardous locations, the metallic pipes with electric wires passing through and the metal sheet of cables shall be used as the auxiliary earthing conductors. The metal pipes for delivering dangerous substances shall not be used as the earthing device.

12.7.5 The selection of the cross-section of guard wires shall be in accordance with those specified in the relevant clause in the current national standard "Code for Design intermediate Low Voltage Electrical Installations" GB 50054.

12.7.6 In the dangerous goods buildings, the part where the power supply is lead into the general distribution box shall be installed with overvoltage surge protector.

12.7.7 In the dangerous goods buildings, the working earthing of electric installations, the safety earthing, lightning-proof earthing, anti-electrostatic earthing, electronic system earthing, and shielding earthing shall share the same earthing devices. The value of the earthing resistance shall meet the minimum value therein. When a large number of disperse equipment are needed to be earthed, the main earthing line that forms into one closed loop circuit shall be installed indoors. The indoor main earthing line shall be connected to the outdoor main ring earthing line once for every 18~24m and shall be connected to the outdoor main earthing line for at least 2 times in every building.

12.7.8 The positions where the overhead metal pipes are in and out of the buildings shall be connected to the lightning & electro-induction-proof earthing devices. The metal pipes away from the building by no more than 100m shall be earthed once for about every 25m, and the impact earthing resistance shall not be larger than 20Ω. The positions where the buried or trenched metal pipes are in and out of the buildings also shall be connected to the lightning & electro-induction-proof earthing devices.

When the clear distance among the parallel laid metal pipes is less than 100mm, these pipes shall be bridged with metal wires once for about every 25m; when their intercrossing clear distance is less than 100mm, their intercrossing positions also shall be bridged.

12.8 Electrostatic Prevention

12.8.1 In the hazardous locations, the exposed conductive part of the metallic equipment or the external conductive part of equipment, the metal pipes and the steel support all shall be carried with the direct anti-electrostatic earthing.

12.8.2 The direct anti-electrostatic earthing devices and the lightning-proof electro-induction equipotential coupling shall share the same earthing devices.

12.8.3 In the hazardous locations, the metallic equipment and devices that can not or should not be earthed directly shall be earthed indirectly through anti-electrostatic materials.

12.8.4 When adopting anti-electrostatic floor in the hazardous locations, the ohm-value of its electrostatic leakage shall be determined according to the variety of dangerous goods in this working chamber.

12.8.5 The equipment and devices manufactured with electrostatic non-conducting materials

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