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Standard for design of cold store

冷库设计标准

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1 General provisions

1.0.1 This standard is formulated, in order to standardize and integrate the technical requirements for design of cold store, guide the design of cold store, meet food refrigeration technology and hygiene requirements, achieve the goals of economical and reasonable, energy-saving, environmentally friendly, safe and reliable.

1.0.2 This standard is applicable to the newly-built, expanded, reconstructed food cold store, which adopts the subcritical vapor compression direct refrigeration systems using ammonia, halogenated hydrocarbons and their mixtures, carbon dioxide as refrigerants, AND the indirect refrigeration systems using carbon dioxide, brine, etc. as refrigerating medium.

1.0.3 The cold store design shall be safe and reliable, energy-saving, environmentally friendly, economically reasonable, advanced and applicable.

1.0.4 The cold store design shall not only meet the requirements of this standard, BUT also meet the requirements of relevant national standards.

4 Architecture

4.1 Site selection and general layout

4.1.1 The site selection of the cold store shall meet the following requirements:

1 It shall meet the requirements of the local masterplan;

2 The cold store, which uses the ammonia refrigeration system, should be located on the leeward side of the annual maximum frequency wind direction, in the adjacent concentrated residential area;

3 There shall be good sanitary conditions around the store site. It shall be avoided and kept away from harmful gases, smoke, dust and other areas with pollution sources;

4 Considering factors such as logistics flow and short-term and long-term development, choose an area with convenient transportation;

5 It should have reliable water source, power source, drainage conditions;

6 It shall be avoided from the areas, which are prone to floods and mudslides and other areas with poor geological conditions;

7 The positioning of cold store shall also consider the special requirements of various types of cold store.

4.1.2 The general layout of the cold store shall meet the following requirements:

1 It shall meet the comprehensive requirements of logistics technology, transportation, management, reasonable arrangement of equipment pipelines, fire safety;

2 When setting up special railway lines, storehouses shall be arranged along the special railway lines;

3 When setting up a water transport wharf, the storehouse shall be arranged close to the water transport wharf;

4 When road transportation is the mainstay, the storehouse shall be arranged close to the main entrance and exit of cold store's transportation road;

5 The cold store of the production and processing enterprise shall be arranged, in the clean area of the factory area; meanwhile it shall be on the upwind side of the maximum frequency wind direction in summer, in the polluted area;

6 The cold store, which uses the ammonia refrigeration system, in the food wholesale market, shall be arranged in the storage area; it shall be arranged separately from the trading area;

7 A weather vane shall be set at a conspicuous location in the storehouse area.

4.1.3 The general layout of the cold store shall be a combination of short-term and long-term, focusing on the short-term. Resources such as storehouse land, railway dedicated lines, water transport wharf, equipment pipelines, roads, carriage return yards, shall be planned as a whole, reasonably arranged, taking into account the needs of future expansion.

4.1.4 The vertical design of the general plan of the cold store shall meet the following requirements:

1 There shall be a good rainwater drainage system in the storehouse area. The roads and return yards shall have technical measures, to prevent accumulation of water and anti-skid;

2 Open ditch shall not be used to discharge sewage, around the storehouse.

4.1.5 The main roads in the storehouse area shall be paved with concrete or asphalt pavements, which are suitable for vehicles.

4.1.6 When two storehouses, which have grade 1 and grade 2 fire endurance, are arranged next to each other, the total length of the adjacent storehouses shall not be greater than 150 m; the total area of the cold storage rooms of the two storehouses shall not be greater than 10000 m^2; there shall be a loop fire lane. The outer walls of adjacent storehouses shall be firewalls. The fire resistance rating of roof load-bearing members and roof slabs shall not be less than 1.00 h.

4.1.7 The fire separation distance, BETWEEN assembly cold stores, which have a building height of more than 24 m, AND other high-rise buildings, shall not be less than 15 m.

4.1.8 When the storehouse covers an area larger than 1500 m^2, fire lanes shall be set, at least along the two long sides of the storehouse.

For the high-rise cold store, it shall arrange at least 2 fire trucks ascending operation sites, along one long side, OR along the bottom side which is 1/4 of the peripheral length and not less than the length of a long side. On the exterior wall at each floor, in the range which is corresponding to the fire trucks ascending operation sites, it shall be provided with the stairwell entrance or fire rescue openings, for fire rescue personnel to enter.

the requirements of refrigeration temperature;

2 It should be divided, according to different business models and management needs;

3 Stored foods, which have peculiar smell or odor-prone, shall not be mixed with other foods for storage.

4.2.10 The storehouse shall be equipped with anterooms or platforms. The temperature shall be determined, according to the requirements of the cold storage process.

4.2.11 The storehouse's highway platform shall meet the following requirements:

1 The platform width should not be less than 5 m;

2 Buffer rubber strips shall be installed at the parking side, on the edge of the platform. It shall be painted with yellow and black anti-collision warning strips;

3 A shelter should be provided on the platform. Where there are structural columns on the edge-side of the platform, the net distance between the column edge and the platform edge should not be less than 0.6 m. The portion of the shelter overhang beyond the edge of platform shall not be less than 1.00 m; the net height shall be compatible to the height of the transport vehicle; it shall be provided organized drainage;

4 Closed platforms shall be set up according to the needs. The closed platforms shall be integrated with or combined with the anteroom of the cold store;

5 The width of the closed platform and its internal temperature shall be determined, according to the requirements of use. The envelope structure shall meet the corresponding thermal insulation requirements;

6 The height of the closed platform AND the number of door openings shall be compatible with the cargo throughput. The temperature-controlled closed platform shall be equipped with corresponding cold store doors and closed soft door covers, which are connected to refrigeration trucks;

7 Steps and ramps, for ascending or descending the platforms, shall be arranged at appropriate positions on the platform. Protective railings should be provided at the steps.

4.2.12 The railway platform of the storehouse shall meet the following requirements:

1 The platform width should not be less than 7 m;

2 The top surface of the platform edge shall be 1.1 m, higher than the top surface of the derailment; the horizontal distance between the edge and the railway centerline shall be 1.75 m;

3 The length of the platform shall be the same as the length of the loading and unloading section, of the railway dedicated line;

4 A canopy shall be provided on the platform. The net distance, between the column side of the canopy and the edge of the platform, shall not be less than 2 m. The height of the eaves and the overhang length shall comply with the boundary requirements of the dedicated railway line;

5 Steps and ramps, for ascending or descending the platforms, shall be arranged at appropriate positions on the platform. Protective railings should be provided at the steps.

4.2.13 Vertical transportation equipment, such as elevators, shall be installed in multi-floored and high-rise storehouses. The car selection of elevators or other transportation equipment shall make full use of the carrying capacity.

4.2.14 Vertical transportation equipment, such as elevators, shall be separately provided with hoist-ways. The fire resistance rating of the shaft wall shall not be less than 2.00 h. The openings shall be provided with elevator landing doors or fire shutters, which have a fire resistance rating of not less than 1.00 h.

4.2.15 The number of elevators, which are installed in the storehouse, shall be calculated, according to the following requirements:

1 The carrying capacity of 5t elevator can be calculated as 34 t/h; the carrying capacity of 3t elevators can be calculated as 20 t/h; the carrying capacity of 2t elevators can be calculated as 13 t/h.

2 The number of elevators in cold store, which are mainly by railway transportation, AND port transit cold store, shall be determined according to the throughput of one-time incoming and outgoing goods AND the allowable time for loading and unloading.

3 The number of elevators for cold store, that only uses road transportation, shall be determined by the average of daily peak inbound and outbound throughput AND the daily trough inbound and outbound throughput.

4 When the number of elevators is determined, by the inbound and outbound throughput of railway and water transportation, the location of the elevator shall take into account the needs of daily production and loading & unloading for highway. It should not install another elevator.

4.2.16 The stairwell of the storehouse of cold store shall be located near the anteroom. It shall be constructed by non-combustible materials. The door, which leads to the anteroom, shall be a grade B fire door. The stairwell shall lead directly to the outdoors, at the first floor. When the number of floors does not exceed 4 AND when the building height is not more than 24 m, the distance, between the door leading to the outdoors and the exit of the stairwell, shall not be more than 15 m.

4.2.17 The cold storage room shall not be arranged adjacent to the processing room with water AND the room with high temperature and high humidity.

4.2.18 The cold storage room, which has a building area greater than 1000 m^2, shall have at least two cold store doors. The cold storage room, which has a building area less than 1000 m^2, shall have at least one cold store door.

4.2.19 The door of the frozen storage room of the non-temperature-controlled anteroom or platform shall be equipped with an air curtain or a low-temperature-resistant transparent plastic curtain, etc. It should be provided a return room.

4.2.20 Other rooms, which are not directly related to the production and management of the storehouse, shall not be set up in the storehouse.

4.2.21 The auxiliary rooms directly related to the production and management of the storehouse, such as offices, duty rooms, changing rooms, restrooms, which are attached to the storehouse, can be arranged near the anteroom; it shall use the fire partition walls, which have a fire resistance rating of not less than 2.50 h, AND the floor slab, which has a fire resistance rating of not less than 1.00 h, to separate from other parts. It shall set at least one independent safety exit. The connecting doors, which are opened on the partition wall, shall be the grade B fire doors.

4.3 Heat-insulation of storehouse

4.3.1 The thermal insulation materials of the storehouse shall be selected, according to the following conditions:

1 The thermal conductivity is small;

2 It has no pollution to food AND is stable in low temperature chemical performance;

3 It has good dimensional stability;

4 When used on the ground and floor, its compressive strength shall not be less than 0.25 MPa.

1 The vapor barrier of the exterior wall shall be overlapped with the waterproof layer and vapor barrier, above and below the ground thermal insulation layer;

2 Waterproof layer or vapor barrier shall be made on the upper, lower, periphery of the thermal insulation layer of the floor and ground; the waterproof layer or vapor barrier of the thermal insulation layer of the floor and ground shall be fully enclosed;

3 Both sides of the thermal insulation layer of the partition wall of the chilling room or freezing room shall be provided with vapor barrier.

4.4.5 For the assembly of the lightweight composite sandwich panels, for assembly cold store, shall take reliable measures, to ensure the tightness and compactness of the panel seams AND the continuity of the vapor barrier.

4.5 Requisite structure of storehouse

4.5.1 Ventilation and heat insulation layer should be provided for the roof of the storehouse. In areas with hot summers and warm winters, ventilated room layers or heat-reflective coatings shall be used, on the roof of the storehouse.

4.5.2 When the suspended ceiling of the storehouse uses the light-weight composite sandwich panels for thermal insulation envelope, ventilation facilities shall be provided on the stuffy ceiling.

4.5.3 A ventilation and heat insulation layer should be provided on the exterior wall of the envelope structure of assembly cold store.

4.5.4 The vents of the ventilation interlayer and the stuffy ceiling shall have structural measures, to prevent small animals from entering.

4.5.5 The deformation joints, at the connections, BETWEEN the exterior wall and cornice of the cold storage room, the exterior wall of the cold storage room at each floor, AND the anteroom, shall be constructed to prevent water leakage.

4.5.6 The following parts of the storehouse shall adopt the cold bridge constructions:

1 The part where the thermal insulation layer is disconnected, due to the need for continuity by load-bearing structure;

2 Around the part, where the door openings, equipment and electrical pipelines pass through the thermal insulation layer;

3 Local ground and floor of the part that transverses the deformation joint,

where the door opening of the cold room storage and freezing room leads to the anteroom.

4.5.7 External gutters and exposed rainwater pipes outside the walls should be installed, for drainage on the roof of the storehouse.

4.5.8 The overhead floor of the cold room building's ground shall have measures, to prevent surface water from intruding.

4.5.9 The building construction of pipeline shafts and stairwells, in the storehouse, shall comply with the relevant requirements of the current national standard "Provisions of code for fire protection design of buildings" GB 50016.

4.6 Refrigerating machine room, electric substation and control room

4.6.1 The refrigerating machine room, electric substation and control room shall meet the following requirements:

1 The layout of the refrigerating machine room shall meet the requirements of the refrigeration process, according to the building category;

2 The refrigerating machine room, electric substation and control room shall all have safety exits, that lead directly to the outdoors; the doors shall be swing doors and open outwards;

3 The wall skirts, floors, equipment bases in the refrigerating machine room shall adopt easy-to-clean surface layers.

4.6.2 In addition to the requirements of clause 4.6.1 of this standard, the ammonia refrigerating machine room shall also meet the following requirements:

1 The control room of the ammonia refrigerating machine room shall be separated by a fire partition wall, which has a fire resistance rating of not less than 3.00 h. The observation window, on the partition wall, shall be a fixed grade A fireproof window. The connecting door shall be a grade A fire door, which opens to the refrigerating machine room.

2 The partition wall adjacent to and shared between the electric substation and the ammonia refrigerating machine room or the control room, shall adopt a firewall. The wall shall only pass through the pipes and channels, which are related to the power distribution. The parts surrounding the pass-through shall be fireproofed.

4.6.3 The ammonia refrigerating machine room shall have at least one long side

6 Refrigeration

6.1 General requirements

6.1.1 In addition to cold store's refrigeration systems, the design of other refrigeration systems than non-cold store, can be implemented, in accordance with the relevant requirements of this Chapter.

6.1.2 The halogenated hydrocarbons and their mixture refrigerants, which are used in the refrigeration system, shall comply with the category A1 refrigerant requirements of the current national standard "Number designation and safety classification of refrigerants" GB 7778.

6.1.3 The refrigeration system shall be a large-scale refrigeration system, when the total air displacement is more than 5000 m^3/h; a medium-sized refrigeration system, when the total air displacement is 500 m^3/h ~ 5000 m^3/h; a small-scale refrigeration system, when the total air displacement is less than 500 m^3/h.

6.2 Load calculation

6.2.1 The load calculation shall include the cooling equipment load of the cold room AND the mechanical load of the refrigeration system. It should adopt the steady-state calculation method, which is corrected hourly or by engineering factors.

6.2.2 The cooling equipment load of the cold room shall include the heat flow rate of the cold room's envelope structure, the heat flow rate of the cargo in the cold room, the ventilation heat flow rate of the cold room, the operating heat flow rate of the motor in the cold room, the operating heat flow rate of the cold room.

6.2.3 The mechanical load of the refrigeration system shall be calculated separately, according to different evaporating temperatures. The mechanical load, at each evaporating temperature, shall include the heat flow of the cold room envelope structure of all corresponding cold rooms, the heat flow of goods in the cold room, the heat flow of ventilation and air exchange in the cold room, the operating heat flow of the motor in the cold room, the operating heat flow of the cold room, the cold loss of all corresponding refrigeration equipment and pipes.

6.2.4 The heat flow calculation of the cold room's envelope structure shall meet the following requirements:

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