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**Safety regulations for dust explosion prevention and
protection**

粉尘防爆安全规程

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Safety regulations for dust explosion prevention and protection

1 Scope

This Standard stipulates the general safety rules of dust explosion prevention and protection, structure and layout of buildings (structures) in area subject to dust explosion hazards, prevention of dust cloud and dust layer ignition, dust explosion control, dust collection system, dust control and cleaning, equipment and facility overhaul, and personal protection.

This Standard applies to engineering and process design, production and processing, storage, equipment operation and maintenance of area subject to dust explosion hazards.

This Standard does not apply to dust places of coal mines, fireworks and firecrackers, explosives and powders, and strong oxidant.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 3836.15, Explosive atmospheres - Part 15: Electrical installations design, selection and erection

GB/T 11651, Code of practice for selection of personal protective equipment

GB 12158, General guideline for preventing electrostatic accidents

GB 12476.1, Electrical apparatus for use in the presence of combustible dust - Part 1: General requirements

GB/T 15605, Guide for pressure venting of dust explosions

GB/T 16758, The classification and technical specification of exhaust hood

GB/T 17919, Directives for dust explosion protection for dust collectors in dust explosion hazardous area

GB/T 18154, Technical specification of automatic dust explosion suppression devices

When an explosion occurs in the enclosure, before the explosion pressure reaches the ultimate strength of the enclosure, the explosion-control technology that discharges the high-temperature and high-pressure combustion products and unburnt substances, which are generated by the explosion, through the weak parts that are set in the enclosure in advance in the direction of no danger, so that the enclosure is not damaged.

3.8 Subsequent explosion

When a dust explosion occurs, the shock wave of the initial explosion lifts up the unexploded sedimentary dust again, to form a dust cloud, which is ignited to cause a continuous explosion.

3.9 Cleaning

The operation that uses a method that does not cause dust to remove dusts which are deposited in the workplace and equipment.

3.10 Dust collection system

A system, which is composed of a dust hood, an air duct, a dust collector, a fan, and a control device, that is used to collect solid particles in a gas-solid two-phase flow.

4 General

4.1 The enterprise shall identify the existing area subject to dust explosion hazards, determine the combustible dust explosion hazards and the number, location, and hazardous areas of the area subject to dust explosion hazards, analyze the existing dust explosion hazards, evaluate the dust explosion hazards, and formulate measures to eliminate or effectively control the dust explosion hazards.

4.2 The enterprise shall establish dust explosion prevention and protection-related safety management system (including dust collection system management) and post safety operation regulations. The safety operation regulations shall include contents such as safety operations and emergency disposal measures to prevent dust explosion.

4.3 The enterprise shall formulate a safety checklist of dust explosion prevention and protection in accordance with this Standard and in combination with its own process, equipment, dust explosion characteristics, explosion protection measures and safety management system, and regularly carry out safety inspection of dust explosion prevention and protection. The enterprise shall inspect at least once every quarter; the workshop (or section) shall be inspected at least once a month.

The building that has an area subject to dust explosion hazards should be a single-story building of frame structure; its roof should be light-weight. If it is a multi-story building, a frame structure shall be adopted.

5.2 The building that has an area subject to dust explosion hazards shall set up a venting area of dust explosion that meet the requirements of GB 50016 and the like.

5.3 For the engineering and process design that involves dust explosion hazards, when there is a special national standard, it shall comply with the standard; the processing equipment that has dust explosion hazards should be installed in open spaces; if a plant has a processing equipment of dust explosion hazards, it should be installed in a higher position inside the building and close to the outer wall.

5.4 Beams, supports, walls and equipment shall have a surface structure that is easy to clean.

5.5 The area (location) subject to dust explosion hazards shall be equipped with safety exits that comply with the relevant regulations of GB 50016, at least one of which shall be directly connected to the outdoor safety exit.

5.6 The area subject to dust explosion hazards shall be equipped with safety passages for evacuation; the location and width of the safety passages for evacuation shall comply with the relevant provisions of GB 50016; the safety passages for evacuation shall be kept clear; the evacuation routes shall be equipped with emergency lighting and obvious evacuation indicatory signs.

5.7 The area subject to dust explosion hazards shall strictly control the number of operating personnel in the area; it shall not be equipped with lounges, meeting rooms and other crowded places; it shall have a fire safety distance not less than the one that is specified in GB 50016 with other factories, staff quarters.

6 Prevention of dust cloud and dust layer ignition

6.1 Prevent spontaneous combustion of powder

6.1.1 Hot powder of spontaneous combustion shall be cooled to normal storage temperature before storage.

6.1.2 Under normal storage conditions, when storing large amounts of bulk powder of spontaneous combustion, the temperature of the powder shall be continuously monitored; when it is found that the temperature is increased or the gas is evolved, measures shall be taken to cool the powder.

6.3 Prevent electric arcs and sparks

6.3.1 Buildings (structures) in the area subject to dust explosion hazards shall take corresponding lightning protection measures in accordance with the relevant provisions in GB 50057.

6.3.2 When there is a danger of electrostatic ignition, in addition to complying with the relevant requirements of GB 12158, the following regulations shall also be observed:

- All metal equipment, device shells, metal pipes, brackets, components, parts shall have anti-static direct grounding measures; if it is inconvenient or the process does not permit direct grounding, it can be indirectly grounded through static conductive materials or products;
- Appliances that are directly used to hold electric powder, pipes (bands) for conveying powder, and the like, shall be made of metal or anti-static materials;
- Metal pipe joints (such as flanges) shall have anti-static bridging;
- Operators shall take anti-static measures.

6.3.3 Electrical equipment which is used in the area subject to dust explosion hazards shall comply with the relevant regulations of GB 12476.1 and GB/T 3836.15; overheating and sparks that are generated by electrical equipment or lines shall be prevented; combustible dust shall be prevented from entering electrical sparks or the outer shell of high-temperature components.

6.3.4 The electrical design and installation of the area subject to dust explosion hazards shall be carried out in accordance with the relevant regulations of GB 50058.

6.4 Prevent friction and collision sparks

6.4.1 Measures shall be taken to prevent friction and collision of equipment and devices in the area subject to dust explosion hazards.

6.4.2 At the feed of the process flow, equipment or devices, such as magnet, pneumatic separator or sieve, that can remove debris that is mixed in the material shall be installed.

6.4.3 Effective measures shall be taken to prevent metal powders, such as aluminum, magnesium, titanium, zirconium, or powders that contain these metals, from having sparks with rusty steel by friction.

6.4.4 When using rotating abrasive wheel and rotating abrasive disk for grinding and cutting, the same safety measures as hot work shall be adopted.

7.2.1 When producing and processing powders that can cause explosions, if there is no explosion suppression device and no pressure relief measures, all processing equipment shall adopt anti-explosion design and be able to withstand the overpressure that is generated by internal explosion without breaking.

7.2.2 The connection between the processing equipment (such as pipes, flanges) shall have the same strength as the equipment itself; the connection between the high-strength equipment and low-strength equipment shall be installed with explosion isolation devices.

7.2.3 Explosion pressure resistance and explosion pressure impact equipment shall meet the relevant requirements of GB/T 24626.

7.3 Venting of dust explosion

7.3.1 When the strength of the processing equipment is not enough to withstand the overpressure that is generated by the internal dust explosion under its actual working conditions, an explosion vent shall be provided; the explosion vent shall be oriented in a safe direction; the size of the explosion vent shall comply with the requirements of GB/T 15605.

7.3.2 The processing equipment of dust explosion hazards which is installed indoors shall be vented to the outdoor in a safety direction through a pressure relief duct. The pressure relief duct shall be as short and straight as possible; its strength shall not be lower than the strength of the protected equipment container.

7.3.3 Indoor container equipment that cannot vent to the outside through the pressure relief duct shall be installed with a flameless venting device of dust explosion.

7.3.4 For processing equipment with inline piping, the design index shall be able to withstand an internal overpressure of at least 0.1 MPa.

7.4 Explosion suppression

7.4.1 The processing equipment of dust explosion hazards should be protected by an explosion suppression device.

7.4.2 If a monitoring explosion suppression device is used, it shall meet the requirements of GB/T 18154.

7.4.3 The design and application of explosion suppression system shall meet the requirements of GB/T 25445.

7.5 Explosion isolation

8.2.1 Suction hoods shall be installed at all dust producing sites; sufficient inlet air volume shall be ensured to meet the dust collection requirements of the job posts.

8.2.2 The design of the suction hood shall comply with the relevant regulations of GB/T 16758.

8.3 Air duct

8.3.1 The air duct shall be paved, and shall not be arranged in underground or semi-underground buildings (rooms).

8.3.2 The air duct shall be made of steel materials; it is forbidden to use dry-aisle-type structures as dedusting air ducts; the design strength of the air duct shall not be less than that of the dust collector.

8.3.3 There shall be no dust deposits in the air duct.

8.3.4 The dust removal port or high-pressure inert gas blowing nozzle shall be set at the interval of every 6 meters of the horizontal air duct; when the air duct is not cleaned, the dust removal port shall be closed; its design strength shall be greater than that of the air duct.

8.4 Dust collector

8.4.1 The installation, use and maintenance of the dust collector shall comply with the relevant regulations of GB/T 17919.

8.4.2 It is forbidden to use dry electrostatic dust collectors and gravity settling chambers for dust collection.

8.4.3 The dust collector should be arranged outside the factory building. If the dry dust collector is installed in the factory, it shall be installed in a separate room at the outer wall of the building of the factory; the partition wall of the room shall be a fire partition whose fire endurance is not lower than 3 h; the outer wall of the room shall have an explosion vent, whose venting area of dust explosion shall meet the requirements of GB 50016.

8.4.4 An air pressure difference monitoring and alarm device shall be installed at the inlet and outlet of the bag filter; the pressure difference data shall be recorded; when the air pressure difference deviates from the set value, the monitoring device shall send out an audible and visual alarm signal.

8.4.5 The bag filter shall not use mechanical vibration; the filter bag shall be made of flame-retardant and anti-static filter materials; the anti-static characteristics of the filter bag shall meet the requirements of GB/T 17919.

9.5 A cleaning method that does not generate dust shall be used according to the characteristics of the dust. Compressed air shall not be used for blowing; negative pressure dust collection should be used for cleaning.

9.6 Metal dusts that spontaneously ignite in case of wetness shall not be cleaned by sprinkling and humidifying; the collected dusts shall be treated in accordance with regulations.

10 Overhaul

10.1 The area subject to dust explosion hazards shall develop safe operation systems and emergency handling measures for equipment and facility overhaul. Overhaul work shall be approved.

10.2 The equipment transmission devices (such as gears, pulleys, belt conveyor rollers, bearings), lubrication systems, dust collection systems, electrical equipment, and the like in the area subject to dust explosion hazards, shall be regularly inspected and maintained.

10.3 Safety devices, such as explosion suppression, venting of dust explosion, explosion isolation and spark detectors, shall be regularly inspected, checked and maintained.

10.4 Before the overhaul, all equipment shall be stopped; and the dust deposited on the ground and equipment surface of the overhaul site shall be cleaned. The overhaul parts and non-overhaul parts shall be kept isolated; all the vents in the overhaul area shall be free of any obstacles.

10.5 The overhaul work shall use anti-explosion tools to prevent sparks; it is prohibited to use iron tools for overhaul.

10.6 If the overhaul process involves hot work, it shall meet the requirements of 6.2.1; a special person shall be set up to supervise; sufficient firefighting equipment shall be equipped.

10.7 Work shall be carried out in accordance with equipment overhaul and repair regulations and procedures; cross-operation is prohibited in the area subject to dust explosion hazards.

10.8 The anti-explosion facilities shall not be arbitrarily changed or dismantled. If there are changes, the inspection and calculation shall be repeated until the requirements of the relevant regulations are met.

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