

Hazardous Area Classification Determination for Solid Sulphur

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Abstract: The Intent of this paper is to provide a overview on determination of Hazardous area extents for Solid Sulphur. Aim is to reduce the probability of co-existence between the release of combustible dust and the source of ignition to a minimum acceptable level. This is accomplished by proper selection of instrument and electrical equipment suitable for the hazardous area.

Keywords: Hazardous Area, Sulphur dust, extents

I. INTRODUCTION

Hazardous locations which are due to the presence of hazardous concentrations of combustible dust or powders may exist in the formation of a dust cloud from any source of release including dust layers or dust accumulation to form an explosive atmosphere. This may also exist in the formation of hazardous concentrations of dust layers which may ignite due to self-heating or hot surfaces and cause a fire hazard or over-heating of equipment. Also, the surface temperature of electrical and instrumentation equipment must be below the auto ignition temperature of the dust. Solid sulphur pose a very high threat of combustible dust

II. CLASSIFICATION OF ZONES FOR DUSTS

The following is a summary of the hazardous area classifications as defined by the IEC standards 60079-10-2 for combustible dust atmospheres.

Zone 20:

Location in where an explosive dust atmosphere, in the form of a cloud of dust in air, is present continuously, or for long periods or frequently.

Example;

- Inside of ducts, producing and handling equipment in which explosive dust / air mixtures are present continuously for long periods, or frequently, such as the granulation drum.
- Explosive dust / air mixture continuously present outside dust containment.

Zone 21:

Location where an explosive dust atmosphere, in the form of a cloud of dust in air, is likely to occur in normal operation occasionally.

Example:

- Inside dust handling equipment where explosive dust / air mixture is possible such as inside the containment inside transfer tower chutes, and inside storage buildings.

Zone 22:

Location which an explosive dust atmosphere, in the form of a cloud of combustible dust in air, is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

Example:

Distance of 3 m beyond around source of release with a vertical downwards to the ground or to the level of a solid floor such as the door openings of the storage buildings and the area surrounding the conveyors, granulators, transfer towers and chutes.

III. MATERIAL GROUP

For the purpose of testing, approval, and area classification, various air mixtures shall be grouped Group IIIC, Group IIIB and Group IIIA according to the nature of dust.

Group IIIC - Conductive metal dust including combustible metal fibres / Flyings

Group IIIB - Combustible Dust, other than combustible metal dust

Group IIIA - Solid Particles other than combustible metal, including fibers

IV. TEMPERATURE CLASS

It is necessary to specify a Temperature Class (T) for different types of protection, since dust can be ignited by contact with hot surface. The maximum surface temperature of the apparatus and the ignition temperature of dust are considered for determining the Temperature Class. For purposes of apparatus selection, the auto-ignition temperature has been standardised and defined as the lowest temperature of heated surface at which, the auto-ignition of a flammable material / dust air will occur.

Temperature Class	Maximum Surface Temperature
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

For sulphur dust clouds in hazardous concentrations, IEC 60079-14 states that the maximum surface temperature shall not exceed two thirds of the minimum ignition temperature. With an auto-ignition temperature of 220 deg. C (per NFPA 499) for sulphur dust, the maximum surface temperature should be 146 deg. C at maximum ambient temperature.

I. EXAMPLES OF HAZARDOUS AREA EXTENTS FOR SULPHUR HANDLING EQUIPMENT (IEC 60079-10:2)

Equipment	Auto Ignition Temp (Deg C)	Material Group	Max Rated Temperature (Deg C)	Zone Extents in meters	
Sulphur Transfer Conveyor	220	IIIB	146	Zone 21 – Inside Conveyor shed / cover	Zone 22 – 3m from edge of conveyor
Transfer Tower	220	IIIB	146	Zone 21 – Within Transfer Tower	Zone 22 – 3m from edge of Transfer Tower
Sulphur Storage Building	220	IIIB	146	Zone 21 – Inside the Building	Zone 22 – 3m from edge of Door / entrance of building

V. CONCLUSION

Upon finalising the zone extents, apparatus subgroup & temperature class, all electrical and instrument equipment shall be selected & produced in line with the Hazardous area classification extents.

REFERENCES

- [1] IEC 60079 10-2 Explosives Atmosphere Part 10-2: Classification of Areas – Explosive Dust Atmospheres
- [2] NFPA 499 Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas