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# Hazardous Area Classification İn A Pharmaceutical Industry To Identify Major Hazards

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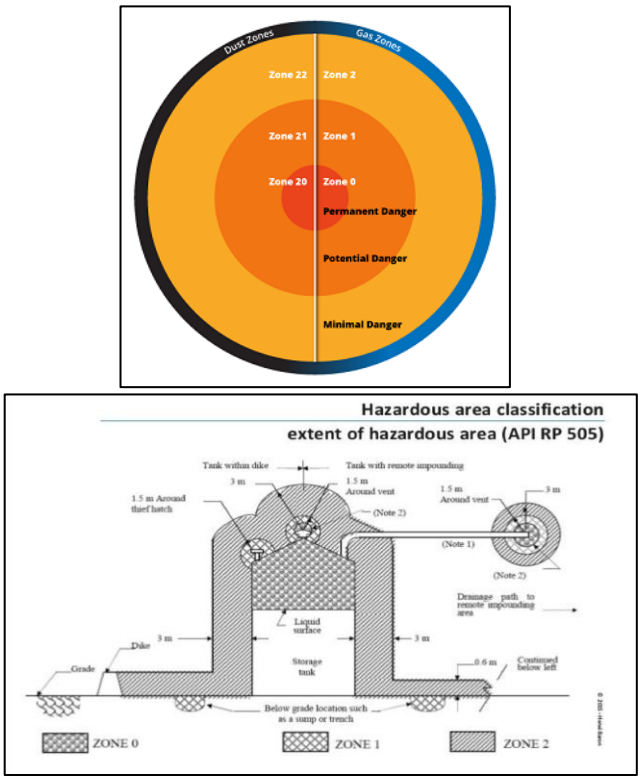
**Abstract:** The pharmaceutical industry is responsible for discovering, developing, manufacturing, and marketing drugs that are given to patients in order to cure them. Chemical and physical procedures are used to create pharmaceutical medications and components from basic materials. During this process, hazardous chemicals are used to perform unit activities such as separation, crystallisation, evaporation, filtering, distillation, and reaction. Because of the wide range of flammable liquids, flammable substances handled in the pharmaceutical sector, there is a . The scientific and engineering-based assessment and classification of hazardous (classified) locations within facilities where chemicals are manufactured, processed, or used, as well as the safe and proper specification and installation of electrical/ electronic equipment located there, is known as hazardous area classification in pharmaceuticals.

**Keywords:** Hazardous Area Classification Risk Assesment, Electrical installation, Flash point.

## 1. Introduction

The goal of the hazardous area classification research is to divide regions with a factory, building, or any other type of operation into zones based on the likelihood of an explosive environment forming. To classify an area, take into account the majority of the important factors, such as ventilation, materials used in the space, kind of operation, and sometimes the layout.




(A) (B)

***Fig.1.*** *(A) Extended Zone Diagram (B) Layout of HAC*

In today's world, the pharmaceutical sector is continually expanding, with advanced technical approaches being used to increase production delivery capacity and obtain optimal results without compromising safety. Because of the handling of many dangerous chemicals in the pharmaceutical business, chances of fire and explosion is intense. As a foundation for safer operations, the Electrical Hazardous Area Classification was created. Electric Hazardous Area Classification drawings are studied as a foundation for identifying the degree and breadth of explosive risks within industrial Based on the above inferences drawn from literature survey, the objectives of the present work concentrate on implementation of a Hazardous Area Classifiication in Pharmaceutical Industry. The major goal of this research is to see how accurate mathematical models are at determining the size of dangerous areas in industrial facilities that use explosive gases. The ability to accurately forecast the size of a hazardous region is critical for both process safety and efficiency

## 2 .Design Philosophy

The combustion triangle is the starting point for understanding these strategies. The fuel source in hazardous situations can be flammable dust, or fibres, with oxygen in the surrounding air serving as the oxidizer.

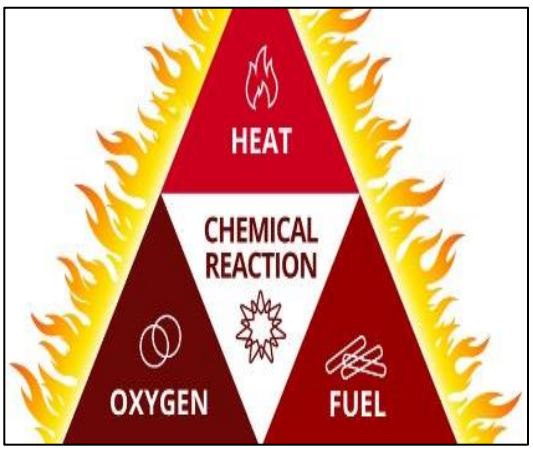



*Figure 2:* ***Fire Tetrahedron***

### 2.1 Source of Release:

It's a location where a gas, vapour, mists, or liquid can be released discharged into the atmosphere, potentially forming a hazardous environment, such as from equipment, tanks, or with data

### 2.2 Grades of release:

***Table 1 : Comparison of Grade of Release***

| Grade of release | Degree | | | | | | |
|---|---|---|---|---|---|---|---|
| | High | | | Medium | | | Low |
| | Availability | | | | | | |
| | Good | Fair | Poor | Good D | Fair | Poor | Good, Fair or Poor |
| **Continous** | (Zone 0 NE) Non Hazard | (Zone 0 NE) Zone 2a | (Zone 0 NE) Zone 1a | Zone 0 | Zone0 + Zone2 | Zone0 + Zone1 | Zone 0 |
| **Primary** | (Zone 1 NE) Non Hazardous | (Zone 1 NE) Zone 2[a] | (Zone 0 NE) Zone 1[a] | Zone 1 | Zone1 +Zone 2 | Zone1 + Zone2 | Zone 1 or Zone 0[C] |
| **Secondary** | (Zone 2 NE) Non Hazardous | (Zone 2 NE) Non Hazardous | Zone 2 | Zone 2 | Zone 2 | Zone 2 | Zone 1 or even Zone 0[c] |

### 2.3 Adequate Ventilation:

It defined as enough to prevent large accumulations of gas-air mixtures at concentrations greater than a quarter of the lower flammability limit.

### 2.4 Availability of Ventilation:

The presence or creation of an explosive gas environment is influenced by the availability of ventilation. As a result, when deciding on the type of zone, theventilation is available must considered.

### 2.5 Zone Classification for Vapour/Gases:

Zone 0: The location where a flammable environment is present all of the time or for extended periods of time, Zone 1 its A hazardous region where flammable environment is to arise during routine operation, Zone 2is The portion of a hazardous region where a flammable environment is unlikely to arise if it does, will last certain period of time. For Dust Zone 20: The portion of location where an explosive dust environment exists constantly or for extended periods of time.Zone 21 is a dangerous area where a dust environment explosive is to arise during normal activities. Zone 22 The portion of location where an dust atmosphere explosive is unlikely to arise in normal operation and, if it occurs, will only last a few minutes

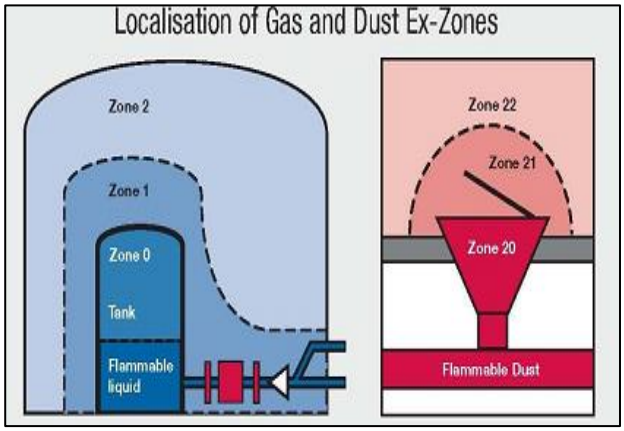



***Figure3:*** *Zone Classification Simple Diagram*

### 2.6 Hazard Radius & Zone Marking

The maximum extent area generated by the source, irrespective of ground effects, when it is located in an open area with unconstrained ventilation. This is the distance between lower flammability limit and the concentration of flammable Vapour in air.This will allow classifying zones in which installationswill be displayed on the plant layout as well as a hazardous sign board displayed in a prominent location to alert the plant community.

### 2.7 Selection of electrical equipment.

Electrical equipment's with flame proof enclosure and ATEX classification chart will be considered.


***Figure 4:*** *Selection of Equipment*

## 3. Conclusion

The HAC system's identified flaws and weaknesses must be filled. Every day, modifications are made in manufacturing plants all over the world. Physical equipment modifications can affect the arrangement of equipment, necessitating to ensure that those affected are informed. Changes in operating procedures and training, as well as adjustments to PM schedules and other PSI documentation, are just a few of the papers that are commonly impacted by such changes. The effective utilisation of HAC information is critical to process electrical safety, and monitoring, implementing, and upgrading this HAC information requires a team approach. This group's capability to take a role in process safety

management is limited by information in the hands of a few. Not only should clear communication be a goal, but it should also be a must, but also a necessary step in involving in the efficient and successful use of HAC data. The work environment must be clean.

## 4. Acknowledgment

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## 5. Conflict of Interest

There is no conflict of interest

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## 7. Author Profile

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