



**Research Paper**

**STUDY OF FIRE PROTECTION AND DETECTION SYSTEM  
FOR PAINT FACTORY AND REMEDIAL MEASURES**

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**ABSTRACT:**

There The Abstract is intended for the overview of the design basis for Fire Protection and Detection System for Paint Factory. The following significant are remedial measures will help improving performance.

Execution of design basis for Fire Protection and Detection System for Paint Factory, Approach is not only design aspects in technical, but, techno-legal. Design engineering aspect seen through the law of the land i.e. statutory engineering and other requirements.

Following are the significant remedial measures for fulfillment of design basis in Paint Factory: Production area requires Foam Sprinkler System, Fire Extinguishers and Smoke Detectors, Tank farm Area requires Foam Fixed System (Bund Fire protection), Water spray system (Exposure Protection) and Linear Heat Detection. Finished Goods Warehouse are requires Sprinkler System, Fire extinguishers and Beam detectors. Raw material Warehouse area requires Sprinkler System, Fire extinguishers and Beam detectors. Administration Building area requires Sprinkler System, Fire extinguishers and smoke Detectors. Security Guardhouse areas requires Fire extinguishers and Smoke Detector Fire Pump house areas requires Sprinkler System, Fire extinguishers and Smoke Detectors. Electrical Room area requires Clean Agent System, Fire extinguishers and Smoke Detectors. Battery Room area requires Clean Agent System, Fire extinguishers and Smoke Detectors.

**KEYWORDS:** Fire protection, Fire and gas detection, Fire alarm, Light (Low) hazard ordinary, (Moderate) hazard, extra (High) hazard Etc.

**1. INTRODUCTION**

Fire is one of the major threats to people, asset and environment. Fire is a voluntarily advancing process of combustion one or more object that release energy. Fire constitutes a significant threat to life and property in industrial plant.

Fire is the rapid oxidation of a material in the exothermic chemical process of combustion, releasing heat, light, and various reaction products.

The mitigation measures are followed and continuously improving to the threat of fire in industry in many ways, including fire department intervention, insurance, regulations, education on fire hazards, controls on the use of materials and products in buildings, and the design of plant to resist the effects of fire.

Requirements regarding fire safety come from the local authorities imposing certain requirements, from the insurance or from the company itself.

Authorities, in general, have requirements regarding fire safety in order to provide a minimum level of life safety and environmental safety.

Apart from the authorities, the insurance and the company itself might have fire safety requirements. Especially large industrial companies handling flammables, like major paint producers, have their own fire safety standards. Apart from the life safety objective, the objectives of the insurance and companies regarding fire safety are to minimize financial loss.

Worldwide most company and insurance fire safety standards are based on the NFPA codes and standards added with extra requirements or deviations. For companies handling flammable liquids, the NFPA 30 – Flammable and combustible liquids code – is the code formulating minimum requirements regarding fire safety.

**2. OBJECTIVES AND SCOPE**

**2.1 Objective**

To study fire protection and detection for paint factory in-line with internationally accepted standards and NFPA guidelines.

To find out recommendations and remedial measures for best code of Practices.

To align with existing Fire protection and detection system of Paint factory with new upgraded regulatory, International Standard and Best Industrial practices.

To analyze the strength and weakness of the current best Fire protection and detection code of practices and system for Paint factory.

To provide a strong base for the existing best Fire protection and detection system of practices to further implementation in Paint factory.

The NFPA (National Fire Protection Association – US) standards is generally used as a benchmark.

**2.2 Scope**

Scope of this study will be limited to the existing best Fire protection and detection system practices for paint factory. This study is based on the experiences and design to till date. It is a part of continual improvement through design and review of Fire protection and detection system which will give indications of potential areas of improvement and uncover the risk which are inherent and did not exposed to the surface. Study is not only relying own review and encouraging the third fresh eye view by inviting external experts as guide. Design to have insight for Fire protection and detection system practices and system effectiveness.

**3. METHODOLOGY**

Relevant NFPA Standards used for design Fire Protection and Detection System

Relevant SHELL Standards used for design Fire Protection and Detection System

Relevant API Standards used for design Fire Protection and Detection System

Regulatory requirements, International standards and Industrial practices.

#### 4. HAZARD

Fire Protection purposes, Hazards are categorized into Light, Ordinary, High and Extra High Hazards.

Light (Low) hazard occupancies shall be classified as locations where the quantity and combustibility of Class A combustibles and Class B flammables are low and fires with relatively low rates of heat release are expected.

Ordinary (Moderate) hazard occupancies shall be classified as locations where the quantity and combustibility of Class A combustible materials and Class B flammables is moderate and fires with moderate rates of heat release are expected.

Extra (High) hazard occupancies shall be classified as locations where the quantity and combustibility of Class A combustible material is high or where high amounts of Class B flammables are present and rapidly developing fires with high rates of heat release are expected

#### 5. CONCEPT OF FIRE PROTECTION

Fire Protection or Fire Extinguishment can be achieved with various techniques and mechanisms. However, basically the concepts behind all the extinguishing measures are one or more of the following.

- i. Physically separate the combustible material from the flame
- ii. Removing or Reducing the Oxygen supply
- iii. Reducing temperature of the combustible or the flame
- iv. Introducing the chemicals that modify the combustion chemistry

#### 6. FIRE PROTECTION SYSTEM

The fire protection system shall be provided by automatically and manually operated fixed systems, in conjunction with portable and mobile firefighting equipment.

The purpose of the below listed active fire protection systems is to provide adequate means to control and/or extinguish possible fires and to prevent fire escalation.

The systems shall be designed in compliance with the all applicable NFPA standards and other international standards.

The required fire protection systems envisaged for the fire protection of the paint factory are listed below.

- Firewater Pumps,
- Hose reel
- Water spray system (Deluge)
- Foam system
- Portable fire extinguisher
- Wheeled Fire extinguisher
- Clean Agent fire suppression system

#### 7. CONCEPT OF FIRE DETECTION & ALARM SYSTEM

The principle objective of the Fire and Gas Detection system is to provide an early warning to the personnel (by initiating Alarms, Horns, Beacons) of the existence of a potentially dangerous situation such as flammable atmospheres, gas release or fire and to enable automatic initiation of remedial actions

to avoid or minimize the escalation of the event e.g. by initiating relevant shutdown.

A well-engineered Fire & Gas System enables mitigation of hazardous conditions such as fire or loss of containment by performing three basic functions:

- Detect the Hazard;
- Alert People;
- Initiate Action.

#### 8. FIRE DETECTION & ALARM SYSTEM

The purpose of fire and gas protection is to prevent or limit the escalation of a fire, to avoid risk to life and to minimize material damage until the source of hazard has been isolated or consumed.

The provision of mitigating fire and gas detection system and will serve the following functions,

- i. Assist search and rescue operations
- ii. Reduce escalation
- iii. Extinguish fires
- iv. Reduce asset and business loss

##### 8.1 Fire Detectors

There are several types of systems for the detection of fire. The detectors required for the paint factory are as follows:

Basis of Detection	Type of Detector
Flame	Triple IR Flame detector
Smoke	Optical Smoke detector & High sensitivity smoke detector
Heat	Rate of Rise with fixed temperature and Linear Heat Detector(LHD) cable

#### 9. CONCLUSION

Production area requires Foam Sprinkler System, Fire Extinguishers and Smoke Detectors.

Tank farm Area requires Foam Fixed System (Bund Fire protection), Water spray system (Exposure Protection) and Linear Heat Detection.

Finished Goods Warehouse requires Sprinkler System, Fire extinguishers and Beam detectors.

Raw material Warehouse area requires Sprinkler System, Fire extinguishers and Beam detectors.

Administration Building area requires Sprinkler System, Fire extinguishers and smoke Detectors.

Security Guardhouse areas requires Fire extinguishers and Smoke Detector.

Fire Pump house areas requires Sprinkler System, Fire extinguishers and Smoke Detectors.

Electrical Room area requires Clean Agent System, Fire extinguishers and Smoke Detectors.

Battery Room area requires Clean Agent System, Fire extinguishers and Smoke Detectors.

#### REFERENCES

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2. NFPA 13: *Standard for the Installation of Sprinkler Systems.*
3. NFPA 14: *Standard for the Installation of Standpipes and Hose Systems*
4. NFPA 15: *Standard for Water Spray Fixed Systems for Fire Protection.*
5. NFPA 16: *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems.*
6. NFPA 20: *Standard for the Installation of Stationary Pumps for Fire Protection.*
7. NFPA 22: *Standard for Water Tanks for Private Fire Protection*

8. NFPA 24: *Installation of Private Fire Service Mains and Their Appurtenances*
9. NFPA 30: *Flammable and combustible liquid code*
10. NFPA 72: *National Alarm Code.*
11. NFPA 101: *Life safety code*
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