safety handbook

minimum safety rules

Prepared By

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Contents

Chapter 1 Definitions

1.1. Hazard:
Anything that can potentially cause harm to people, property, processes, or the environment.

1.2. Types of Hazards (PCBPEEM):

- **Physical**: Noise, vibration, electricity, temperature, lighting
- **Chemical**: Gas, dust, smoke
- **Biological**: Viruses, bacteria, fungi, mold
- **Psychological**: Fatigue, stress
- **Ergonomics**: Strain, work pressure
- **Environmental**: Dust, smoke
- **Mechanical**: Entanglement, trap, impact, contact, ejection (ENTICE)

1.3. Risk: Risk is the combination of the likelihood of a hazardous event happening and the consequences or severity of that event. Risk = Likelihood × Severity

1.4. Likelihood: The frequency at which the hazardous event occurs.

1.5. Severity: The extent of the negative impact or consequences of the event.

1.6. Risk Classification:

1.6.1. High Risk (Unacceptably High): Intolerable losses to people, processes, assets, environment, and reputation.

1.6.2. Medium Risk: Acceptable but must be managed to ALARP (As Low As Reasonably Practical).

1.6.3. Low Risk: Acceptable with no further action needed.

1.6.4. Residual Risk: The remaining risk after control measures are applied.

1.7. Safety Signs: Safety signs are used to convey important health and safety information or instructions

1.8. Standard Safety Signs Categories:

1.8.1. Prohibition: Used to stop dangerous behavior (e.g., "No Smoking"). Round shape. Black pictogram on white background, red edging and diagonal line

1.8.2. Warning: Alerts people to a potential hazard (e.g., "Fork Lift Trucks Operating in The Area"). Triangular shape. Black pictogram on a yellow Amber background with black edging

1.8.3. Mandatory Action: Instructs people to take specific actions, such as wearing protective equipment (e.g., "Eye Protection Must Be Worn"). Round shape. White pictogram on a blue background.

1.8.4. Safe Condition: Identifies safe behavior or areas (e.g., "First-Aid Station"). Rectangular or square shape. White pictogram on a green background

1.9. Toxic Chemicals: As per Gujarat Factories Rules, Chemicals with high acute toxicity and certain physical and chemical properties may pose major accident hazards.

Sr.	Degree of toxicity	(Medium lethal by the oral route toxicity) LD 50 (mg/kg body weight of test animals)	Medium lethal by the normal (dermal LD 50 body weight of test animals)	Medium letal concentration by Inhalation route (Four hours) LC 50 (mg/1 Inhalation in test animals
1.	Extremely toxic	1 - 50	1 - 200	0.1 - 0.5
2.	Highly toxic	51 - 200	201 - 2000	0.5 - 2.0

1.10. As per Gujarat Factories Rules, flammable chemicals are classified as:

- **Flammable gases**: Boiling point ≤ 20°C, flammable with air**.**
- **Highly flammable liquids**: Flash point < 23°C, boiling point > 20°C.
- **Flammable liquids**: Flash point < 65°C, hazardous under high pressure/temperature.

1.11. Flammable liquids as per IS-5572:

- Flammable liquids have a flash point below 93°C and vapor pressure not exceeding 2.81 kg/cm² at 37.8°C.
  - **Class A:** Flashpoint < 23°C, highly volatile.
  - **Class B:** Flashpoint 23°C–65°C, moderately volatile.
  - **Class C:** Flashpoint 65°C–93°C, low volatility and minimal vapor release.

1.12. Flammable liquids are classified as per NFPA-30:

- A flammable liquid is any liquid that has a closed-cup flash point below 100°F (37.8°C). Flammable liquids are classified as Class I:
  - **Class IA:** Flash point < 73°F (22.8°C), boiling point < 100°F (37.8°C).
  - **Class IB:** Flash point < 73°F (22.8°C), boiling point ≥ 100°F (37.8°C).
  - **Class IC:** Flash point ≥ 73°F (22.8°C), < 100°F (37.8°C).

1.13. As per Gujarat Factories Rules, Confined spaces with dangerous fumes must have a manhole for entry. The manhole should be:

- Rectangular/oval: At least 40.6 cm long and 30.5 cm wide.
- Circular: At least 40.6 cm in diameter.

Chapter 2 Layers of Defense - Against a Possible Accident – General guidelines

2.1. Basic Rules Of Safeguard

- **Rule 1:** Safeguards Should Act Before the Event Happens
- **Rule 2:** Criteria for Analyzing Layer of Defense

Severity	Preventive safeguard	SIS	Mechanical safeguard	Alarm and Operator intervention	Admin	Passive	Minimum Total Safeguard
5	2	2	0	1	2		5
		1	1				
4	2	2	0	1	1		4
		1	1				
3	1	1		1	1		3
2	1	1			1		2
1	--	--	--	1		--	1

- **Rule 3:** Safeguard should demonstrate the performance
- **Rule 4:** Layer of Defense should be independent
- **Rule 5:** Not All Layer of Defense Credits Are the Same
- **Rule 6:** Consider Process Control Failures in Risk Assessment, Not Layers of Defense Failure
- **Rule 7:** In Case of Redundancy, Only Single Layer of Defense Should Be Considered
- **Rule 8:** If Two Safety Devices Are in Series, They Will Count as a Single Layer of Defense
- **Rule 9:** If One Equipment Has Two Transmitters for Different Parameters, Count as a Single Layer of Defense

2.1 Static Charge

- **Reference Standards**: IS-7689, NFPA-77, OISD-RP-100, API-2003
- **Information about Static earthing system :**
  - Grounding and bonding as per standards (with regular inspection and monitoring)
  - Earth pit inspection and monitoring plan
  - Earth pit resistance should be under 10 ohms
  - Continuity check from equipment to earth pit

2.2 Lightning

- **Reference standard:** IS-2309, NFPA-780, OISD-GDN-180 API-2003
- **Information about Lightning System:**
  - Ensure that all workstations and equipment handling flammable chemicals are protected by lightning arrestors.
  - Lightning protection design technique - Protective Angle Method for Workstations and process units, Rolling Sphere Method identify the areas of a building or structure that needs protection mainly for warehouses.
  - Grounding and bonding as per standards (with regular inspection and monitoring)
  - Earth pit inspection and monitoring plan
  - Earth pit resistance should be under 10 ohms
  - Continuity check from equipment to earth pit

2.3 Electrical Spark -

- **Reference standard:** API-2003, OISD-STD-113, IEC-60079, IEC 60079, IS 5572 & IS 61241, API-RP-500 & 505, NFPA-497 & NFPA-499

- **Information about Electrical Spark :**
  - Use equipments as per Hazardous Area Classification
  - Inspection and Testing Program
  - Ensure adequate ventilation
  - Housekeeping to prevent the leakage and dust layer formation
  - Zone 0: Explosive gas/vapor atmosphere present continuously or for long periods.
  - Zone 1: Explosive gas/vapor atmosphere likely to occur occasionally.
  - Zone 2: Explosive gas/vapor atmosphere unlikely but may occur briefly.
  - Zone 20: Explosive dust atmosphere present continuously or for long periods.
  - Zone 21: Explosive dust atmosphere likely to occur occasionally.
  - Zone 22: Explosive dust atmosphere unlikely but may occur briefly.

  - **Temperature Limitations Due to Dust Clouds**: The maximum surface temperature of equipment, tested per IEC 60079-0 in a dust-free environment, must not exceed two-thirds of the minimum ignition temperature of the dust/air mixture: **Tmax** $\leq$ 2/3 TCL where TCL is the minimum ignition temperature of the dust cloud.

DETERMINING A "ZONE" REQUIRES ANSWERING 4 ESSENTIAL QUESTIONS

1 What is emission level of gas/vapor?
(a) continuous, (b) first level emission, (released during normal operation)
(c) second level emission (released during abnormal operation)

2 What type of openings currently exist?
(a) continuously open, (b) normally closed,
(c) weatherproof, (d) emergency open only

3 What is ventilation?
(a) very good, (b) good, (c) poor

4 What is level of ventilation?
(a) high, (b) average, (c) weak

CHART 1
AREA CLASSIFICATION—IEC vs NEC®/CEC (CLASS/DIVISION/GROUP)

Inflammable material	IEC/CENELEC				NEC®/CEC		
	Protection	Zone	Group	Subdivision	Class	Division	Group
Gases and vapors							
Acetylene	d and/or e	1 or 2	II	C	I	1 or 2	A
Hydrogen	d and/or e	1 or 2	II	$C - H_2$	I	1 or 2	B
Propylene oxide Ethyl oxide Butadiene	d and/or e	1 or 2	II	B	I	1 or 2	B
Cyclopropane Ethyl ether Ethylene	d and/or e	1 or 2	II	B	I	1 or 2	C
Acetone Benzene Butane Propane Hexane Paint solvents Natural gas	d and/or e	1 or 2	II	A	I	1 or 2	D

CHART 2
IEC vs NEC® TEMPERATURE CLASSIFICATION COMPARISON

Temperatures in °C	Classification	
	IEC	North America
85	T6	T6
100	T5	T5
120	T4	T4A
135	T4	T4
160	T3	T3C
165	T3	T3B
180	T3	T3A
200	T3	T3
215	T2	T2D
230	T2	T2C
260	T2	T2B
280	T2	T2A
300	T2	T2
450	T1	T1

CHART 3
SAFE EQUIPMENT OPERATING TEMPERATURE

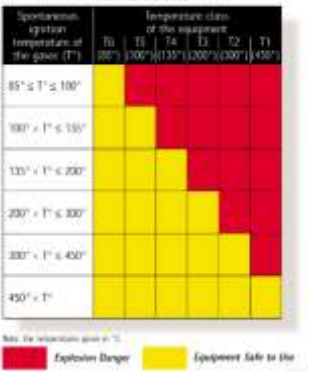


CHART 4
IEC–NEC® GAS GROUPS

IEC	NEC® CEC	Gas or vapor
II C	A	Acetylene
II C	B	Hydrogen
II B	C	Ethylene
II B	C	Ethyl ether
II B	C	Cyclopropane
II B	C	Butadiene 1, 3
II A	D	Propane
II A	D	Ethane
II A	D	Butane
II A	D	Benzene
II A	D	Pentane
II A	D	Heptane
II A	D	Acetone
II A	D	Methyl ethyl
II A	D	Methyl alcohol
II A	D	Ethyl alcohol

CHART 5
IEC/NEC® EQUIPMENT STANDARDS

Equipment	IEC	CENELEC	NEC® (UL)	CEC (CSA)
Fixed luminaires for general use	• 60 079-0 • 60 079-1 • 60 079-7 • 60 308-1	• EN 50 014 • EN 50 018 and/or 50 019 • EN 60 598-1	• UL 844	• C22.2 No. 4
Portable equipment			• UL 844 • UL 781	• C22.2 No. 4 • C22.2 No. 137
Floodlights and lamps			• UL 844 • UL 783	• C22.2 No. 4 • C22.2 No. 137
Luminaires with fluorescent lamps			• UL 844 • UL 1570	• C22.2 No. 4 • C22.2 No. 137
Luminaires with incandescent lamps			• UL 844 • UL 1571	• C22.2 No. 4 • C22.2 No. 9
Power outlets	• 60 079-0 • 60 079-1 • 60 079-7 • 60 309-1 • 60 309-2	• EN 50 014 • EN 50 018 and/or 50 019 • EN 60 309-1 (EN 60 309-2)	• UL 1010 • UL 1682	• C22.2 No. 154 N/A
Switches	• 60 079-0 • 60 079-1 • 60 079-7 • 60 947-1 • 60 947-3	• EN 50 014 • EN 50 018 and/or 50 019 • EN 60 947-1 • EN 60 947-3	• UL 508 • UL 98 • UL 1087 • UL 894	• C22.2 N/A • C22.2 No. 9.2 • C22.2 No. 21 & 30

CHART 6—PROTECTION TECHNIQUES RECOGNIZED BY IEC, NEC® AND CEC

Protection method	Identification letters	Permitted in division	Permitted in zone	Principle
Flameproof	d	2	1 or 2	Containment
Intrinsic safety (zone 0)	ia	1 or 2	0, 1, 2	Energy limited
Intrinsic safety (zone 1)	ib	2	1 or 2	Energy limited
Pressurization	p	1 or 2	1 or 2	Expels vapors
Increased safety	e	2	1 or 2	No arcs
Immersed in oil	o	1 or 2	1 or 2	Arc immersion
Filled with powder/sand	q	2	1 or 2	Arc immersion
Encapsulated	m	2	1 or 2	Hermetic seal
Apparatus with "n"* protection	n	2	2	No sparking

UNDERSTANDING THE INGRESS PROTECTION SYSTEM

IP

The IEC IP classification system designates the degree of protection provided by an enclosure against impact and/or water or dust penetration (ingress). It has two numbers: first—protection against solid objects, second protection against water.

EXAMPLE: IP 54

1st Figure: protection against solid bodies

IP	TESTS	
0		No protection
1		Protected against solid bodies larger than 50mm (e.g. accidental contact with the hand)
2		Protected against solid bodies larger than 12.5mm (e.g. finger of the hand)
3		Protected against solid bodies larger than 2.5mm (tools, wires)
4		Protection against solid bodies larger than 1mm (fine tools, small wires)
5		Protected against dust (no harmful deposit)
6		Completely protected against dust

2nd Figure: protection against liquids

IP	TESTS	
0		No protection
1		Protected against vertically falling drops of water (condensation)
2		Protected against drops of water falling at up to 15° from the vertical
3		Protected against drops of rainwater at up to 60° from the vertical
4		Protected against projections of water from all directions
5		Protected against jets of water from all directions
6		Completely protected against jets of water of similar force to heavy seas
7		Protected against the effects of immersion

Chapter 3 Layers of Defense - Against a Possible Accident – Case studies

3.1 Handling of Explosive Powder

- Wear anti-static clothing and footwear for materials with MIE <30 mJ.
- Use anti-static scoops for dryer powders with MIE <30 mJ.
- Use non-sparking tools with explosive powders.
- Inert dryers with nitrogen (N2) to prevent ignition.
- Ensure proper ventilation to avoid flammable dust/vapors.
- Conduct toolbox talks for safety.

3.2 Handling Toxic Chemicals

- Use proper PPE.
- Perform the fit test for respirator PPE at regular intervals.
- Install flange guards on transfer lines.
- Use ventilation systems (e.g., fume hoods) for toxic vapors.
- Keep spill kits nearby.
- Install toxic gas detectors in key areas.
- Label chemicals properly and ensure dedicated storage.

3.3 Handling Flammable Chemicals

- Ensure dry run protection is available to Transfer Pump (Low flow Dry run protection if Pump HP is less than 5 and Low current Dry run protection if Pump HP is equal to or more than 5 HP)

- Install an ON/OFF valve and level switch in the receiving tank, and interlock to close the valve on a high-level alarm. Or,
- Overflow Protection: Use a level switch with pneumatically operated ON/OFF Valve in the tank inlet line and interlock to close the valve on a high-level alarm. Or,
- Overflow Return Line: Provide overflow return line to the main storage tank.
- Install flame and gas detectors in critical areas.
- Install automatic systems (e.g., sprinklers, foam) for fire response.
- Use equipments in areas with flammable chemicals as per Hazardous area classification.
- Static earthing as per to IS-7689 to prevent hazards.
- Install a Lightning Arrestor system across the site to protect against strikes.
- Dip Pipe with Anti-Siphon Hole: For top inlet lines, install a dip pipe with an anti-siphon hole in all incoming lines from tankers to storage tanks. If the velocity of incoming liquid is less than 1 m/s, use a J-pipe; otherwise, use a dip pipe.
- Provide N2 in equipment handling flammable chemicals.
- Install PSV in N2 supply line and PRV with pressure set below equipment design.
- Provide BVFA in the vent of equipment.

3.4 Powder/Liq. Charging in Eqp. with Flammable Atm.

- Use double valve or rotary valve arrangements for powder charging with earthing and bonding.
- Operators must use conductive platforms and wear anti-static clothing and footwear.

- Install a static discharge point near the charging station.
- SOP: "Do not shake the powder bag after emptying" to prevent dust buildup and flash fires.

Chapter 4 Life Safety Rules

To ensure a safe working environment, adherence to the following Life Saving Rules is mandatory:

Note: Any violation of life safety rules must be investigated immediately. If found intentional may be terminated or strict action as per company rule

Chapter 5 Safety Studies

5.1 Summary of Safety Studies requirement

5.2 Overview of Safety Study Objectives and Ref. Std.

Safety Study	Objective	Reference Standards
HAZID (Hazard Identification)	Identify potential hazards and assess risks in processes or projects.	- ISO 31000 (Risk Management) - IEC 61882 (HAZOP/HAZID Studies) - IS 15656
HAZOP (Hazard and Operability Study)	Systematically identify and evaluate hazards and operability issues in process designs.	- IEC 61882 (HAZOP Methodology)
Safety Audits	Conduct thorough audits of safety practices to ensure compliance and identify improvements.	- IS-14489
LOPA (Layer of Protection Analysis)	Assess risk by determining the layers of protection and their effectiveness in reducing hazardous events.	- IEC 61511 (Functional Safety for the Process Industry) - IEC 61508 (Functional Safety)
QRA (Quantitative Risk Assessment)	Quantify and assess potential risks and their impact on operations, people, and the environment.	- TNO Purple Book, Guidelines for quantitative risk assessment
HAC (Hazardous Area Classification)	Classify areas based on the presence and likelihood of explosive atmospheres to ensure proper equipment selection and safety measures.	- IEC 60079 (Electrical Equipment for Explosive Atmospheres) - IS 5572 & IS 61241 - NFPA-497 & NFPA-499
Fire and Gas Detector Mapping study	Identify and map locations of fire and gas detectors to ensure safety coverage.	- NFPA 72 (National Fire Alarm and Signaling Code) - IEC 61508 (Functional Safety)

Safety Study	Objective	Reference Standards
Electrostatic Hazard Risk Assessment	Evaluate the risk of electrostatic discharge hazards in areas handling flammable materials.	- NFPA-77 - IEC TS 60079-32-1
FIRE LOAD CALCULATION	Calculate the fire load in a facility to assess the potential fire hazards.	- IS:1641
VENT DISPERSION ANALYSIS	Assess the dispersion of hazardous gases or vapors from a vent to ensure safe dispersion and avoid toxic exposure.	- API-521
FIRE WATER ADEQUACY STUDY	Ensure the adequacy of firewater supply to effectively combat fire hazards.	- NFPA-72 - Fire Protection Manual Tariff Advisory Committ ee, twelfth edition - NFPA 13 - NFPA-20 - IS 2190 - NFPA 101 - NBC-2016 – SP 7
HIRARC (Hazard Identification and Risk Assessment)	Identify hazards and assess risks to reduce incidents and improve safety.	- ISO 31000 (Risk Management) - OHSAS 18001 (Occupational Health and Safety Management Systems)
FIRE PROTECTION AND SAFETY DESIGN (FPSD)	Design fire protection systems based on safety requirements and risk analysis.	NFPA-11, 25, 10,13,17,20,22,72,
FIRE SAFETY RISK ASSESSMENT (FSRA)	Evaluate fire safety risks and recommend corrective actions.	- NFPA 551 This guide provides assistance in evaluating the appropriateness and execution of a fire risk

Safety Study	Objective	Reference Standards
		assessment (FRA) for a given fire safety problem. GOV.UK
FIRE AUDIT	Conduct an audit to assess the fire protection system's functionality and compliance.	-TAC Fire Protection Manual - NFPA 13/20 - IS 2190
EMERGENCY RESPONSE & DISASTER MANAGEMENT PLANS (ERDMP)	Develop and implement plans for managing emergencies and disasters effectively.	- Petroleum and Natural Gas Regulatory Board (PNGRB) ERDMP Amendment Regulations
SAFETY MANUAL	Develop safety procedures and guidelines for workers to follow to ensure a safe environment.	- ISO 45001 (Occupational Health and Safety Management Systems)
EMERGENCY RESPONSE PLAN	Develop plans for evacuation, emergency response, and employee safety during emergencies.	- Exit Routes and Emergency Planning - U.S. Occupational Safety & Health Administration (OSHA) 29 CFR 1910 Subpart E - NFPA 101 - Employee Alarm Systems – OSHA 29 CFR 1910.165 - Evacuation Planning Matrix – OSHA - Evacuation Plans and Procedures tool – OSHA
ROOT CAUSE ANALYSIS (RCA)	Analyze accidents and incidents to determine their root causes and prevent recurrence.	RCA Methodologies (Various methodologies used in incident investigations)
DUST HAZARD ANALYSIS	Identify potential hazards posed by combustible dust	NFPA 652

Safety Study	Objective	Reference Standards
	and establish safe handling practices.	
SAFETY TRAINING	Provide training to employees to improve awareness and compliance with safety standards.	SAFETY TRAINING Guidelines (various organizations)
SAFETY REPORT - SCHEDULE 8	Prepare safety reports as required under hazardous chemicals regulations.	The Manufacture, Storage And Import of Hazardous Chemicals Rules, 1989
SAFETY REPORT - SCHEDULE 7	Prepare safety reports as required under hazardous chemicals regulations.	The Manufacture, Storage And Import of Hazardous Chemicals Rules, 1989
N2 INERTIZATION AND VALIDATION	Ensure that N2 inertization systems are correctly implemented and validated for safety.	NFPA-69
STORAGE TANK - N2 INERTIZATION	Ensure proper inerting of storage tanks to prevent combustion risks.	- API 2000 Venting Atmospheric and Low-Pressure Storage Tanks - NFPA 69
STORAGE TANK/VESSELS - VENT SIZING	Determine the correct vent sizing for storage tanks or vessels to ensure safe venting of vapors.	- API 2000 Venting Atmospheric and Low-Pressure Storage Tanks - NFPA 30 Flammable and Combustible Liquid Code
INCIDENT INVESTIGATION	Investigate incidents to determine the cause and improve safety measures.	INCIDENT INVESTIGATION Guidelines (various organizations)
BEHAVIOR-BASED SAFETY (BBS) METHODOLOGY,	Implement and monitor behavior-based safety programs to promote safety culture.	Behavior-Based Safety Guidelines (various organizations)

Safety Study	Objective	Reference Standards
IMPLEMENTATION AND MONITORING PROCEDURE		

5.3 Safety Studies Methodology link and FAQ

S.NO.	STUDY METHODOLOGY	LINK
1	METHODOLOGY FOR FIRE WATER SYSTEM ADEQUACY STUDY (FWSAS)	https://www.hse-rms.com/blog/methodology-for-fire-water-system-adequacy-study-%28fwsas%29
2	METHODOLOGY FOR HAZARD OPERABILITY (HAZOP) STUDY	https://www.hse-rms.com/blog/methodology-for-hazard-&-operability-study
3	METHODOLOGY FOR HAZARDOUS AREA CLASSIFICATION (HAC) STUDY- IEC	https://www.hse-rms.com/blog/methodology-for-hazardous-area-classification-%28iec%29
4	METHODOLOGY FOR HAZARDOUS AREA CLASSIFICATION (HAC) STUDY-IS	https://www.hse-rms.com/blog/methodology-for-hazardous-area-classification-is
5	METHODOLOGY FOR HAZARDOUS AREA CLASSIFICATION (HAC) STUDY-NFPA	https://www.hse-rms.com/blog/methodology-for-hazardous-area-classification-nfpa
6	METHODOLOGY FOR FIRE & GAS STUDY	https://www.hse-rms.com/blog/methodology-for-f&g
7	METHODOLOGY FOR ELECTROSTATIC HAZARD RISK ASSESSMENT STUDY	https://www.hse-rms.com/blog/methodology-for-electrostatic-hazard-risk-assessment-multi-product-facility
8	METHODOLOGY FOR LAYERS OF PROTECTION ANALYSIS (LOPA)	https://www.hse-rms.com/blog/methodology-for-lopa-study

S.NO.	STUDY METHODOLOGY	LINK
9	METHODOLOGY FOR VENT DISPERSION ANALYSIS STUDY	https://www.hse-rms.com/blog/methodology-for-vent-dispersion-analysis-study
10	METHODOLOGY FOR HAZARD IDENTIFICATION (HAZID) STUDY	https://www.hse-rms.com/blog/methodology-for-hazard-identification-%28hazid%29
11	METHODOLOGY FOR HIRARC	https://www.hse-rms.com/blog/methodology-for-hirarc
12	METHODOLOGY FOR FIRE PROTECTION AND SAFETY DESIGN (FPSD)	https://www.hse-rms.com/blog/methodology-for-fire-protection-and-safety-design-%28fpsd%29
13	METHODOLOGY FOR QUANTITATIVE RISK ASSESSMENT (QRA) STUDY	https://www.hse-rms.com/blog/methodology-for-qra-study
14	METHODOLOGY FOR SAFETY AUDIT STUDY	https://www.hse-rms.com/blog/methodology-for-safety-audit
15	METHODOLOGY FOR FIRE SAFETY RISK ASSESSMENT (FSRA) STUDY	https://www.hse-rms.com/blog/methodology-for-fire-safety-risk-assessment-%28fsra%29
16	METHODOLOGY FOR FIRE AUDIT STUDY	https://www.hse-rms.com/blog/methodology-for-fire-audit
17	METHODOLOGY FOR EMERGENCY RESPONSE & DISASTER MANAGEMENT PLANS (ERDMP)	https://www.hse-rms.com/blog/methodology-for-emergency-response-&-disaster-management-plans-erdmp
18	METHODOLOGY FOR SAFETY MANUAL	https://www.hse-rms.com/blog/-methodology-for-safety-manual
19	METHODOLOGY FOR EMERGENCY RESPONSE PLAN	https://www.hse-rms.com/blog/methodology-for-emergency-response-plan

S.NO.	STUDY METHODOLOGY	LINK
20	METHODOLOGY FOR ROOT CAUSE ANALYSIS (RCA) STUDY	https://www.hse-rms.com/blog/-methodology-for-root-cause-analysis-%28rca%29
21	METHODOLOGY FOR DUST HAZARD ANALYSIS (DHA)	https://www.hse-rms.com/blog/methodology-for-dust-hazard-analysis
22	METHODOLOGY FOR SAFETY TRAINING	https://www.hse-rms.com/blog/methodology-for-safety-training
23	METHODOLOGY FOR SAFETY REPORT-SCHEDULE 8	https://www.hse-rms.com/blog/methodology-for-safety-report--schedule-8
24	METHODOLOGY FOR FIRE LOAD CALCULATION	https://www.hse-rms.com/blog/methodology-for-fire-load-calculation-study
25	METHODOLOGY FOR SAFETY REPORT SCHEDULE 7	https://www.hse-rms.com/blog/methodology-for-safety-report-schedule-7
26	METHODOLOGY FOR N2 INERTIZATION AND VALIDATION	https://www.hse-rms.com/blog/methodology-for-n2-inertization--and-validation
27	METHODOLOGY FOR STORAGE TANK N2 INERTIZATION	https://www.hse-rms.com/blog/methodology-for-storage-tank--n2-inertization
28	METHODOLOGY FOR STORAGE TANK/VESSELS - VENT SIZING	https://www.hse-rms.com/blog/methodology-for-storage-tank-vessels-vent-sizing

S.NO.	FAQ	LINK
1	FAQ-SAFETY MANUAL	https://www.hse-rms.com/blog/faq-safety-manual
2	FAQ-HAZARD AND OPERABILITY STUDY (HAZOP)	https://www.hse-rms.com/blog/faq-hazard-and-operability-study-%28hazop%29

S.NO.	FAQ	LINK
3	FAQ-HAZARD IDENTIFICATION, RISK ASSESSMENT, AND RISK CONTROL (HIRARC)	https://www.hse-rms.com/blog/faq--hazard-identification,-risk-assessment,-and-risk-control-%28hirarc%29
4	FAQ- SAFETY AUDIT	https://www.hse-rms.com/blog/faq-safety-audit-
5	FAQ- HAZID	https://www.hse-rms.com/blog/faq-hazid
6	FAQ- FIRE PROTECTION AND SAFETY DESIGN (FPSD) STUDY	https://www.hse-rms.com/blog/faq--fire-protection-and-safety-design-%28fpsd
7	FAQ- FIRE LOAD CALCULATION	https://www.hse-rms.com/blog/faq--fire-load-calculation
8	FAQ- FIRE SAFETY RISK ASSESSMENT (FSRA)	https://www.hse-rms.com/blog/faq--fire-safety-risk-assessment-%28fsra%29
9	FAQ- LOPA STUDY	https://www.hse-rms.com/blog/-faq--lopa-study
10	FAQ-QUANTITATIVE RISK ASSESSMENT (QRA) STUDY	https://www.hse-rms.com/blog/faq--quantitative-risk-assessment-%28qra%29
11	FAQ-VENT DISPERSION ANALYSIS	https://www.hse-rms.com/blog/faq--vent-dispersion-analysis-
12	FAQ- FIRE AUDIT	https://www.hse-rms.com/blog/faq--fire-safety-audit
13	FAQ-EMERGENCY RESPONSE & DISASTER MANAGEMENT PLANS (ERDMP)	https://www.hse-rms.com/blog/faq-emergency-response-&-disaster-management-plans-%28erdmp%29
14	FAQ-HAZARDOUS AREA CLASSIFICATION (HAC) STUDY-IS	https://www.hse-rms.com/blog/faq--hazardous-area-classification-is-%28hac%29
15	FAQ-HAZARDOUS AREA CLASSIFICATIONS (HAC) STUDY -IEC	https://www.hse-rms.com/blog/faq--hazardous-area-classification-%28hac%29-study-iec

S.NO.	FAQ	LINK
16	FAQ HAZARDOUS AREA CLASSIFICATION (HAC) STUDY- NFPA	https://www.hse-rms.com/blog/faq-hazardous-area-classification-hac-study-nfpa
17	FAQ-FIRE WATER SYSTEM ADEQUACY (FWSAS) STUDY	https://www.hse-rms.com/blog/faq-fire-water-system-adequacy-%28fwsas%29-study-

Chapter 6 Important Information

6.1 Set Pressure of RD and PSV

- When a rupture disk (RD) is installed before the pressure safety valve (PSV) in series, the set pressure of the RD should be 5 to 10% lower than that of the PSV. This ensures that the RD activates first, preventing shock loading on the PSV.
- If the RD bursts but the PSV remains closed, it is crucial to clean the PSV before installing a new RD. This prevents potential corrosion and ensures the PSV operates correctly.

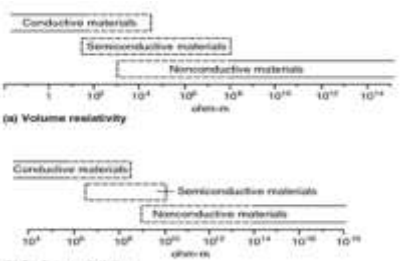
6.2 Process Safety Test

- **Reaction Calorimetry (RC) Test:** Provides data on heat release, thermochemistry, and reaction kinetics.
  - RC for Raw material dump case,
  - RC for Raw material accumulation case,
  - RC for utility failure during exothermic reaction

Enthalpy (J/g)	Category
0-50	Low
50-200	Medium
200-400	High
400+	Very High

- **Minimum Ignition Energy (MIE) Test**: Defines the minimum energy needed to ignite flammable substances.
- **Differential Scanning Calorimetry (DSC) Test**: Measures the amount of energy absorbed or released.
  - DSC enthalpy of sample

- **Accelerating Reaction Calorimeter (ARC) Test:** Provides data on reaction onset, heat release, pressure rise, and gas generation.
  - ARC stability of sample
- **Dust Explosion Test:** Identifies conditions for dust ignition and combustion.
- **Burning Test:** Assesses flammability and combustion characteristics of materials.
- **Powder Resistivity Test:** Measures the electrical resistivity of powders to assess their risk of ignition from electrostatic discharge.
- **Resistivity range as per NFPA-77**



- **Resistivity range as per IS-7689**

For the purposes of this Code it is helpful to divide powders into three groups depending on the volume resistivity of the material of which the particles are composed. These groups are:

a) low resistivity powders, for example, metals, having volume resistivities up to about $10^{6}\Omega m$;

b) medium resistivity powders, for example, many organic powders, such as flour having volume resistivities in the approximate range $10^{6}\Omega m$ to $10^{10}\Omega m$; and

c) high resistivity powders, for example, many synthetic polymers and some minerals, such as quartz, having volume resistivities above about $10^{10}\Omega m$.

6.3 General Safety Information

- Oxygen cylinders should be stored at least 20 feet (6.1 m) away from fuel-gas cylinders or combustible materials (like oil or grease), or separated by a noncombustible barrier at least 5 feet (1.5 m) high with a fire-resistance rating of at least 30 minutes.
- The separation distance between the HSD storage tank and the office building should be the greater of half the diameter of the tank (2.25 m) or the radius of the tank.
- Energy generated by spark :-

Activity	Electrostatic voltage kV (RH 10%-20%)	Energy generated in mJ	Electrostatic voltage kV (RH 65%-90%)	Energy generated in mJ
Walking across Carpet	35	70	1.5	3
Walking across Vinyl floor	12	24	0.25	0.5
Working at a bench	6	12	0.1	0.2
Vinyl envelopes for work instruction	7	14	0.6	1.2
Poly bag picked up from bench	20	40	1.2	2.4
Work chair padded with polyurethane foam	18	36	1.5	3

- Energy released from the activity is equal that MIE of the product, the chances of ignition can occur.
- To prevent charge accumulation:
  - Use of conductive flooring and footwear
  - Personnel grounding devices
  - Antistatic or conductive clothing
- During normal activities, the human body's potential can reach 10 kV to 15 kV, and the energy of a potential spark can range from 20 mJ to 30 mJ.
- As per OSHA Section 1926.1053(a)(19), fixed ladders with a climb length of 24 feet (7.3 m) or more must be equipped with one of the following:
  - Ladder safety devices
  - Self-retracting lifelines and rest platforms at intervals no greater than 150 feet (45.7 m)

- A cage or well, with ladder sections not exceeding 50 feet (15.2 m), offset from adjacent sections, and landing platforms at intervals of no more than 50 feet (15.2 m).

➢ Lightning protection is not required for equipment if it is properly grounded (at least 5 mm or 3/16 in.). However, lightning protection is required for yard fences.

6.4 Emergency Actions

➢ When reporting an emergency by telephone, radio, or messenger, ensure the following information is provided:

- Say: "This is an emergency."
- Exact location.
- Nature of the emergency/incident.
- Number of injured/missing personnel.
- Type of service(s) required (i.e., fire, medical, security).
- Name and badge/ID number.
- Telephone number you are calling from, if available.

➢ Note: Stay on the telephone or radio until told to hang up. Repeat the message if asked to do so.

6.5 What to do during emergencies?

➢ Follow local plans or instructions.

➢ Stay calm.

➢ Stop working.

➢ Go safely to the assembly area

➢ Stay there until you hear "All Clear."

6.6 Basic Safety rules

➢ Stop Unsafe Work- Immediately stop any unsafe work that could cause harm.

- Report Incidents-
  - Report all injuries, fires, spills, or unsafe conditions immediately.

- **Follow Safe Practices**
  - Follow safe driving rules and speed limits.
  - Ensure seatbelts are worn in vehicles.
  - Keep your work area clean and organized.
  - Use proper lifting techniques for heavy loads.

- **Avoid Unsafe Activities**
  - Never climb on equipment, pipes, or unstable surfaces.
  - Use fall protection when working at heights >6 ft (1.8 m).
  - Avoid operating equipment with "DANGER, DO NOT OPERATE" tags.

- **Protect Yourself**
  - Always wear hard hats, safety eyewear, and safety footwear.
  - Use appropriate PPE for specific hazards.
  - Use hearing protection in high-noise areas.