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# Disaster




Bhopal Gas Tragedy



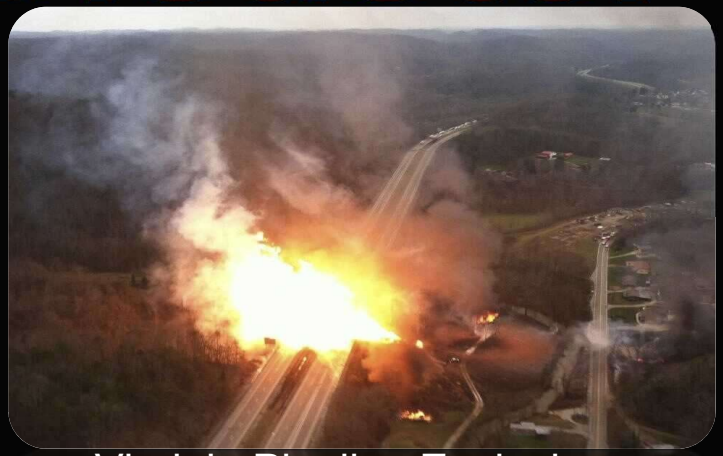
Piper Alpha



Baghjan Blow out



B P Texas  Refinery Explosion



Virginia Pipeline Explosion



Deepwater Horizon

तेल उद्योग सुरक्षा निदेशालय
Oil Industry Safety Directorate
ISO 9001:2015 certified

# OISD GDN 206




By
DEVENDRA M MAHAJAN
Member Coordinator- OISD-GDN-206

इंडियनऑयल
IndianOil



# OISD-GDN-206 SAFETY MANAGEMENT SYSTEM

INCEPTION OCTOBER 2001

## COMMITTEE

| | |
|---|---|
| **Leader** | |
| A.A.Raichur | Hindustan Petroleum Corpn. Ltd. ( R), Mumbai |
| **Members** | |
| C.S.Chakrabarti | Bharat Petroleum Corpon. Ltd. (R), Mumbai |
| T.S.Lamba | Oil & Natural Gas Corpon. Ltd, Kolkata |
| N.Rengaswamy | Engineers India Ltd. , New Delhi |
| S.Thangavelu | Chennai Petroleum Corpn. Ltd., Chennai |
| R.C.Pandey, | Bongaigaon Refinery & Petrochemicals Ltd., |
| N.Dasgupta | Bharat Petroleum Corpon. Ltd. (M), Mumbai |
| T.K.Kumar | Indian Oil Corpon. Ltd. (PL), New Delhi |
| S.S.Maji | Indian Oil Corpon. Ltd. (R), New Delhi |
| Dr. D.Buragohain | Gas Authority of India Ltd., New Delhi |
| **Member Co-ordinator** | |
| Shri S.N.Mathur | Oil Industry Safety Directorate, New Delhi |

## REFERENCES


- OISD-STD-107 / 114/154/145/166/178/105
- 29 CFR Part 1910 OSHA Rules, Process Safety Management of Highly Hazardous Chemicals
- AIChE Guidelines on Technical Management of Chemical Process Safety, 1995

Industry Best Practices Experience

Conceptualization to Decommissioning

Highly experienced Functional committee

All sector representation in FC




Annexure 20: Major changes in revised edition- All New

Review from Industry Expert

Ease of Implementation

Best Standards/ Committee Reports / 32 OISD STD/ 25 National/ International

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# FUNCTIONAL COMMITTEE

| NAME | DESIGNATION | ORGANISATION |
|---|---|---|
| **LEADER (Sh.)** | | |
| Vivek Bichave | Head – Safety (Manufac) | Reliance Industries Limited |
| **MEMBERS (Sh.)** | | |
| Lakshman Babu Gattu | Senior Manager – PSM | Bharat Oman Refineries Limited, Bina |
| Madhu K M | Chief Manager – IA | Bharat Petroleum Corporation Limited, Kochi |
| Asok Subrahmanyam | DGM – ROU & HSSE | Bharat Petroleum Corp. Ltd. (Pipeline Div.) |
| Navratan Sharma | Chief Health & Safety | Cairn Oil & Gas, Vedanta Limited |
| Deepak Kumar | DGM – Safety | Engineers India Limited |
| Ravi Sharma | GM– F&S | Gas Authority India Limited |
| Anshul Tiwari | Manager - PSM | HPCL-Mittal Energy Limited (HMEL), Bhatinda |
| Hiren G Kotecha | Chief Manager - HSE | Hindustan Petroleum Corp. Ltd. (Marketing Div.) |
| Sri Ganesh Kakkirala | Chief General Manager | Hindustan Petroleum Corp. Ltd. (Refinery Div.) R |
| N Barik | General Manager (Plant) | Indian Oil Corp. Ltd. (Marketing Division) |
| Nikunj A Jain | Senior Manager (PC-PJ) | Indian Oil Corp. Ltd. (Refinery Division) |
| Nirankar Singh | Chief Manager - HSE | Mangalore Refinery and Petrochemicals Limited |
| Mahesh Savaliya | Head – Safety & PSM | Nayara Energy Limited |
| Sandip Kumar Sarma | Chief Engineer – PL Proj | Oil India Limited |
| Jitesh Dixit1 | General Manager (Prod) | Oil and Natural Gas Corporation |
| M M Prasad | Additional Director | Oil Industry Safety Directorate, Noida |
| N J V Prasad | Consultant – E&P | Oil Industry Safety Directorate, Noida |
| **MEMBER CO-ORDINATOR** | | |
| Devendra M Mahajan2 | Joint Director OISD, Noida (till 02.05.22) | Oil Industry Safety Directorate, Noida |
| M M Prasad | Additional Director OISD, Noida (effective 03.05.2022) | |

**Industry veterans Sh. S L Chakravorty, Sh. S P Garg and Sh. Badal Roy provided their technical & professional guidance**

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# 1.0 INTRODUCTION

An effective Safety Management System (SMS) should be in place to prevent incidents and mitigate their consequences including catastrophic events.

This document emphasizes the application of management controls for dealing with the hazards and risks associated with oil and gas industry.

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# 2.0 SCOPE




This document provides guidelines, which shall be applied to all upstream, midstream and downstream sectors of the oil and gas industry for development of Safety Management System.

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# 3.0 DEFINITIONS

| | | | | |
|---|---|---|---|---|
| As low as reasonably practicable (ALARP) | Hazard Identification and Risk Analysis (HIRA | Line Breaking | Quantitative Risk Assessment (QRA): | Shall: |
| Asset integrity | Hi-Po (High Potential) Near miss | Lost Time (Man-days) | Quality and Cost Based Sourcing (QCBS): | Should |
| Audit | Human Factor | Major Accident | Risk | Standing instruction/ orders |
| Checklist | HSE Policy | Management Review | Risk Tolerance Criteria | Toolbox Talk (TBT) |
| Competence | HSE Policy | Near-miss | Root Cause Analysis (RCA): | Training |
| Authorized Person | Incident | Non-routine | Safety Barriers | Unsafe Act |
| Consequence analysis | Job Safety Analysis (JSA)/ Job Hazard Analysis (JHA) | Probability | Safety Critical Equipment | Unsafe Condition |
| Controlled Document | Integrity Operating Windows | Process | Standard Operating Procedures (SOP): | Workforce |
| Facility | Lagging indicator | Process Hazard Analysis | Safe Operating Limit (SOL) |  Microsoft Office Word Document |
| Hazard | Leading indicator | Pre-Startup Safety Review (PSSR): | Safe Work Practices | |

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# 4.0 SAFETY MANAGEMENT SYSTEM

Safety Management System is the formal, top-down as well as bottom-up organization-wide approach to manage safety risk and assure the effectiveness of safety risk controls. It includes systematic procedures, practices, and policies for the management of safety risk.



The organization should establish, implement, maintain and continually improve a safety management system.

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# 4.0 SAFETY MANAGEMENT SYSTEM

<table>
<tr><th>Commit<br>(to Safety)</th><th>Assess<br>(Hazards & Risk)</th><th>Control<br>(Risk)</th><th>Verify<br>(for Assurance)</th></tr>
<tr><td rowspan="2">Safety Organization</td><td rowspan="12">Hazard identification and Risk Analysis (HIRA)<br></td><td>Process Safety Information</td><td rowspan="3">Pre-Startup Safety Review</td></tr>
<tr><td>Operating Procedures</td></tr>
<tr><td rowspan="2">Consultation & Participation</td><td>Safe Work Practices and Work Permits</td></tr>
<tr><td>Training and Competence</td><td rowspan="6">Safety Management System Audit</td></tr>
<tr><td>Contractor Safety Management</td></tr>
<tr><td>Safe Operation Management</td></tr>
<tr><td>Asset Integrity Management (AIM)</td></tr>
<tr><td>Management of Change</td></tr>
<tr><td>Incident Reporting, Investigation Analysis and Learning</td><td rowspan="2">Management Review<br></td></tr>
<tr><td>Emergency Response Management<br></td></tr>
<tr><td></td><td>Transport Safety Management</td></tr>
<tr><td></td><td>Project HSE Management</td></tr>
</table>

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# 4.1 SAFETY ORGANIZATION




Safety organization is the structure and process by which workforce in the organization are assigned specific functions, authority and responsibility for the accomplishment of organizational safety objectives and targets.

The organization should determine the aspects that are relevant to its purpose and that affect its ability to achieve the intended outcome(s) of its Safety Management System.

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# 4.1 SAFETY ORGANIZATION




- WHAT IS SAFETY ORGANIZATION?
- LEADERSHIP AND COMMITMENT
- HEALTH SAFETY AND ENVIRONMENT POLICY
- SAFETY COMMITTEE(S)
- SAFETY CULTURE

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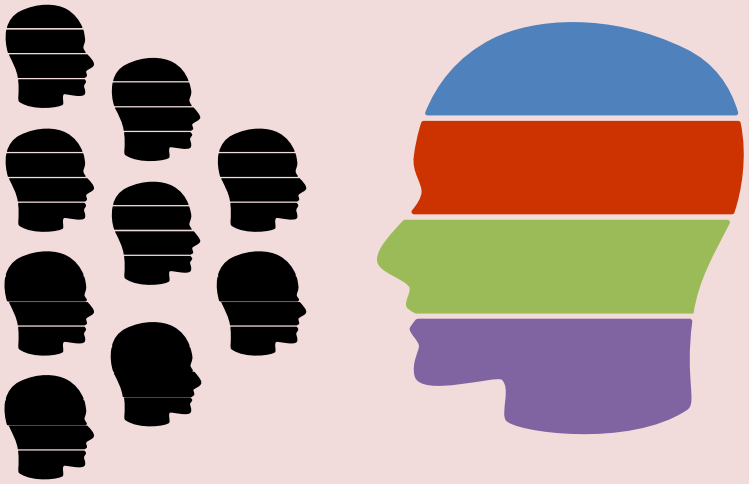
# LEADERSHIP AND COMMITMENT

Organization's leadership should provide strong, visible leadership and commitment and ensure that this commitment is translated into the necessary resources, to develop, operate and maintain the Safety Management System (SMS) towards strategic objective.

It should demonstrate leadership and commitment by taking overall responsibility and accountability for:



Develop & Establish HSE Policy and structure, competencies, responsibilities, authorities, and lines of communication for its implementation

Ensuring well integrated SMS into the organizations' business processes, Encouraging engagement and safety leadership at all levels

Prevention of injury, ill health and providing safe and healthy work places and processes, Implementation of tools for preventing incidents in the organization. providing necessary resources

Periodic review of the Safety Management System, Promoting a positive safety culture, its periodical assessment , Supporting and functioning of Safety Committee(s), Promoting reporting of unsafe acts, unsafe conditions and near misses, Ensuring emergency preparedness

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# HSE POLICY

Organization should establish, implement and maintain a Health, Safety and Environment (HSE) Policy duly approved by the Board which covers

A commitment to

i. *Provide safe and healthy working conditions*
ii. *Fulfill legal, statutory and other requirements*
iii. *Eliminate hazards and reduce HSE risks*
iv. *Consultation and participation of workforce*
v. *Training on health and safety procedures to workforce*
vi. *Environment friendly operation*
vii. *Continual improvement of the Safety Management System*

A framework for setting up of the HSE objectives;

In a vernacular language easily understood by them, displayed at various locations

Review & updation should be done at least once in 3 years.

Applicable to contractors also

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# SAFETY COMMITTEE(S)




- ✓ Safety Committee(s) at all levels including all relevant functions.
- ✓ Encourage consultation and participation of the workforce in their activities.
- ✓ Meeting at specified frequency and MOM
- ✓ The committee should review
  - MOM of previous meeting(s).
  - HSE performance,
  - Audits findings,
  - Unsafe acts, unsafe conditions, near misses, off the job and on the job incidents, incident investigation/ analysis reports / recommendations
  - Shortcoming in fire/ emergency drills,
  - Long pending safety concerns,
- ✓ Escalation of concerns should be a part of agenda of safety meetings.
- ✓ Time bound implementation

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# SAFETY CULTURE



Culture is attitude, value and belief that underpin "the way we do things". Safety culture has been a key organizational factor in the implementation of a healthy Safety Management System.

Organizations should promote a positive safety culture throughout the organization, which is characterized by

- Visible leadership and commitment
- Adequate knowledge base
- Personnel competency, training
- Informed decision making

- Information sharing
- People acknowledge their accountability and act
- People trust, use, and rely on the organization's processes
- Individuals are empowered to stop if deviation/ UA/ UC
- Individuals report/ raise safety issues without fear
- Decision makers promote continual safety improvement

- Safety perception/ culture survey (preferably every 5 Yrs)
- Improve safety culture through awareness raising and changing behaviour through promotional activities
- Empowerment of workforce

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# CONSULTATION AND PARTICIPATION

An effective Safety Management System requires an organization to **engage the workforce in development, implementation and continual improvement** of the Safety Management System.

Communication should be **two-way** between leadership and workforce across various sections.

The employee Consultation & Participation element should address

The mechanism, time, training, roles & responsibilities and resources required

Establishment of means and methods to keep workforce informed



Preparation and display of procedures and instructions

Process for addressing the employee's safety concern and suggestions.

- Safety Campaign
- SOV
- Suggestion Scheme/ Idea Fair
- HIRA/ SOP/ MANUAL
- HIRA/ JSA/TBT/ WPS
- Safety Committee

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# HAZARD IDENTIFICATION & RISK ANALYSIS

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# 6.1 HAZARD IDENTIFICATION AND RISK ANALYSIS (HIRA)




- PURPOSE OF CONDUCTING HIRA STUDY
- BORGANIZATION'S APPROACH FOR HIRA
- APPLICABILITY ASIC STEPS OF HIRA
- FOR HIRA
- SCOPE OF HIRA STUDY
- HIRA TECHNIQUES
- THE TEAM
- UPDATION & REVALIDATION
- ACTION TRACKING
- COMMUNICATION

**Annexure 3: Basic steps of QRA, Individual and societal risk and ALARP level/ Tolerable limit values**

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# HIRA

The purpose of HIRA is to identify, evaluate, and reduce the likelihood and/ or minimize the consequences of uncontrolled releases and other safety or environmental incidents within the organization's risk tolerance criterion by recommending. appropriate prevention and/or mitigation measures




BASIC STEPS OF

Hazard Identification:

**This step is critical in the context of the risk management since an overlooked hazard (hence, risk) cannot be further assessed and controlled**

Risk Analysis:

**Qualitative-** frequency and severity determined qualitatively.
**Semi-quantitative** -in which frequency and severity are approximately quantified within ranges.
**Quantitative risk assessment (QRA)** - in which full quantification occurs.

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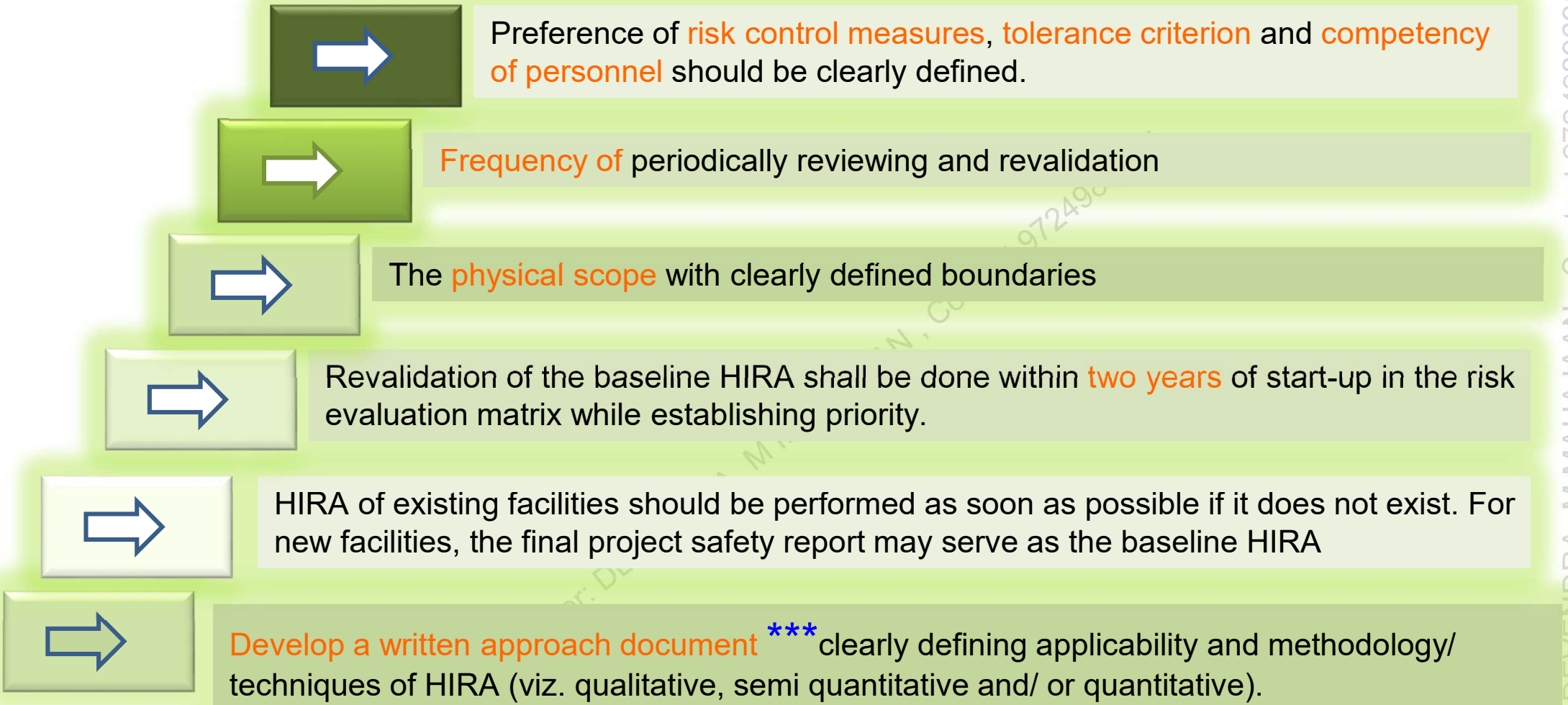
# ORGANIZATION'S APPROACH FOR HIRA




*** Document to Develop

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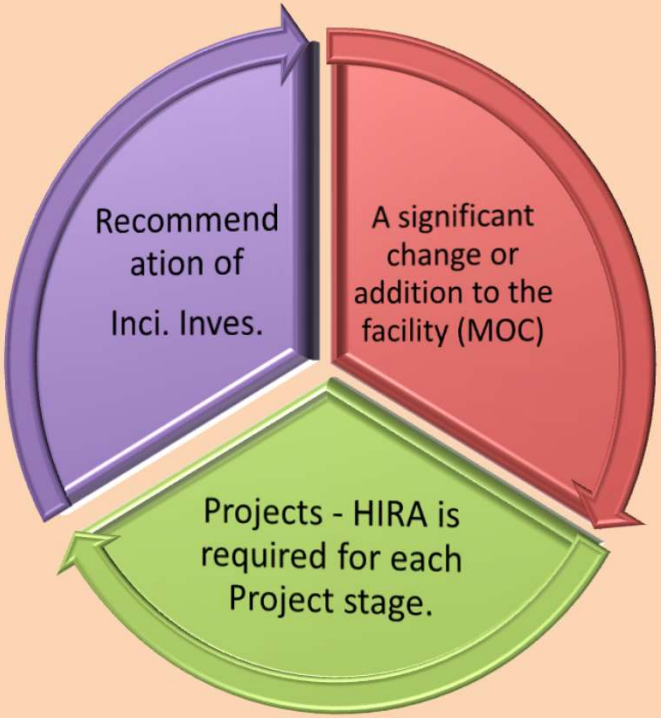
## 6.5 APPLICABILITY FOR HIRA

HIRA should be carried out if there is




## SCOPE OF HIRA STUDY



- The process hazards
- any previous incidents that had the potential for catastrophic consequences.
- Engineering and administrative hazard controls and their interrelationships.
- Consequences of the failure of these controls
- The broader considerations of facility siting.
- Human factors that apply to the effective application of safety barriers or controls.
- A qualitative and quantitative evaluation of the effect of control failure on the safety and health of site workforce.

# Quantitative Risk Assessment (QRA)

The Quantitative Risk Assessment (QRA) is generally preceded by a qualitative/ semi qualitative systematic identification of process hazards. It is a quantitative evaluation of expected risk from high potential incident scenarios. It examines both consequences and frequencies, and how they combine into an overall measure of risk. The QRA results may be used to make decisions, particularly when mitigation of risk is considered.

QRA should be carried out with one or more of the following objectives,

i. To demonstrate compliance with the legislation.
ii. When the outcome of qualitative studies is not adequate for decision making,
iii. To support decisions on risk mitigation including emergency preparedness for facilities.
iv. To assist in option selection at project phase for land-use planning, layout, selection of inherently safer technology etc.
v. To indicate whether risks are tolerable as compared to defined Risk tolerance criterion by legislation or the organization.
vi. Whenever major addition in installation or major change in the surrounding areas/ population, operating parameters, product grade takes place or recommended by incident investigation.

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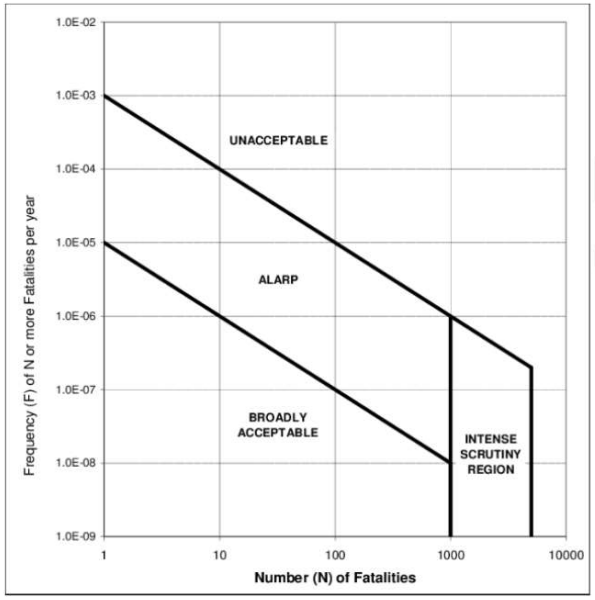
# Basic steps of QRA study

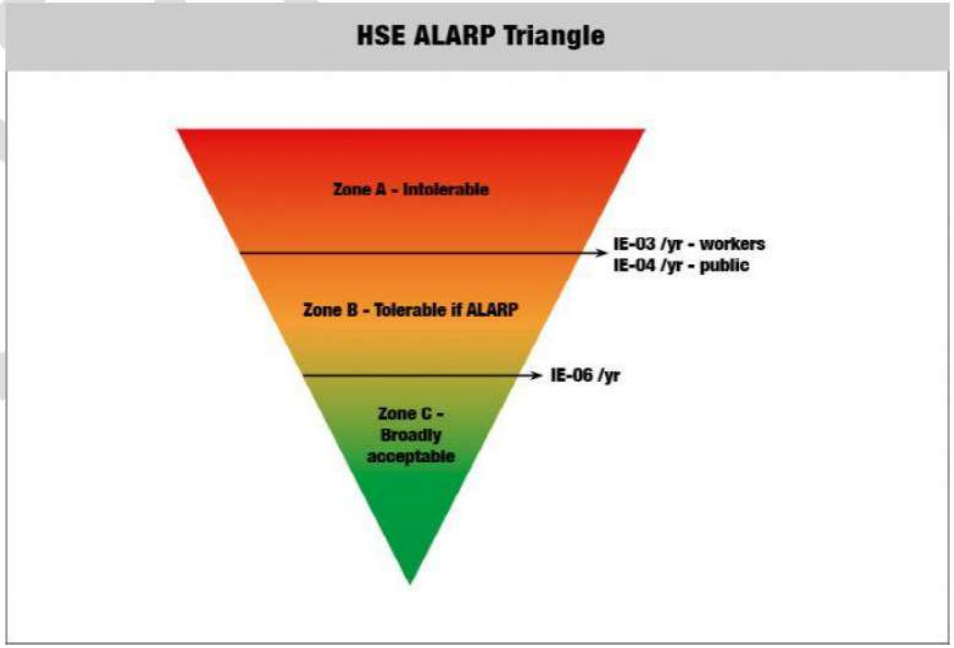
## Typical F/N curve

A typical F/N curve is provided below. Corporation may develop F/N curve for their organization.




F-N Curve for Evaluating Societal Risk

ALARP level/ Tolerable risk limit should be in the range of $10^{-6}$ to $10^{-3}$ for worker and $10^{-6}$ to $10^{-4}$ for public risk or stringent benchmarked with internationally acceptable data.

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# PROCESS SAFETY INFORMATION

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# 7.0 PROCESS SAFETY INFORMATION

**Process safety information (PSI)** refers to the complete and accurate, written information collected for all technologies, operations and equipment involved in operation of the facilities. PSI is used as a basis for other SMS elements including HIRA, training, Operating Procedures, Mechanical Integrity, Management of Change, Emergency response management plans and Incident Investigation etc. Complete and accurate written information (detailed in following sections) should be compiled for the following categories:

(a) Process and other chemical Information

(b) Process technology

(c) Process equipment

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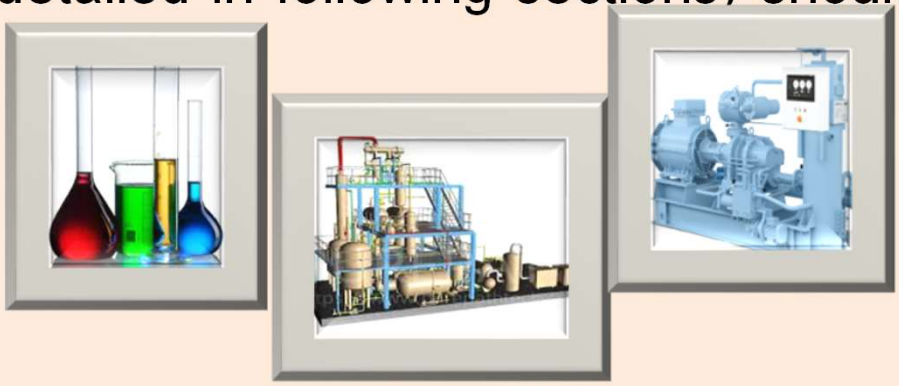

7.1.4 Updation of process safety information should be done as often as necessary or at predefined frequency (at least once in every three years) whichever is earlier. A record of such reviews and changes should be maintained.

7.1.5 Wherever the original process design information no longer exists, information should be developed in conjunction with hazard analysis in sufficient detail after thorough review and approval process.

7.1.6 Organization should develop a documented procedure for control of Process Safety Information. (Refer Informative Annexure 4: General document control features).

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## 7.1.1 PROCESS AND OTHER CHEMICALS INFORMATION

(a) Process chemicals should include all raw material, intermediate/ finished product, byproduct, waste generated, catalyst and chemicals etc. Similarly, other chemicals should include maintenance/ inspection chemicals (e.g., special oils, lube oils, dyes, paints etc.), sanitization/ cleaning chemicals, laboratory chemical/ reagents, waste treatment chemicals, drilling scale inhibitors & additives etc. used in the installation.

(b) Data pertaining to process chemical hazards should help in assessing fire and explosion characteristics, reactive hazards, safety and health hazards to workforce, environment and the corrosion and erosion effects on the process equipment.

(c) A complete inventory of the process chemicals should be prepared.

(d) Based on the compatibility of chemicals, their storage should be planned.

Note: For major Installations like Refinery, QC laboratories (of installations), Petrochemical Industries etc. where large numbers of chemicals are handled, periodic review should be done to identify incompatible chemicals and a comprehensive, updated Compatibility matrix of such chemicals should be developed and maintained

(a) For each chemical handled at the facility, a 16-point (M)SDS sheet should be maintained

Note: For minimum content of (M)SDS, Refer OISD-STD-114.

BACK

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## 7.1.2 PROCESS TECHNOLOGY

(a) Process technology (as applicable) information should include the following:

i. Written process descriptions ii. Process chemistry iii. Design basis

(b) A simplified Process Flow Diagrams (PFD) or block flow diagram for very simple processes

(c) P&Ids (d) Process data Sheets

(e) Process chemistry, including hazards related to credible undesired chemical reactions

(f) Material and energy balances

(g) Safe upper and lower limits for process parameters and the likely consequence of deviation from safe limits.

(h) List of safety critical equipment and system

(i) Licensor's manual, Supervisory Operating Manual

(j) Description of Interlocks, control system logic in narrative format and/or simple figures, Cause and Effect diagrams, Instrument Specifications

(k) Detailed fire assessment study: The extent of the fireproofing around equipment and structures should be based strictly on the detailed fire assessment study and the same should be clearly indicated on layout and construction drawings.

(l) HIRA Reports

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BACK

## 7.1.3. PROCESS EQUIPMENT

(a) Process equipment include columns, vessels, heat exchangers, reactors, furnaces, pumps and compressors, valves, piping, storage tanks, silos, spheres, bullets, boilers, pipelines etc. that contain process chemicals.

(b) Design data/Hazards of process equipment should be documented and should include the following:

i. Approved installation layout, Equipment layout, plot plans of underground utility and process piping
ii. Design specifications and calculations including emergency shutdown system, depressurization system, Relief system including flare system, blow down philosophy, heating and cooling system and their design basis etc. as applicable.
iii. Codes, standards and industry accepted engineering practices used for design and fabrication as applicable.
iv. Mechanical data/ design basis, inspection reports for process equipment
v. Shop fabrication drawings, General Arrangement drawings, Isometric drawings, As-built drawings
vi. Piping and Material specifications
vii. Electrical data, including Single-Line Diagrams (SLD), Motor database, and grounding/ bonding drawings and Hazardous area classification
viii. Structural drawings and structural analysis records/ design basis information for fixed fire protection and firefighting systems.
ix. Original Equipment Manufacture's Manual

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BACK



# OPERATING PROCEDURES



STANDARD



OPERATING



PROCEDURE

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# 7.2 OPERATING PROCEDURES

- Operating Procedures
- Operating Manual
- What Operating Manual Should contain
- Standard Operating Procedure



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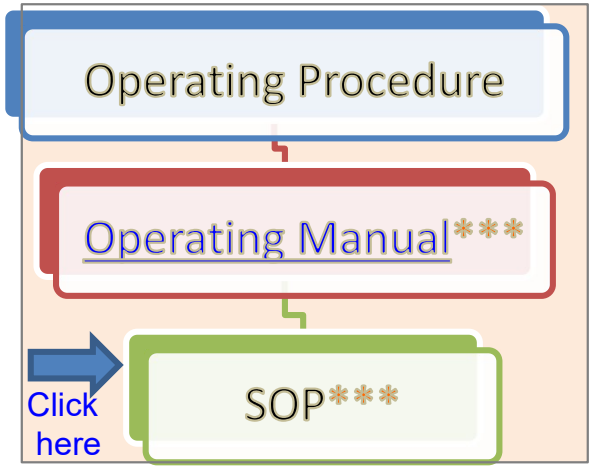
# 7.2 OPERATING PROCEDURES

Provision of clear, concise, accurate and unambiguous written operating procedures is the most effective measure to prevent, control and mitigate. In some cases, these are the only practical way of managing a particular risk.

An effective way to convey the operating procedural information is to develop a comprehensive operating manual that can be used both as a training document as well as reference in the field. Organizations should develop an operating manual specific to the operation/ installation.






OPERATING MANUAL***: The purpose of an operating manual is not only to help the operation personnel to operate the installation safely, but also to ensure availability of all the details and procedures required for safe operation, troubleshooting, emergency handling and training of personnel in a single comprehensive document.

Training to all concerned

Review/Updation every 3years

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# 7.2.1 OPERATING MANUAL***

Operating manuals should be a controlled document. It should readily be available and accessible to all concerned. (Refer Informative Annexure 4: General document control features).

(b) Operating parameters should be consistent with the process safety information.

*Note: Original Equipment manufacture's (OEM) manual and process licensor manual are the base document for development of Operating manual.*

(c) All concerned should understand it thoroughly and should be fully conversant with the operating manual.

(d) The Operating manuals should cover (but not limited to):

Operating Manual

i. Introduction
ii. Design Basis
iii. Process Overview: A detailed Process description including process chemistry, diagrammatic process flow, desirable conditions, Hazards etc.
iv. Auxiliary and utility systems
v. Equipment operation**: List and operating details of all equipment**
vi. Standard Operating Procedure containing specific instructions with responsibility matrix on what steps to be taken or followed while carrying out the following
• for routine/ normal activities/ operations
• Temporary, abnormal and emergency operations such as Pre commissioning, Commissioning, Startup, Temporary operation, Normal shut-down, Emergency operation and shut-down, Simultaneous operations etc.
Note: Standard Operating Procedures are part of Operating manual, may be documented as separate volume if required. Development and content of SOP detailed in the following section (4.5.4).
vii. Instrumentation and Control: Cause and effect diagram, testing requirement, Control Systems and Optimization
viii. Details of Safety system: Details of Fire protection/ fighting facilities, details of Safety Critical Equipment, Fire and Gas detection system and Operation, MCP details hazards of exposure of the chemicals being handled, Preventive methods and control measures adopted for exposure protection
ix. Equipment/plant handing over taking over
x. Standard Blind List
xi. Analytical Tests: Sampling, Laboratory Analysis and Quality Control: Recommended Methods and Frequency
xii. Drawings: Process Flow Diagrams, Piping and Instrument Diagrams etc.

What Op. Manual should cover

BACK

## 7.2.2. SOP

Duly approved list*** of activities

Developed & establish written SOPs***

define the authorities

consistent with the PSI

controlled document

SOPs- Mandatory

Area experts, cover statutory & OISD std

Documented Procedure*** for downward communication

Work instructions/ Do's and Don'ts derived – Authenticated -all necessary information enabling operating crew

Reviewed, revised and approved at least every 3 years Modification/ revamping ,ii Change in Process Safety Information, iii. Change in operating conditions/ operations iv. Changes in applicable statutory, regulatory, OISD standard v. Learnings from incidents vi. Suggestions from concerned parties

simple format ,clear to the user,specific to the task
Steps clearly mentioned with responsibility matrix ,should address the HSE considerations
specific Tools and tackles, PPEs, Hazards involved and Preventive measures, the consequences of and steps to correct.

Hired Services: controlled through bridging/ interface document before start of the assignment

Establish methodology for effective implementation of SOP

BACK

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## Annexure 5: Typical contents of an operating manual of a process installation (Informative)

**I. Introduction**
**II. Design Basis**
A) Installation Design, Normal and Turn Down Capacity
B) Feed Characteristics
C) Product (and By-Product) Specifications
D) Utility Conditions
E) Heat and Material Balance Tables
F) Utility Summary Tables
G) Effluent Summary
**III. Process Description**
A) Nature of Process
B) Process of Flow
**IV. Operating Variables and Controls**
A) Control Points
B) Effect of Operating Variables
C) Troubleshooting Guide
**V. Auxiliary Systems**
**VI. Equipment Operation**
A) Pumps and Compressors
B) Exchangers
C) Fired Heaters
D) Vessels and Reactors
E) Package Units
**VII. Instrumentation and Control**
A) General
B) Advanced Control Systems and Optimization
C) Setting Point List
**VIII Standard Op. Procedures**
**A. Initial Start-Up Preparation**
A.1 Installation inspection after completion of mechanical side
A.1.1 Field checking
A.1.2 Commissioning of utilities
A.1.3 Mechanical running test of rotary machinery
A.2 Cleaning and washing of piping system
A.3 Heater inspection and dry-out
A.4 System drying
A.5 Chemical cleaning and preparation of chemicals
A.6 Catalyst loading
A.7 Leakage and pressure test
A.8 Purging air with Nitrogen
**B. Initial Start-Up Procedure**
B.1 General
B.2 Prepare Units for Charging
B.3 Steam Out and Purge
B.4 Pressurize Systems
B.5 Reduction and Activation of Catalyst
B.6 Establish Gas Circulation Through Catalytic Reactor Sections
B.7 Feed in and Circulation
B.8 Heating up of Installation
B.9 Establish Operation
B.10 Start Chemical Injection
B.11 Line Out
**C. Normal Start-Up Procedure**
C.1 General
C.2 Re-Start-Up After Short Shut-Down Duration (Hot Start)
C.3 Re-Start-Up After Long Shut-Down Duration (Cold Start)
**IX Normal Operation**
A. General
B. Normal Operating Conditions
C. Check Points and Adjustments
D. Reduced Operation
**X Normal Shut-Down Procedure**
A. General
B. Load Down
C. Shut-Down Procedure
**XI Emergency Shut-Down Procedure**
A. General
B. Safeguarding Systems and Equipment
B.1 Trip Sequence System
B.2 Safety Relief Valves Load Summary Table
C. Causes of Emergency Shutdown
C.1 Feed Failure
C.2 Power Failure
C.3 Steam Failure
C.4 Cooling Water Failure
C.5 Instrument Air Failure
C.6 Fuel Failure
C.7 Machine (Mechanical) Failure
C.8 Explosion, Fire, Line Rupture, Serious Leaks
C.9 Other Faults and Failures
**XII Miscellaneous Procedures**
A. Catalyst Oxidation
B. Catalyst Regeneration
C. Catalyst Unloading
D. Decoking
E. Neutralization
**XIII Safety**
A. General
B. List of chemicals & properties
C. Storage capacity
D. Storage conditions
E. Fire-Fighting Equipment
F. List of Safety Critical Equipment
**XIV Analytical Tests**
**XV Catalysts, Chemicals and Packings**
**XVI Drawings**

BACK

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# 7.3 SAFE WORK PRACTICES AND WORK PERMITS

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## 7.3 SAFE WORK PRACTICES AND WORK PERMITS

Safe work practices and work permits integrates the accepted safety and health practices into a particular task of **non-routine nature** and help to control hazards and manage associated risk.

Safe work practice helps to control hazards associated with maintenance and other non-routine work. Safe work practices are statements of **what one should or should not do** in order to do a job or task safely with minimum risk to people, equipment, material, environment, and process.

Safe work practice guide a worker through a task from **start to finish in a chronological order** and is designed to reduce the risk by minimizing potential exposure. Safe work procedures are usually developed as a result of a JSA, TBT, accident or incident investigation, and/or as a supplement to a safe work practice.

Safe work practices are often supplemented with **work permits** (i.e., checklist that includes an authorization step). Safe work practices and work permits help to ensure **communication** between the receiver (person assigned to perform the job) and the issuer of the permit

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## How to develop SWPs

7.3.1 While developing safe work practices, following key elements should be addressed:

(a) It should have defined:

i. Scope of the safe work practices (i.e., where certain requirements apply),

ii. Applicability: Identify which safe work practices govern specific activities

iii. Roles and responsibilities and Competence required for development, implementation, issue, receive, approval and review of associated activities (as applicable).

iv. Communication protocol

v. Training requirement and procedure

vi. Revision criterion and frequency

(b) Should highlight specific hazards (may include checklist) that may be encountered while performing the work and specify appropriate safeguards.

(c) Human factors should be considered in the development.

(d) Identification of anticipated or inherent/ specific hazard and risk involved should be done through:

i. Systematic evaluation of stepwise activities involved in the non-routine job or it's execution

ii. Identification of possible unsafe conditions in the surrounding

iii. Identification of Hazard and risk from other job in the vicinity (if any)

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## How to develop SWPs

(e)Prior to the start of the job, all the deliberated solutions to mitigate the risks involved should be put in place.

(f) The identified hazard and risk involved should be communicated to all concerned through checklist, permit and tools like Tool Box Talk (TBT)

(g) Work force should be trained and must know how to effectively authorize and conduct non-routine work. They should be trained to identify the event of deviation, perception of danger and empowered to shut down an ongoing operation in such scenario. They should be trained to

i. Understand the overall system of safe work practices and procedures.

ii. Recognize hazards typically associated with non-routine activities.

iii. Applying procedures and properly filling out permits and checklists.

(h) Consistent implementation of safe work practices should be verified by routinely inspecting worksites, reviewing completed permits etc.

(i) If existing safe work practices cannot be followed, work should be stopped until an appropriate alternative method can be devised and approved.

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# TRAINING



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# TRAINING AND COMPETENCE



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## 7.4 TRAINING AND COMPETENCE

To provide assurance of competence, a Training and Competency Management System should be established, which should contain the minimum required competence and level of assessment required for each role.

### 7.4.1 **Salient activities under Training and competence Management System should be as follows:**

(a) Each organization should identify and define competence requirements in terms of qualification, set/ level of skills, depth of knowledge, experience and needs, including training, to meet the competency objectives.

(b) Gap analysis should be carried out for all employees as and when required, a minimum of once in a three year. and same to be imparted

(c) Organizations should ensure development of procedure***, means of identification of training need and schedule/ calendar of training*** in line with relevant OISD standards (154 and 176).

(d) A supporting training matrix*** including training need analysis, training development and delivery should be developed by organizations. It should identify the minimum training that should be completed at different levels and positions of employees and Contractor personnel.

(e) The workforce should be closely supervised while undergoing on-the-job training.
(f) Specific competency profiles should be developed for personnel involved in critical activities like significant HSE risk and/ or activities, legal obligation etc.
(g) There should be a documented procedure*** for verification and ensuring that training based on technical certification, accredited courses (including certificates submitted as pre-qualification criteria) are carried out only by certified people/ agency.

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## 7.4 TRAINING AND COMPETENCE

(h) Training on the Safety Management System should be provided to all concerned.

(i) For new employees and contractor personnel, there should be an induction program addressing the relevant competence requirement, job coverage and possible HSE risks.

(j) All the visitors should be given requisite safety briefing.

(k) A training gap analysis should be conducted for employees moving into new positions, new places (location) taking on added duties and responsibilities and necessary training to be imparted as and when applicable.

(l) Additional refresher training and/or information should be systematically reviewed and provided whenever a site and/or operation is impacted by change, including circumstances such as change in PSI (e.g., new equipment, processes etc.), incident and obligations.

(m) Any Project-specific HSE Training should be identified, recorded and ensured as part of the Facility/ Site HSE Plan.

(n) Organization should define the criterion and frequency of review of training and competence management system.

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## 7.4.2 ASSESSMENT

(a) The effectiveness of training and competencies should be evaluated and assessed on a regular basis. Organizations should ensure that the competencies and knowledge remain current.

(b) There should be a process for feedback from participants on the effectiveness of trainers/ training providers.

(c) Organization should establish the methods and management practices for training and competency assessment of all employees and contract personnel .

d) Competency assessments and verification should only be performed by trained, authorized personnel.

## 7.4.3 TYPICAL TRAINING

| | | |
|---|---|---|
| Functional Training | Refresher Training | Contractor Training |

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## (a) Functional Training

Each employee, before being involved in operating a newly assigned process, should be trained in an overview of the process and in the

i. Process safety Information
ii. Standard Operating Procedures
iii. Safe work practices and work permits
iv. Safety systems and their functions
v. Emergency preparedness or disaster management plan
vi. Previous incident occurred in the installation/similar installation and learning from incidents

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(b) **Refresher Training**

Refresher training should be provided

i. To maintain understanding of and adherence to the current operating procedures.

ii. If site and/or operation is impacted by change, including circumstances such as change in PSI (e.g., new equipment, processes etc.), incident and change in obligations, Requirement of Management of change (MOC) procedure (Refer MOC element for details).

iii. At specified Periodicity (Periodicity of Refresher training should be as per organization requirements as per job demand and feedback. However, same should be in line with applicable OISD standards)

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**(c) Contractor Training**

i. The training provided to contract personnel involved in asset facing activities (performing operating duties, maintenance or repair, construction, civil works, pipeline laying, turnaround, major renovation, or specialty work at the facility) should include work practices necessary to perform their job safely and facility-specific topics such as relevant hazards, relevant safety, environment and security rules, applicable provisions of emergency action plans, any access restrictions etc.

ii. Contractors providing services which do not influence operation of the facility, such as cleaning work, food and drink services, delivery, other supply services, etc. should be trained to perform their jobs in a safe and environmentally sound manner as per defined job competence.

iii. Contractors should receive training in emergency evacuation and other applicable safety aspects.

iv. Contractors should also familiarize themselves with the applicable environmental aspects and requirements like air emission, oil spills, soil and groundwater contamination etc.

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# 7.5 CONTRACTOR MANAGEMENT

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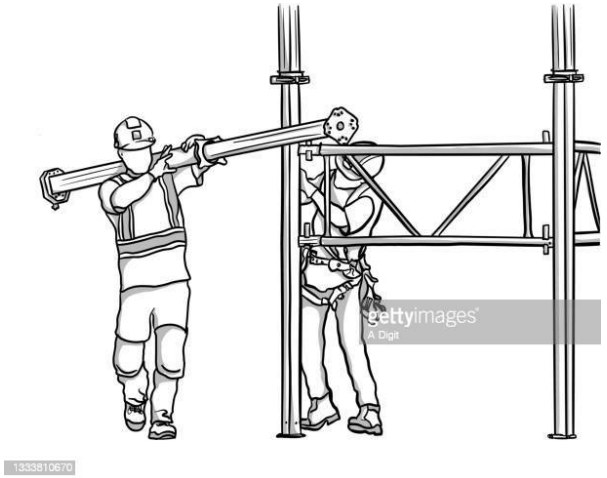
# 7.5 CONTRACTOR MANAGEMENT




Every organization should develop, establish and maintain a contractor management system.

The intent of contractor management should be to implement practices to ensure that contractor personnel can perform their jobs safely.

The key principles and essential features of a contractor management system are as follows:

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| | | |
|---|---|---|
| 7.5.1 MANAGEMENT RESPONSIBILITIES | 7.5.2 CONTRACT EMPLOYER (CONTRACTOR) RESPONSIBILITIES | 7.5.3 CONTRACTOR WORKMEN (WORKFORCE) RESPONSIBILITIES |

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| 7.5.1 MANAGEMENT RESPONSIBILITIES | |
|---|---|
| Maintain procedures to ensure that its contractors operate a safety management system that is consistent with organization. | Identify orientation and training requirements for contractor personnel and responsibility of training |
| Procedures should facilitate interfacing of contractors' activities with those of the organization and with those of other contractors, as appropriate.(Bridging doc. To be developed accordingly). | should verify contractor training<br>Maintain a contract worker injury and illness log<br>Regular safety inspection of its own as well as contractors' equipment/ tools and tackles |
| Evaluating the performance of the contractor during pre-selection stage .Organizations should have Quality and Cost Based Sourcing (QCBS) procedure of contracting. | Conduct safety meeting with all the contractors at defined intervals (minimum one per contract employer per month). |
| Competency of the contractor personnel w.r.t. the specific trade/ work should be defined and ensured / record maintained. | Develop and maintain robust mechanism for evaluating the performance of the contractors through periodic assessments/ audits after deployment in the organization. |
| The known potential hazards related to the contractor's work and the process and provisions of the emergency action plan and their role should be explained/ communicated . | Should develop a defined procedure for necessitating disciplinary action and/ or penalty against the contractor in case of any safety violations |
| Develop and implement Safe work practices and procedures | Promote and implement an incentive scheme which values positive HSE performance |

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| 7.5.2 CONTRACT EMPLOYER (CONTRACTOR) RESPONSIBILITIES | |
|---|---|
| should comply with applicable regulations, standards and policies as well as waste management and spill prevention practices. | The contractor should keep the management informed of any specific hazards presented by the contracted services. |
| Should ensure that every contract personnel under him follow the safety rules/ SOP/SWP of the facility . | should provide and maintain work places, installation, equipment, tools and machinery properly organized |
| Contractor should declare that each of their personnel has received and understood their roles in safe working practices and emergency response*** . | should assign workers only that job for which they are suited |
| should check and ensure the documents viz. qualification, experience, training certificate submitted by the personnel are genuine. | should provide adequate resources for supervision and safe execution of the job as per the procedure agreed maintain a contract personnel injury and illness log |
| Shall provide adequate and correct personal protective equipment. Ensure personnel are trained in its use and using properly .Ensure inspection of all PPEs prior to each use. | In case the entire facility/ installation is handled by contractor, the same shall be guided according to bridging document signed between the Operator and the Contractor |
| Note: All requirements mentioned here should be applicable to the main contractor whether or not it sublets (subcontracts) some or all of the work covered by the contract. In the case of subletting (partial or full), prime responsibly of compliance with the above will remain with the main contract employer. He/ she should ensure compliance through subcontractor. | |

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| 7.5.3 CONTRACTOR WORKMEN (WORKFORCE) RESPONSIBILITIES |
|---|
| (a) Contractor workforce at every level are expected to perform their duties with alertness, due thought, full knowledge, sound judgment, and a proper sense of pride and accountability. |
| (b) The contractor's workforce should make safety a part of their job by following safety rules and regulations and by using all safeguards and safety equipment. |
| (c) The contractor workforce should take an active participation in the safety & health programs, suggestion systems, trainings, reporting to all injuries, any unsafe act and condition or incident to ensure their own safety and injury free employment. |
| (d) The contractor workforce should ensure that equipment and materials shall only be stored in designated areas appropriate for that material. |
| (e) A Job Safety Analysis should be understood by each contractor workforce that may be performing any of the functions of the task under such job safety analysis. |

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# Declaration

CONTRACTOR SAFETY TRAINING - _____ (Name of the organization)

DECLARATION FORM
Description of Work Order &No: _____
Location: _____
Contractor Name: _____ Co. Phone: _____
Start Date: _____ Completion: _____
Description of Work: _____
_____

I have received, read, and understood the requirements as specified in the written Contractor Safety Program/ Bridging document of _____ **(Name of the organization)** and applicable government regulations. All the representatives of my company and I have undergone the "HSE Awareness" training course and have understood the following.

1. Organization's Environmental, Health and Safety policies.
2. Emergency procedures for the installation and site.
3. Procedure for internal and external transport.
4. The hazards of chemicals in the areas of anticipated work and requirements of PPEs.
5. Fire safety requirements of the office provided at site during the stay.
6. Communication protocol.

*On Behalf of M/s _____ (name of the contractor's company), we declare that all representatives of_____ should adhere to it.*

Name & Signature
(Representative of contractor's company)

Date

Location

Contractor should declare that each of their personnel has received and understood their roles in safe working practices and emergency response***

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# 7.6 SAFE OPERATION MANAGEMENT

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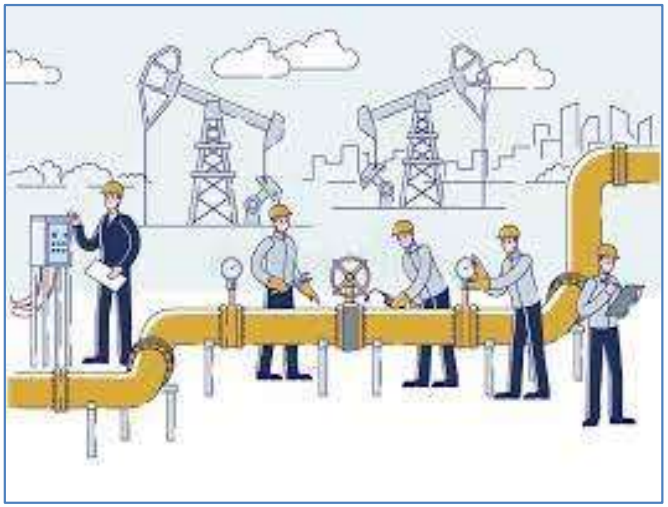
# 7.6 SAFE OPERATION MANAGEMENT



A Safe operation management programme should be developed and implemented which should establish clear expectations for every asset facing activity/ operations such as following procedures, expectations from workforce, clear instructions for safe and controlled operation, its monitoring, controlling access to hazardous areas, reliable communication etc.

| | | |
|---|---|---|
| 7.6.1 WRITTEN PROCEDURES | 7.6.2 QUALIFICATION AND TRAINING OF WORKFORCE | 7.6.3 ASSIGN ADEQUATE RESOURCES |
| 7.6.4 FORMALIZE COMMUNICATIONS | 7.6.5. SOL, LIMITING CONDITIONS, ALARM MANAGEMENT | 7.6.6 INTERLOCK BYPASS MANAGEMENT |
| 7.6.7 ACCESS CONTROL REQUIREMENTS AND OCCUPANCY | 7.6.8 FIELD ROUNDS AND EQUIPMENT MONITORING | 7.6.9 MAINTAIN GOOD HOUSEKEEPING |
| 7.6.10 LABELING AND COLOUR CODE | 7.6.11 PROCESS MOCK EXERCISES | |

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## 7.6.1 WRITTEN PROCEDURES

Operating Procedures (Operating manual, SOP)/ Standard Maintenance Procedures (SMP)/ safe work practices should be developed, reviewed, approved, updated and established in line with respective elements as explained in clause # 7.2 and 7.3.



## 7.6.2 QUALIFICATION AND TRAINING OF WORKFORCE

Work force should be qualified, trained and competent for the tasks they are expected to perform. (Refer Training and Competence element for details)



## 7.6.3 ASSIGN ADEQUATE RESOURCES

The organization shall determine and provide the resources in terms of manpower needed for the establishment, implementation, maintenance and continual improvement of the Safety Management System.

Adequate operating/ support facilities (such as safe sitting arrangement, cabins, illumination etc.) and adequate equipment (such as walkie-talkie/ radios, gas monitors/ responders etc.) should be provided for carrying out the operation in a safe manner.

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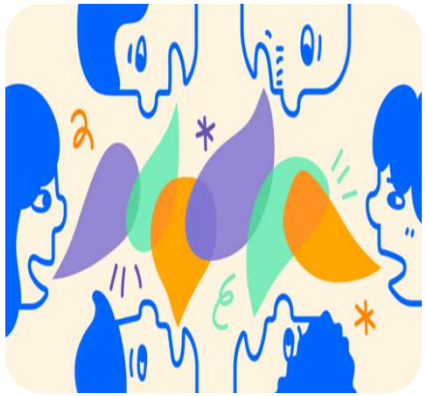

### 7.6.4 FORMALIZE COMMUNICATIONS

The organization shall establish, implement and maintain the process(es) needed for the internal and external communications relevant to the Safety Management System.

Documented system to be developed for proper communication among the various levels such as management circulars, work instructions, standing instructions, shift handing over taking over, shift logs, safe work practices, consultation and participation.

**(a) Work Instruction:**

i. Work instructions with respect to scheduling, planning of activities, and specific precautions for the conduct of operation on day to day basis as applicable should be given by supervisor.

ii. These instructions should be specific, adequately detailed and in language understood by the concerned to avoid any miscommunication/ unsafe operation.

iii. These instructions should be understood and acknowledged by operating personnel before execution.

iv. An instruction register (Online/ offline) (controlled document) should be developed. (Refer Annexure 4: General document control features)

**(b) Standing Instruction:**

Standing instructions should be developed which can be referred and followed in case of emergency situation, incident inside installation premise like emergency escape/ exit route, assemble at designated place (assembly point) and other specific instructions for critical job etc.

**(c) Shift handing over and taking over and shift logs**

i. Structured shift handing over and take over procedure should be developed and implemented.

ii. Proper and accurate logging of data should be ensured.

Annexure 9: General Guidelines for developing Shift handover/ take over procedure and recording information in logs.

iii. Supervisors should periodically review and countersign the logs for accuracy and completeness to emphasize their importance.

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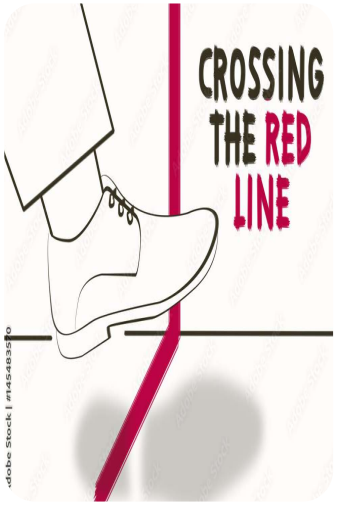


## 7.6.5 ADHERE TO SAFE OPERATING LIMITS, LIMITING CONDITIONS FOR OPERATION, ALARM MANAGEMENT

(a) Adherence to Safe Operating Limits/ Window, Integrity Operating Window and limiting conditions for operation should be ensured. Record of changes/ deviation in above with proper approval as per organization policy/ MOC should be maintained

(b) Alarm set values should be in line with the master alarm database (MADb). Record of changes in master alarm database (with proper approval) should be maintained.

(c) A system for Process Alarm management and rationalization should be developed and implemented (Refer OISD-STD-152 for details) to facilitate accurate and timely fault prompting and diagnosis to operators, and hence more effective alarm management system.

(d) The healthiness and operability of the interlock system should be tested at a defined frequency. Record of the same to be maintained. The frequency and procedure of interlock testing should be documented in the operating manual.

(e) Ensure that those authorizing deviations or changes in operating limits or interlock bypass are well aware of the risks and have a sense of vulnerability.

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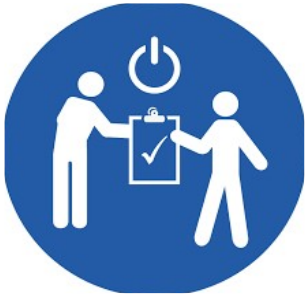
## 7.6.6 INTERLOCK BYPASS MANAGEMENT



(a) Process Interlock/ Equipment Interlock if required to be bypassed, exposes the installation operations to unknown hazards. Interlocks are bypassed for short or long duration to attend instrument/ process/ equipment problems during start up/ shutdown, normal operations, equipment changeover etc. However, endeavor should be made to keep all interlocks in line for the safety of the equipment/ installation.

(b) Organizations should develop and maintain an approved documented procedure for Interlock bypass management . The salient features of the same should be as follows:

i. All the operational/ process/ equipment interlocks should always be kept in line. If required to be bypassed, Interlock bypass procedure should be followed and record of the same should be maintained. It may be best practice to have automatic event logging of every interlock bypass.

ii. The delegation of authority for approving the bypass any safety interlock with respect to period should be clearly defined.

iii. An interlock bypass register (controlled document) should be maintained by each operation unit/ section. It should be readily available with shift-in-charge. (Refer Annexure 4: General document control features)

Note: The register can be maintained in soft (e- system)/ hard copy.

iv. The register should contain tag no. of bypassed interlock, tag description, date and time of bypassing the interlock, reasons for bypassing, compensatory measures, precautions to be taken during the period of interlock bypass and date and time of taking the bypassed interlock back in line along with the signature of the approving authorities as per the delegation of authority.

v. After three months, documented review of necessity of Interlock, further course of action should be done on monthly basis.

(A specimen Interlock bypass procedure and formats are attached as Annexure 10)

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7.6.9 MAINTAIN GOOD HOUSEKEEPING (a) Working areas should be kept clean and organized, trash should be removed, damaged equipment should be repaired, paint and surface finishes should be maintained, abandoned equipment should be demolished. (b) Emergency escape routes should be free of any obstructions. (c) 5S (sort out, set in order, standardize, shine and sustain) are some of the practices which helps in maintaining good housekeeping. (d) Hazardous waste storage and disposal should be ensured in line with the applicable regulatory requirements. (e) Adequate illumination should be ensured in accordance with OISD-STD-149.



7.6.10 LABELING AND COLOUR CODE (a) Organization should have facility-wide standards for labelling and colour coding of equipment, pipelines etc. for reliable operation/ emergency management. (b) Location of various emergency equipment/ life saving appliances such as safety showers, ESD, Manual Call Point (MCP), Assembly Point, Public Address System, Emergency Exit, PPE Station, firefighting equipment, life jacket, raft etc. should be distinctly marked for easy identification.



7.6.11 PROCESS MOCK EXERCISES : Periodic Process mock exercises should be conducted in process installations for hands on emergency handling experience for asset facing supervisors and workers. Typical Mock Exercises topics are as follows:i. Process equipment failure ii. Instrument malfunction iii. Utility Failure such as Instrument air failure, cooling water failure, total power failure etc.

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**Annexure 10: A specimen Interlock bypasses procedure and format**

This is specimen Interlock Bypass Procedure only. Organization should develop, approve and implement procedure in line with the guidelines mentioned in section 7.6.6 of this document.

| **Company Name and Logo** | | |
|---|---|---|
| **Reference No:** | **Revision No:** | **Date:** |
| **Interlock Bypass Procedure** | | |
| **Scope: This Procedure is applicable to: (For e.g.)**<br>All Process Units, Offsite, Storage and Dispatch Facilities<br>All Power and Utilities operations covering TPS, CGPs, Electrical Substations, Cooling Towers etc.<br>CETP operations. | | |
| **Delegation of Authority: (for e.g.)**<br>Please find below delegation of authority for bypassing any Process and Equipment Safety Interlock<br>**(Note: Organization to decide authorities as per their organogram)** | | |
| **Interlock System** | **Period Of Bypassing** | **Approving Authority for Respective Unit** |
| Process Safety (Production Operations) | Up To 8 Hrs. | Shift-In-Charge / Prod. Superintendent (Grade A Or B) |
| | < 24 Hrs. | Shift In Charge (Grade C Or D) |
| | > 24 Hrs. & up to 7 Days | Unit In Charge (Grade D Or E) |
| | > 7 Days & up to 15 Days | DGM (Operations) Grade F |
| | > 15 Days & up to One Month | GM (Operations ) Grade G |
| | > One Month & up to Three Months | CGM (Operations) Grade H |
| | > Three Months | Necessity of the Interlock needs to Be reviewed.** |
| EQUIPMENT SAFETY (Maintenance/ Mechanical/ Electrical/ Instrumentation) | Up To 8 Hrs. | Zonal Maintenance Engineer |
| | < 24 Hrs. | Maintenance In-charge |
| | > 24 Hrs. & up to 7 Days | HOD (Maintenance) |
| | > 7 Days & up to 15 Days | DGM ( Maintenance) |
| | > 15 Days & up to One Month | GM ( Maintenance) |

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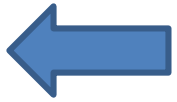
Specimen
INTERLOCK BYPASS PROCEDURE AND FORMAT



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# 7.7 ASSET INTEGRITY MANAGEMENT (AIM)

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**ASSET INTEGRITY MANAGEMENT (AIM)**




- WHAT IS ASSET INTEGRITY MANAGEMENT (AIM)
- ASSET INTEGRITY MANAGEMENT (AIM) PROGRAMME AT VARIOUS STAGES
- CRITERIA FOR ACCEPTING EQUIPMENT AFTER MAINTENANCE
- MAINTENANCE PROCEDURES
- PERFORMANCE REVIEW

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# 7.7 ASSET INTEGRITY MANAGEMENT (AIM)



The means of ensuring that the people, system, process and resource that deliver integrity are in place, in use and will perform when required over the whole lifecycle of the asset. It is continuous assessment process applied throughout the lifecycle of assets to assure that the assets are and remain to be fit for purpose. covers the equipment, its support structures and those other systems that prevent, detect, control or mitigate against a hazard

Four major objectives:

i. Define the requirements to be achieved by the asset.

ii. Design and build integrity into new and modified asset.

iii. Maintain the integrity of the asset throughout the facility lifetime.

iv. Detect and correct deficiencies and failures that occur during operation.

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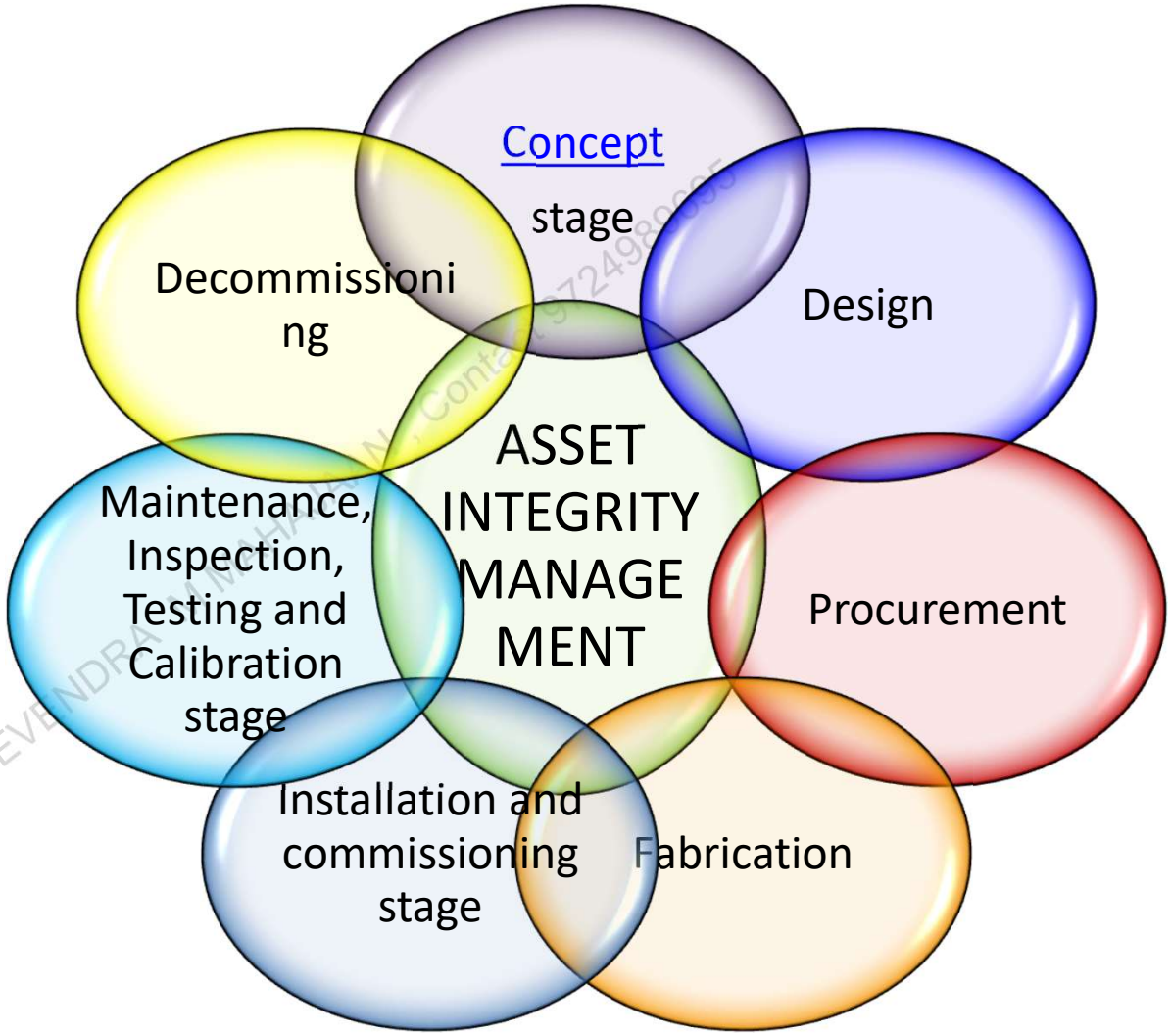
# 7.7.1 ASSET INTEGRITY MANAGEMENT (AIM) PROGRAMME

Asset Integrity Management (AIM) programme should ensure that procedures are in place and implemented in a manner to serve its intended function without chances of failure consistent with service requirements, manufacturer's recommendations and industry standards.

Each organization should implement the AIM programme covering various stages of lifecycle of an asset.

The assets including safety critical equipment to be covered under AIM should be clearly identified and listed.

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## 7.7.2 CONCEPT STAGE

(a) Organization should establish AIM program requirements and objective before the start of the process design.

(b) Asset management program should include road map for maintaining integrity and availability of asset such that organizational objectives are converted into AIM objectives

## 7.7.3 DESIGN STAGE

(a) Various aspects of "Build in" reliability and inherent safety in assets to be reviewed and incorporated at design stage to achieve higher reliability, availability and safety.

(b) Technical and personnel safety aspects such as safe access, approach, escape etc., operability and maintenance aspects such as ergonomics etc. w.r.t. equipment should be reviewed and ensured.

(c) The design of safety critical equipment should be reviewed to ensure its availability and operability for the intended purpose and survival during emergencies/ events (such as initial fire or explosion) envisaged during design.

(d) Organization should develop and maintain design documentation up to date and readily accessible (refer PSI element)

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## 7.7.4 PROCUREMENT STAGE

(a) Guidelines for procurement should be developed to verify and ensure equipment compliance with applicable design and material specifications.
(b) It is recommended to conduct an audit of the equipment supplier's facilities to better assure purchase of required equipment which is suitable for intended use.

## 7.7.5 FABRICATION STAGE

(a) Written guidelines for quality control and assurance procedures and specifications for asset should be developed and implemented to ensure that material, construction and procedure (fabrication and inspection) during the fabrication stage are in accordance with the design specifications.
(b) In the construction of new installation and equipment, it should be ensured that equipment as it is fabricated is suitable for the process application for which it will be used.
(c) Calibration/ standardization of equipment and instrumentation required/ used for fabrication should be ensured.

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## 7.7.6 INSTALLATION AND COMMISSIONING STAGE

(a) Guidelines on appropriate checks and inspections such as Positive Metal Identification (PMI), Hydrostatic Pressure test, Vacuum box test etc. (whichever applicable) to be performed before start up to ensure that the equipment are installed properly and is in accordance with design specifications and the manufacturer's recommendations, should be developed and implemented.

(b) Procedure to ensure that installation procedures recognize field installation concerns should be developed and implemented.

(c) 'As built' drawings, together with certifications of vessels and other equipment and materials of construction need to be verified and retained in the quality assurance documentation. (refer PSI element)

(d) Equipment installation jobs should be inspected in the field for use of proper materials and procedures and to assure that qualified craftsmen are used to do the job.

(e) Use of appropriate gaskets, packing, bolts, valves, lubricants and welding rods etc. should be verified in the field and documented.

(f) The procedure for installation of safety devices should be verified such as torque on the bolts on rupture disc installation, uniform torque on flange bolt, proper installation of pump seal etc.

(g) Pre Commissioning Safety Audit (PCSA) of the installation/ facilities shall be carried out in accordance with relevant OISD standards during installation and commissioning stage.

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## 7.7.7 MAINTENANCE, INSPECTION, TESTING AND CALIBRATION STAGE

(a) Risk Based maintenance and inspection programme as applicable should be established and implemented taking into consideration the safety, reliability and quality aspects to achieve objective of Asset Integrity Management (AIM).

(b) The statutory requirement, manufacturers recommendation, requirements by relevant OISD and other National/ International codes and standards, SOPs for Integrity assessment by national and international bodies and Recognized and Generally Accepted Good Engineering Practices (RAGAGEPs) should be considered in developing such programme.

(c) Maintenance and Inspection programme should include:

i. The frequency/ schedule, procedure, practice and responsibility for operation, maintenance, inspection, testing, calibration, corrosion control etc. as applicable shall be clearly defined, approved and periodically reviewed based on aging, deterioration mechanism and failure history.

ii. Each inspection and test done on equipment and its components should be reviewed against the established criterion for acceptance and documented.

iii. Strategies for management of spare parts, consumables, tools and tackles

(d) Quality control procedures to verify that maintenance material, spare parts and component, spare equipment etc. meet design specifications.

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## 7.7.7 MAINTENANCE, INSPECTION, TESTING AND CALIBRATION STAGE

Plan for management of safety critical equipment and emergency response equipment and systems.

(f) Training of maintenance personnel in the application of the procedures, relevant hazards, safe work practices and standard operating procedures etc.

(g) Procedure to review all changes in facilities in accordance with MOC guidelines. A comprehensive review of the impacts of potential change (e.g., increase in vibration, increase in corrosion etc.) is to be undertaken before implementation.

(h) Plan and methodology for analysis of failure, its documentation and reporting criterion (Failure data from operating experience should be documented and analysed)

(i) Feedback from maintenance activities should be given to other elements of safety system i.e., design and operations for updation of P&IDs, changes in design of asset and operating manuals as required

(j) Strategies for outsourcing of services/ ensuring safety in outsourced jobs (refer contractor management element for details)

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## 7.7.7 MAINTENANCE, INSPECTION, TESTING AND CALIBRATION STAGE

(k) Procedure and responsibility for approval of deviation from inspection and maintenance programs.

Note: All the aspects of deviation approval should be addresses in this procedure.

(Refer Annexure 11: Specimen procedure for deferment of scheduled Maintenance, Inspection, Testing and Calibration).

(l) Consideration for improving reliability of equipment such as Reliability modelling in design stage, Failure Analysis, Reliability Cantered Maintenance, Root Cause Analysis, Risk Based Inspection etc. and its monitoring using established reliability parameters like Mean Time Between Failures (MTBF), Mean Time to Repair (MTTR), availability etc.

(m) Strategies and Procedure for preservation of idle assets and equipment/spares kept in stores/ installations. (Refer OISD-STD-171 for details).

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## 7.7.8 CRITERIA FOR ACCEPTING EQUIPMENT AFTER MAINTENANCE

Following considerations as applicable should be considered while accepting equipment after maintenance:

(a) Asset that has been out of service for maintenance should be taken over after due testing and documentation.

(b) Criteria for acceptable test results should be well defined.

(c) Equipment Asset deficiencies which are outside acceptable limits as defined by the process safety information should be corrected before further use or in safe and timely manner, when necessary, means are taken to assure safe operation. Any deviation accepted should be approved by authorized person.

(d) Proper records for handing / taking over of equipment should be maintained.

(e) After any maintenance, Pre-start up safety review as applicable should be carried out and documented in accordance with PSSR element.

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## 7.7.9 DECOMMISSIONING STAGE

(a) Strategies and criterion for equipment replacement and decommissioning should be established and implemented.

(b) Procedure and responsibility for approval of deviation from replacement and decommissioning criterion should be defined, followed and documented.

(c) Management of change procedure should be followed for equipment replacement and decommissioning in line with OISD-GDN-178.

(d) All the relevant PSI documents should be updated

## 7.7.11 PERFORMANCE REVIEW

It is essential to carry out periodic review of implementation status and performance of Asset Integrity Management (AIM) programme by authorized person of the organization. Such review should essentially cover:

(a) Plans, schedule and Key indicators for performance measurement of the Asset Integrity Management system and implementation of findings/ recommendations.

(b) The programs and schedules should be reviewed and analysed to see if there are areas where break down maintenance is used rather than an ongoing AIM program.

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## 7.7.10 MAINTENANCE PROCEDURES

(a) Documented procedures should be established and implemented to maintain the on-going integrity of process equipment, installation and structure. The procedure should address to the safety aspects regarding task performed on the asset

(b) In addition to the preventive maintenance procedure, written Standard Maintenance Procedures (SMP) for each type of routine repair performed by maintenance personnel should be prepared.

(c) The procedures should contain the minimum following information:

i. The use of personal protective equipment should be laid down for specific maintenance activities.

ii. The task, role and responsibilities should be defined

iii. Records of trend analysis of machine and equipment should be taken into consideration.

iv. The risks associated with different phases of maintenance should be established.

v. All maintenance procedures should be duly authorized.

(d) Results of inspections and tests performed on process equipment are to be recorded and maintained in master File, or electronically and should be accessible to all concerned.

(e) Maintenance and inspection activities should also address the integrity of temporary equipment.

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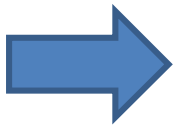
| Level | Approval Authority (Operation) | Approval Authority (Maintenance) |
|---|---|---|
| Level 1 (1-7 Days) | Level-1 (operation) | Level-1 (Maintenance) |
| Level 2 (8 to 14 Days) | Level-2 (operation) | Level-2 (Maintenance) |
| Level 3 (15 & above) | Level-3(operation) | Level-3 (Maintenance) |

**Deviation request cum approval form**

| Company Name and Logo | | | | | |
|---|---|---|---|---|---|
| Unit - | | Equipment - | | Equipment Tag No - | |
| Due Date of Inspection | Reason for not offering for Inspection | Contingency/ Mitigation Plan | Expected Date for Offering for Inspection | Operations Remarks | AIM / Maintenance Remarks |
| | | | | | |
| | | Operation/ Technology | | Maintenance/ Inspection | |
| Requested By | | | | | |

| | | |
|---|---|---|
| Approved by – (Level 1) (1-7 Days) | | |
| Approved by – (Level 2) (7-15 Days) | | |
| Approved by – (Level 3) (16 Days & above) | | |

Refer Annexure 11: Specimen procedure for deferment of scheduled Maintenance, Inspection, Testing and Calibration).



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# 7.8 MANAGEMENT OF CHANGE (MOC)

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# 7.8 MANAGEMENT OF CHANGE




Any changes can introduce unforeseen new hazards, unknowingly increase the risk associated with existing hazards or compromise the safeguards built into the original design. Such changes, if not carefully controlled, can increase the risk of process or operation and result in unwanted consequences

7.8.1 The organization should develop, implement and establish documented procedure to manage changes in accordance with OISD-GDN-178 "Guidelines for Management of Change

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# 7.9 INCIDENT REPORTING, INVESTIGATION, ANALYSIS AND LEARNING

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# 7.9 INCIDENT REPORTING, INVESTIGATION, ANALYSIS AND LEARNING

An incident is an event caused by failure in the safety barrier or safeguards.

An incident is an indication that safety barriers were ineffective/ impaired and that prompt changes need to be made.

It may recur unless key factors responsible for incidents are analyzed and corrected.

A corrective action program and dissemination of learning to required stakeholders









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# 7.9 INCIDENT REPORTING, INVESTIGATION, ANALYSIS AND LEARNING

Every organization should develop, establish and maintain an incident management system which should address

## 7.9.1 ROLE, RESPONSIBILITY AND ACCOUNTABILITY IN INCIDENT MANAGEMENT

- Incident Reporting
- Investigation of incident
- Communication of learning
- Documentation of incident investigation report and other record.
- Corrective Actions, Recommendation tracking and Implementation
- Training and competency of investigation team and other stakeholders
- Analysis of Incident Data




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(a) **Incident Reporting**

Following aspects should be considered for development of incident reporting guidelines:

i. All the incident ( including near miss/ injury/ minor/ major etc.) should be reported.
ii. The guidelines should also emphasis on and have provision for reporting of unsafe act and unsafe condition separately. All the reported unsafe acts and unsafe conditions should be analyzed, rectified and findings should be shared with all concerned.
iii. Awareness programme on reporting of unsafe act, unsafe condition & Incident for the workforce should be conducted periodically.
iv. Timelines for reporting the incident
v. Criterion for incident classification of various incidents based on their severity/ consequence.

(OISD Incident classification and reporting criterion is attached as Annexure 12)

i. The reporting form/ template and timelines should be aligned to the Incident classification criterion, reporting requirement of statutory and regulatory authorities4 and other applicable agencies).
ii. Define the system, procedure and tools available to report the incident.
iii. Barricading and securing of the scene

Note: The organization should encourage reporting off-the-job safety incidents of the employees and develop & maintain necessary system for the same. These incidents should be analyzed and findings should be shared with all concerned.

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(b) **Investigation of incident:**

Incident investigations should be initiated as promptly as possible considering the necessity of securing the incident scene, relevant evidence, information and protecting people and the environment.
This section should address

i. The criterion for investigation (which type of specific events should be considered as HSE incidents, requiring comprehensive investigation)
ii. Defined timelines w.r.t investigation process
iii. Constitution of investigation team,
iv. Criterion for selection of Team leader and members.
v. Methodology of investigation,
vi. Reviewing and approving process,
vii. Submission of Report in standard template for documenting facts, findings (Physical observations, process parameters, Time stamping, Key witnesses, Photographs etc.) key factors, analysis and recommendations

Refer annexure 13 (a) List of sample questions which Investigators may ask to witness (b) List of sample questions for identifying incident root causes (Informative)

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(c) **Communication of learning.**

i. Organization should establish the procedure on learning from internal and external incidents. These high value learnings should be coupled with actions directed to prevent the similar incident happening at the facility.
ii. The Learning from incident (LFI) should be communicated to all relevant stakeholders for e.g.
• Similar facilities within the organization.
• Personnel whose job tasks are relevant to the incident findings including contract workforce when applicable.
iii. The learnings should be considered as one of the inputs for future Hazard analysis, Risk assessment revision, induction / regular trainings etc.

(d) **Documentation of incident investigation report and other record.**

Organization should establish a system of maintaining an incident data base wherein information is properly recorded in a form suitable for easy use. Incident investigation reports to be retained for a minimum period of five years in order to determine if an incident pattern develops or exists.

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e) **Corrective Actions, Recommendation tracking and Implementation**
A procedure should be established to promptly address and resolve the report findings and implement recommendations. Resolution and corrective actions should be documented.
The procedure should address
i. Tracking and monitoring of open, overdue and closed recommendation status.
ii. The validation of effectiveness of closed recommendation.

(f) **Training and competency of investigation team and other stakeholders.**
Organization incident management program should ensure that investigators and others engaged in incident investigations (like reviewer, approver, etc.) are trained in the techniques of Incident investigation.

(g) **Analysis of Incident Data:**
Organisation should develop a system for analysis of incident data which can be used for preventing recurrence and set the warning signals to prevent major incidents. Refer 'Case Studies' and 'Safety Alerts' of major incidents within the premises in the OISD portal under section Knowledge Management.

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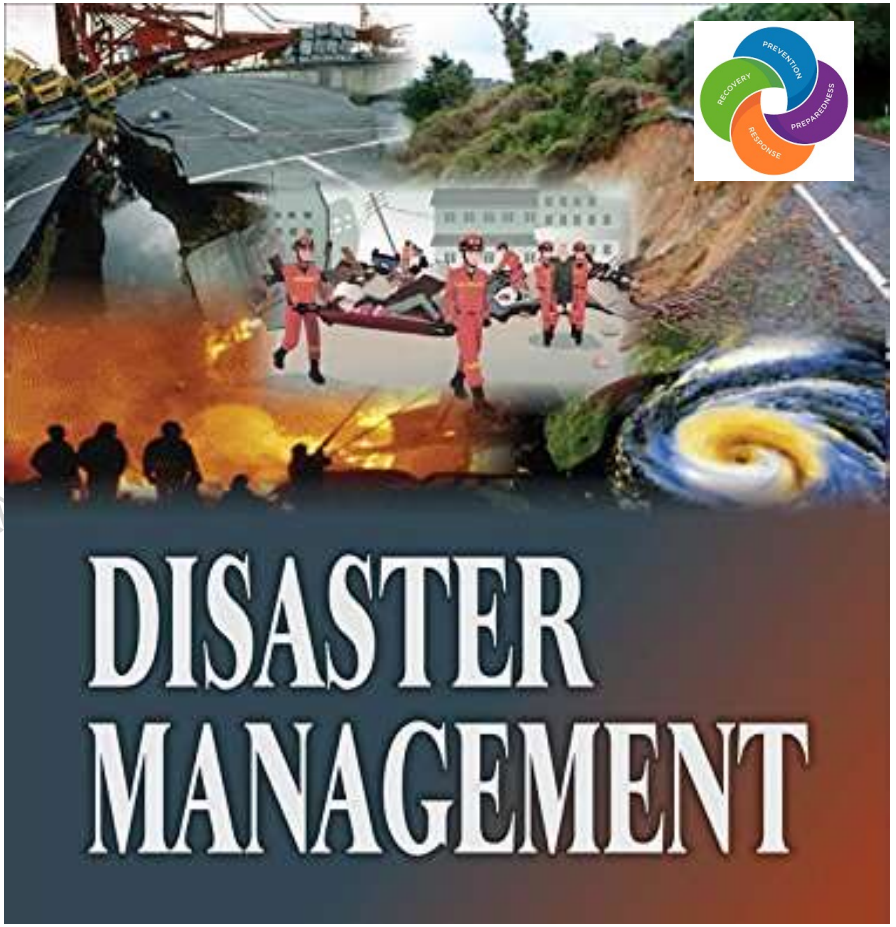
# 7.10 EMERGENCY RESPONSE MANAGEMENT

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## 7.10 EMERGENCY RESPONSE MANAGEMENT




Emergency response management is a critical component of safety management system. The objective of Emergency response management is to mitigate adverse effects of incidents through effective risk assessment, emergency preparedness, mitigation and response measures.

Each organization should develop, implement and establish emergency response and disaster management plan in accordance with all applicable statutory/ regulatory/ OISD guidelines such as OISD-GDN-227/ MOP&NG DMP/ PNGRB ERDMP Regulation-2010 and amendments thereof.



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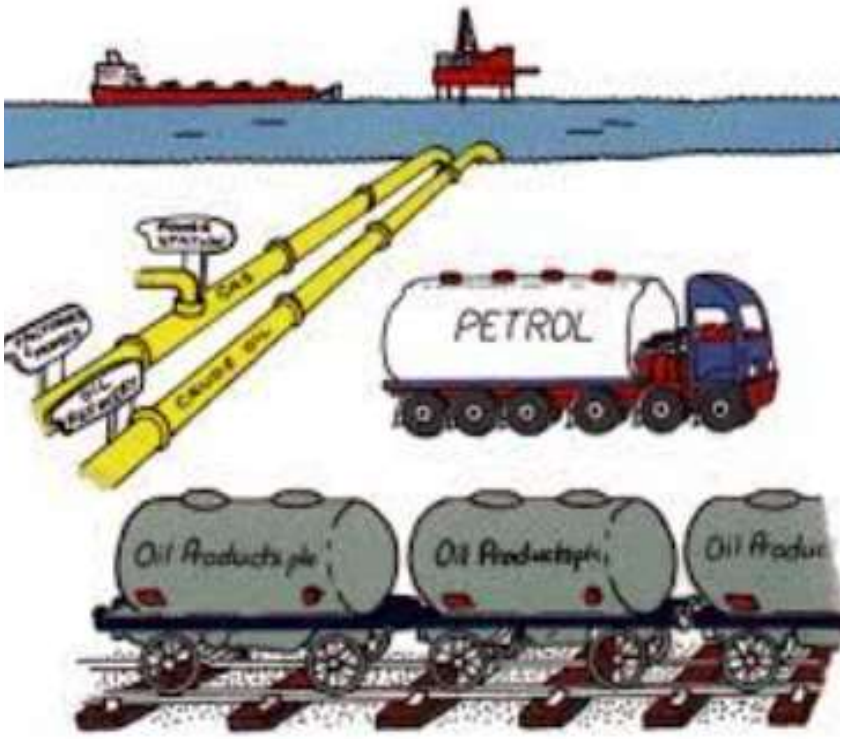
# 7.11 TRANSPORT SAFETY MANAGEMENT

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## 7.11.1 CLASSIFICATION OF HAZCHEMS

Every goods carriage, carrying petroleum products (whether in bulk or in packages), should display a distinct mark of the United Nations (UN) class label appropriate to the type of HAZCHEMs. In India, the classification of HAZCHEM as recommended by the UN Committee of Experts on the Transport of HAZCHEMs has been widely adopted for all modes of transport.

Refer Annexure 14 for UN international classification system / Code Number & Letters for important and popular chemicals(Informative).




**CLASS 1-Explosives**

**CLASS 2-Gases**

**CLASS 3-Flammable liquids**

**CLASS 4-Flammable solids**

**CLASS 5-Oxidizers**

**CLASS 6-Toxic materials**

**CLASS 7-Radioactive materials**

**CLASS 8-Corrosive materials**

**CLASS 9-Miscellaneous dangerous goods**

**DANGEROUS- Indicates a mixed load of hazardous materials**

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| TRANSPORTATION BY ROAD TANKERS | TRANSPORTATION BY PIPELINES | TRANSPORTATION BY SEA/ WATERWAYS | TRANSPORTATION BY RAILWAYS |
|---|---|---|---|





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# 7.12
# PROJECT
# HSE MANAGEMENT




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# PROJECT HSE MANAGEMENT



- PROJECT HSE RISK MANAGEMENT STRATEGY
- PROJECT HSE PLAN
- PROJECT HSE ASSURANCE PROCESS
- REQUIREMENTS UNDER PHSER REVIEW PROCESS

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## 7.12 PROJECT HSE MANAGEMENT



HSE RISK MANAGEMENT STRATEGY

PROJECT HSE MANAGEMENT PLAN

The purpose of this section is to provide guidance to project delivery on how to align and comply organization's SMS standard for projects lifecycle.

These guidelines provide the required structure for HSE management in projects. It facilitates preventive approach to risk management as appropriate risk control and mitigation measures that can be incorporated in early stage of projects or at various stages of project.

Key Project HSE management activities include:
(a) Development of HSE risk management strategy (as part of the overall project risk strategy),
(b) Development of a Project HSE Management Plan.

The HSE Management Plan describes the key management systems that the project should use to manage the risk.

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# 7.12.1 PROJECT HSE RISK MANAGEMENT STRATEGY

HSE risk management strategy should be based on following basic consideration:

(a) Safety in Design: This process involves major hazard identification, evaluation and continuous risk reduction through design safety measures.

(b) Environmental and Social: Basic objective of this aspect is to identify and understand the environmental and social impacts of new project, design to avoid adverse impacts, minimize use of natural resources and reduce the adverse residual impact of waste, emission and discharge.

(c) Health Risk: Health Risk Assessment and health risk management is essential to ensure that personal, occupational, and environmental health risks in projects and operations are managed properly in line with applicable statutory regulations and applicable guidelines.

(d) Risk Management: Risk management should include identification of hazards associated with operations, assess the risk, manage holistically and formally document the details

(e) Emergency Response: Emergency Response should be considered as part of the project development, based on identified hazards and risks associated with the project and its activities including those developed from the HIRA/ PHA.

(f) Regulatory and Compliance: The HSE compliance framework should detail the requirements for HSE compliance management process.

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## 7.12.2 PROJECT HSE PLAN

(a) A Project Health, Safety, and Environmental (HSE) Plan should be developed and owned by the project team, which specifies all HSE studies and requirements throughout all stages of a project.
(b) HSE Plan is specific to each project and details the timing of all HSE studies, audits, reviews, preparation, verification and submission for approval at certain phases of the project.
(c) The HSE Plan is developed at pre-project/ conceptual stage, then updated and formally issued prior to the commencement of each succeeding phase of design development, when a closer definition of HSE requirement has been established.
(d) The HSE plan should be revisited/ updated during
i. Conceptual phase - when surface facilities are being identified,
ii. Basic Engineering (FEED stage) – to incorporate more specific design requirements, and
iii. Detailed Engineering stage – to incorporate construction and commissioning requirements during EPC stage.
(e) The purpose of the HSE Plan is to ensure that all projects follow organization's Standards and practices and adhere to Organization HSE lifecycle phases.
(f) A project specific HSE philosophy should be developed based upon philosophies, also the specific codes and standards adopted on the project. The HSE Plan should be prepared and developed in conjunction with the projects HSE philosophy document, which when combined contain all HSE requirements on any new project from concept to commissioning phase.
(Refer Content of a typical project HSE plan attached as Informative annexure 15)

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## 7.12.3 **PROJECT HSE ASSURANCE PROCESS**

(a) Project HSE Review (PHSER) is an element of a project's assurance strategy. PHSER's heighten the awareness of HSE risks and help make HSE an integral part of the gated decision and HSE approval process for projects.
(b) The overall objective of a PHSER is to provide assurance that all HSE aspects of the project have been identified and that the appropriate project, engineering, construction and operational procedures have been or will be developed to control risks identified. The PHESR process has multi stage as listed below:

i. PHSER Phase I - FEED or Basic engineering stage
ii. PHSER Phase II - Detailed engineering stage
iii. PHSER Phase III - Construction stage
iv. PHSER Phase IV - Pre startup stage
v. PHSER Phase V - Post operation stage (After one year)
vi. PHSER Phase VI - Abandonment stage

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Requirements under PHSER review process

Annexure 16: Details PHSER objectives for various phases and Informative Annexure 17: Typical checklist of HSE deliverable.

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## (c) The requirements under PHSER review process are as under:

i. To confirm that HSE Management System including HSE Plan, and HSE action Tracking Register has been established/ implemented effectively.

ii. To verify that HSE studies, including specialist reviews such as HIRA/ PHA, PHSER, QRA, EIA etc. have been conducted and that the outcome of these studies have been satisfactorily addressed/ incorporated in the design and in the EPC Package. To ensure that the HSE related aspects of the FEED meet regulatory requirements, project codes, standards have been identified and design philosophies have been established/ applied.

iii. To confirm that Management of Change procedures (MOC) which include design change and engineering change have been developed and applied and appropriate hazard review of changes has been instigated to maintain HSE integrity.

iv. To confirm that all the HSE related aspects, requirements and instructions for construction phase have been identified and documented in the EPC Package.

v. The PHSER is a sort of audit including interviews, site visit and document review and verification, PHSER is guided by a questioner checklist (Companies to develop) of this document and taking benefit from the previous experience of the persons around the table.

vi. The PHSER should address the HSE aspects at the different stages of the life cycle of the project, from FEED to pre-startup stage. In certain cases, PHSER should be conducted for Post-operation and abandonment stages. The PHSER recommendations from one phase should be closed prior to initiate for next PHSER stage.

vii. PHSER in addition to Pre startup safety review/ ready for startup, which check for readiness of system for introduction of hydrocarbon/ energy source.

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# 8.1 Pre-startup Safety Review (PSSR)



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# 8.1 Pre-startup Safety Review (PSSR)

One of the most critical periods in an operation is the startup of the process. Before a new or modified facility/ installation is started, a systematic check should be made to ensure that the equipment has been installed properly, operating procedures have been reviewed, items needing attention from PHA's have been resolved and personnel have been trained.




8.1.1 The prestart-up safety review provides a final check of new and/ modified process/ equipment to confirm that all appropriate elements of the Safety Management system have been addressed satisfactorily, and the facility is safe to operate.

8.1.2 The main purpose of the review is to reduce the chance of some requirement being overlooked that could create a hazard or introduce unexpected safety problem as process is brought to normal operating conditions.

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# 8.1.4 Pre Startup Safety Review should be conducted prior to:

(a) Commissioning of newly constructed facilities (minor or major project).

(b) Startup of facility/ installation after revamp/ shutdown/ turnaround (when the integrity of facilities, installation and equipment has been disturbed as a part of revamp/ shutdown/ turnaround)

(c) Commissioning/ startup of facilities which have undergone significant alteration, modification; permanent or temporary, via Management of change procedure (for modified facilities when the modification is significant enough to require a change in the process safety information).

(d) Startup of hired or temporary facilities.

Check Points

(e) Startup post soft changes in control systems (e.g. DCS/ESD).

(f) Startup after prolonged shutdown (e.g. Mothballed/ preserved/ idle facility/ installation)

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8.1.3 Organization should develop and establish procedure of Pre Startup Safety Review, that should confirm the following:

(a) All requisite statutory and legal compliances, approvals, consents, NOC, clearances are in place.
(b) Integrity and the essential safety systems have been installed (/reinstated) and tested as below (but not limited to):
i. Safety Critical Equipment such as PSV, TSV, Gas detectors, H2S detectors, Fire alarms, Smoke/ Heat detectors, firefighting facilities etc.
ii. Communication facilities viz. CCTVs, Call stations, PA system, telephones etc.
iii. Safety instrumentations such as safety interlock (cause and effect), DCS, Alarms etc.
(c) Construction is in accordance with design specifications, such as:
i. Material of construction,
ii. Direction of NRVs, Orifices
iii. Gasket, stud, Fasteners
iv. Position of isolation valves, Blinds, Drain, Vents, Supports etc. in accordance with the P&ID
v. Direction/ stroke checking/ fail safe action of all the control valves/ SDVs in accordance with the P&ID etc.
(d) For new facilities and modifications, Process Hazard Analysis (PHA) is performed and recommendations have been resolved or implemented before startup;

(e) To ensure site modifications during construction phase have been properly controlled, approved and records updated. (Refer Informative Annexure 4: General document control features)
(f) Operating, maintenance and emergency procedures are in place and are adequate.
(g) For new project, commissioning procedure for the facilities with responsibility matrix are in place and are adequate.
(h) Liquidation of all pending points/ recommendations of PCSA, Internal Audit checklists, HIRA, QRA, HAZOP, Licensors checklist, P&ID note(s), P&ID review, 3D model review (as applicable) should be ensured. Compliance with the same should be authenticated & approved for acceptance.
(i) To ensure training of each employee involved in the operating process is

8.1.5 The pre startup safety review should be conducted by a multidisciplinary team which includes representation from operations, design, process engineering & maintenance and process safety expertise/ HSE etc.
8.1.6 An appropriate prestart-up checklist(s) relevant to the particular process/ equipment should be developed and used.
8.1.7 The PSSR should be documented, signed by each member of the review team. A system should be established and controlled to ensure that the PSSR recommendations are closed in time bound manner and properly documented.

# 8.2 SAFETY MANAGEMENT SYSTEM AUDIT




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# 8.2 SAFETY MANAGEMENT SYSTEM AUDIT

Safety Management System Audit is a compliance audit that helps in the identification of vulnerable areas, risks & hazards, and opportunities for improvement. It enables an organization to provide a safe and healthy workplace, prevent work-related injury & ill health, and continually improve its HSE performance. It also gives an idea about how effectively the Safety Management System is implemented and how its objectives are being accomplished.

It is the feedback mechanism that provides management with the status and measurement of effectiveness of the various elements and activities of SMS and leads to the appropriate control over these efforts.

The organizations should establish and maintain an audit program and procedures for the periodic audit of the Safety Management System.

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# 8.2.1 Safety Management System Audits are undertaken to meet the different specific objectives viz.-

(a) To check whether the organization conforms to its established HSE policy and requirements.

(b) To determine the adequacy and effectiveness of the Safety Management System.

(c) To identify any deficiencies in the Layout, Construction and Design which might have cropped up during the addition and modification of facilities.

(d) To ensure fire protection facilities and safety systems are well maintained.

(e) To ensure that operating and maintenance procedures are in line with established manuals and Standard Operating Procedures.

(f) To check the effectiveness of emergency preparedness and response.

(g) To check the compliance of applicable statutory/ legal requirements like statutes and regulations, permits, licenses, etc., and other requirements like standards and guidelines, codes of practice, technical specifications, OISD standards.

(h) To review the existing assessment of risks and hazards and adequacy of mitigation measures implemented.

(i) To determine the adequacy and effectiveness of the Incident Management System.

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# 8.2.2. The audit program*** and procedures should cover

(A) The activities and areas to be considered in audit.
(b) The frequency of audit
(c) Composition of audit team
(d) Audit process
(e) Audit Reporting

Sufficient resources should be committed by management to the audit in order to meet its intended scope.

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# 8.3 MANAGEMENT REVIEW

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## 8.3 MANAGEMENT REVIEW

The Management Review element monitor the near-real-time effectiveness of the Safety Management System, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness.

(a) The organization should determine:

i. The committee (Chairperson & other members), frequency of review/ evaluation and agenda including the status of actions from previous management reviews.

ii. Performance parameters/ indicators for measuring the effectiveness of control measures, including indicators of the failure of any control measure, effectiveness of control etc. The results of safety audits, incident investigations etc. acts as inputs for developing leading and lagging indicators.

(A combination of leading and lagging indicators is the best way to provide a complete picture of safety management effectiveness).

iii. The methods for monitoring, measurement, analysis and performance evaluation and reporting

iv. Corrective actions to be taken in the event of failure of controls and in the event of the indicators not meeting performance targets.

How to set performance standard

Specimen

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## 8.3 MANAGEMENT REVIEW

(b) In setting performance standards/ parameter/ criterion, organization should consider the following questions:

i. How will I know that this particular SMS element is working effectively?

ii. Alternatively, what will tell me that the element is not working?

(c) The performance evaluation should also include the parameters like compliance of legal requirement, compliance of environment monitoring, compliance against occupational health monitoring, compliance of actions against the identified hazards, risk, opportunities for continual improvement, gaps and results of previous evaluations etc. in addition to those related to Safety Management System.

Note: Organizations may develop Annual performance management sheets on the basis of criterion/ performance standards/ parameter decided by organization for ease of monitoring and control. (Refer Annexure 18: Specimen performance management sheet).

Typical Criterion/ performance standards/ parameters (Refer Annexure 19) should be monitored and measured.

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# Any Question?




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# Thanks


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## Annexure 1: Definition of major accident as per DMP 2021, GOI, MoPNG

An incident should be treated as Major if any of the following occurs

(a) Any incident of fire not extinguished in 15 minutes.

(b) Any incident on account of explosion/ blowout/ radioactive (leakage or loss).

(c) Any incident causing shutdown of operation(s) for more than eight hours.

(d) Any incident causing financial loss above Rs. 50 lakhs.

(e) Any incident within unit/ installation premises leads to fatality(s).

(f) Any incident within unit/ installation premises, leading to permanent loss of body part and/ or permanent disability.

(g) Any incident causing major loss of containment and having adverse impact outside the installation/ location premises including disaster defined under Section 2 (d) of DMP Act 2005.

(h) Cumulative lost time, due to incident (within unit/ installation premises) is more than 45 man-days.

(i) Any incident of road accidents (during transportation of petroleum products) resulting in fire/ explosions which in turn leads to fatality(s).

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**Annexure 2: Detail description of commonly used techniques to aid in hazard identification and qualitative analysis (Informative)**

Commonly used techniques to aid in hazard identification and qualitative/ semi qualitative analysis include the following:

i. What-If;
ii. Checklist;
iii. Hazard and Operability Study (HAZOP);
iv. Failure Mode and Effects Analysis (FMEA);
v. Fault Tree Analysis;
vi. Bow-tie analysis
vii. Layer of Protection Analysis (LOPA)
viii. An appropriate equivalent methodology/ technique.

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