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# IJISEI

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Objective to publish this Journal is to share information, knowledge among researcher, Professional and organization. Such Journal helps to grow their professional carrier, used for research purpose. Safety, Health & Environment related Journal is very helpful for professional, Institutional, organizational to learn and implement effective system to Prevent Accident, Protect environment and minimize losses during Disaster.

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*"Aim to prevent Accident, Protect Environment & Minimises Losses during disaster"*

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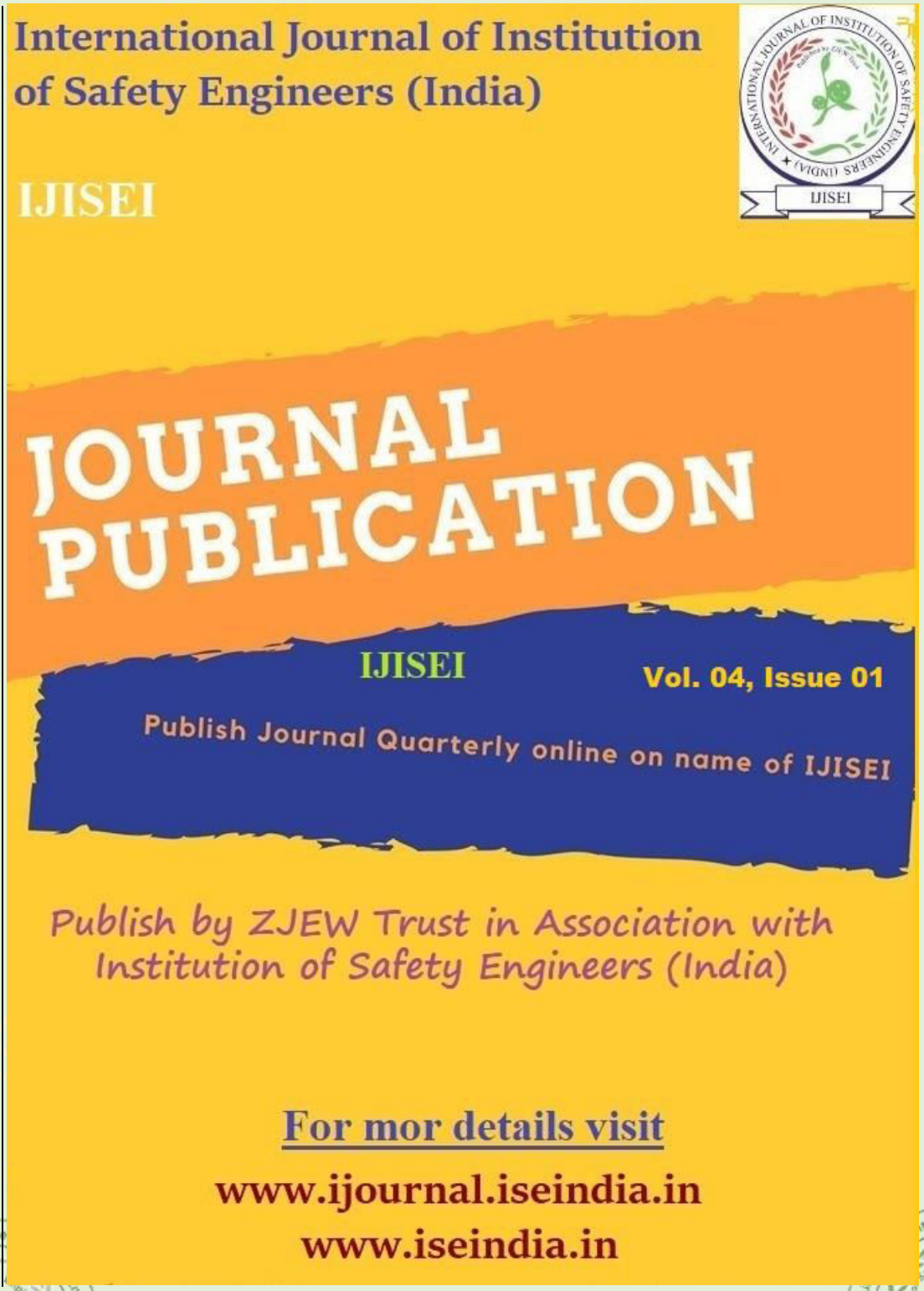

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## This Issue Journal Include:

## SAFETY ACTIVITY DURING JAN. - MARCH 2021

Webinar conduted on date 10th March 2021 by Institution of Sfatey Engineers (India) on Topics

**LEARN FROM DISASTER and PREPARE FOR A SAFERFUTURE**


## FIRST AID & CPR TRAINING

# [1]Accuracy Effect of Instrument in safety

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**Abstract**

To measure or detecting safety related parameter, generally use same instruments for different aspects but did not verify its actual use and calibration process and it effect to safety. For maintaining proper safety aspects, need to use proper calibrated instruments and those instruments to fit for that work. In this Study, Accuracy of Instrument is described and use of suitable instrument or devices recommended for proper work to avoid any incorrect result or prevent error. Results error create un-accepted circumstances and results obstacles to eliminate or rectify to safety related deficiencies.

**Key word:** Accuracy of instrument, Proper device for proper work, Instrument differentiation.

## 1. Introduction

Safety or Health, Safety & Environment (HSE) term is very much famous with industrial instruments or equipment's which are used in daily basis to measure or to maintain every parameter that are directly linked with SAFETY. To fulfill the audit criteria or to maintain the checklists, various time instruments are used that are not suitable for that work or the fittings connected with that instrument is not as much suitable to maintain the safety environment.

To reduce cost, maximum time it is observed that vendor used same instruments in various work but the respective instrument gives accuracy only for the one work not for others. From here the safety violation started and this create gaps in organization safety system during looking actual condition of work environment such safe value of oxygen value, LEL etc. Here this will be discussed that how can reduce this violation and to increase the awareness regarding that.

## 2. Accuracy of instrument

Accuracy of instrument is defined when it is calibrated and tested with the suitable or similar equipment's and tested on regular interval. There will be some error percentage or deviation with the actual value defined. We have to maintain that error percentage or accuracy level and to verify that after each interval during testing or calibration.

**Example:** In a product line standard Pressure gauge is there for 0—6 kg/cm$^2$. During calibration we have to check by portable master calibrator by giving pressure to PG whether this PG giving exact reading like master calibrator or any deviation comes. If any deviation find with the master

calibrator, this must be note down and to maintain in calibration certificate respectively. After every interval this deviation must be check and if any changes find same must be recorded. If difference comes more than permissible limit then the equipment's to replace for safety reason. Also, to remember that this PG (0—6 KG/CM$^2$) can be used only up-to (6 kg/cm$^2$) operation able line not more than this.

### 3. Accuracy in Safety

In Safety, accuracy play major role in every aspect. If we use (0-500) volt voltmeter to check the voltage measurement, the actual voltage in line is 440 volts but in meter it is showing 400 volts. (+40) volts difference will be critical for some industry. Different relay may get tripped but due to accuracy issue the actual issue of tripping can't get identified.

Another example is LEL meter to use for measurement of LEL level or percentage of LEL. Max time we use it to check for $O_2$ level. For $O_2$ measurement different meter is available in market. This is our lack of awareness. For particular work we have to use certified equipment's to maintain safety.

If we don't calibrate the equipment for long time this will also affects our safe environment and may some incident or accident happen. In a 0—10 bar PT if deviation comes and we simply neglect that then after some days something going to happen and that will be not safe.

### 3.1 Effects

The following effects may arise due to accuracy issue of equipment and not to use proper equipment as mentioned below:

- Unsafe situation or unsafe condition may arise
- Any near miss can happen
- Reportable accident may also happen
- LTI (Loss time injury) may take place
- Major accident also take place
- Safety culture or safety environment will not be there

### 3.2 Solutions

Following steps to be followed to resolve the issues:

- Calibration to be done by proper test kit
- Testing checklists to be maintain
- Interval of checking to be maintain

- If any deviation comes, record to be maintain
- Proper equipment must be use work-wise to get accuracy.
- Awareness is most important and use instrument as per manufacturer recommendation

## 4. Example

**Fig. 1,** LEL Meter

**Fig. 2,** $O_2$ Meter

**Fig. 3,** Gas Detector


**Fig. 4,** Flame Detector

## 5. Conclusion

Accuracy effects of instrument always impacts to Safety system of organization. Correct accuracy gives positive results and actual condition such as Oxygen level in work environment. This also helps to seek improvement if any deficiency in organization on based of recorded results of instruments and few major factors to ensure accuracy of instrument are:

- We have to identify suitable and standard instruments or equipments as per work.

- Calibration/Inspection/testing schedule to maintain.
- Proper checklists to be maintain.
- Area/Zone wise instruments to use.
- Deviation/error to update in calibration sheet.

**Reference:**


- K.U Mistry (Fundamentals of industrial safety and health)
- J.B Gupta (Instruments measurement)
- B.L THERAJA (Basic electrical & electronics)
- Google, Wikipedia
- ISEI Manual

# [2]Work Environment Toxicity Assessment at work place

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## Abstract

*Poor air quality of work environment always effects to personnel health. In industries, during storage, operation and process facility several hazardous agents emit and spread in work environment and pollute them and such poor quality of air effects to human health as well living things. In this Study, A work place air quality assessment is carried out and effective method has been recommended to risk control or minimization. This paper is very helpful to know effective procedure of air quality assessment. In this paper air quality is concern with toxicity and show work place air quality is satisfactory or not. So, air quality and work environment toxicity represents same meaning in this paper. This Study is conducted to Assess work environment Toxicity during Storage, handling & Process facility operation in industries to identify associated risk with personnel health of people, environment and their characterization. In this paper basically study focus to Particulate matter ($PM_{10}$, $PM_{2.5}$), Carbon mono-oxide (CO) & Air quality index (AQI). A Study summary including air quality parameters of Alternative Fuel and Raw (AFR) materials handling site, also included in this article.*

**Keyword:** Work environment Toxicity Assessment (WETA), Air quality, Hazardous work environment, Control Prevention, Procedure of WETA, WETA report Preparation

## Objective

Following objectives has been considered in focus while conducting the Assessment:

- Identify Risk of exposure to personnel health & environment due to poor air quality
- Check to existing safety control measure is adequate to minimizes risk as low as reasonably Practicable (ALARP).
- A systematic, critical appraisal of all potential hazards related to toxicity involving environment, personnel, plant, services, operations and procedures at workplace in industries.
- To ensure that effective occupational health safety system to fully satisfy the statutory requirements as per respective state or country rules, regulation and codes.

## 1. Introduction Work Environment Toxicity Assessment

Work place Air quality is important parameter to ensure personnel health of people in industries. In industries, several types of dust, fumes & gases emit during material storage, operation and process facility and mix with air and pollute them. Formaldehyde (HCHO), Total volatile organic compound (TVOC) outdoor, Carbon mono-oxide (CO), Carbon-dioxide ($CO_2$), Particulate matter ($PM_{10}$ or $PM_{2.5}$), Nitrogen oxide ($NO_X$), Sulphur oxide ($SO_X$) are few examples of agents, if they exceed beyond permissible value in work environment, then harm to personnel health and environment. Poor air quality exposed to personnel health through inhalation and may lead to cause of respiratory related illness or harm to others organ of human. The work environment Toxicity assessment is simply the characterization of the potential adverse effects on the safety and health of employees, the public, property and the environment in general. This work environment Toxicity depends on different factors such as product, physical and hazardous properties, handling procedures, storage conditions, duration of exposure and existing control measures, necessary to minimize its adverse effects. In this paper, workplace Toxicity is concern as poor air quality.

Work environment Toxicity Assessment helps to identify materials/products storage, handling and process facility related risk associated with personnel health at work place in industries and their characterization. Effective method always helps to identify potential adverse health effects, potential sources that can harm to environment and adequate safety control measure. As part of the work environment Toxicity assessment, Air quality samples are tested at work place of different location to evaluate health risk. Inadvertent using of hazardous product at work place can result of Occupational Health diseases due their exposure. In addition, Hazardous agent generates from products and process facility and mix with air to environmental concerns and threat to the health and safety of employees. A majority of these health related incidents involved routine frequently performed procedures. Their occurrences can only be attributed to improper material storage, handling, labeling, inadequate training, and/or lack of updating or improving work procedures. There is possibility of health problem when not follow safety norms during working at poor air quality hazardous work place. To ensure personnel safety and probability of environmental impact of such incidents are minimized, a work environment Toxicity assessment, which includes products/ Process study and evaluating work environment toxicity related risk at workplace in industries. There may be different route of exposure of personnel of work environment toxicity such as inhalation, ingestion, injection or direct contact with skin. In this paper basically cover to such agent that can be exposed to personnel health through inhalation.

## 2. Work Environment Toxicity Assessment Procedure

The work Environment Toxicity Assessment in any industries is performed as per the standardized ISEI Methodology, which comprises six steps as shown in Table 1. The objectives of these steps, descriptive parameters and the methods followed to achieve the assessment are also listed in the table 1. Steps can be increase or reduce as based on requirements and study

**Table 1: Work environment Toxicity Assessment (ISEI methodology)**

| Steps | Description | Objective | Methods |
|---|---|---|---|
| 1 | Identification of Products / Materials/ Process | ▪ Obtain an inventory list of all products<br>▪ Recognize hazardous properties<br>▪ Process identification<br>▪ To identify hazardous emission or agents | ▪ Process review<br>▪ Walk-through inspection<br>▪ Interview pertinent personnel<br>▪ Review Material Safety Data<br>▪ Sheets, and waste profile reference of materials |
| 2 | Storage Facility & Condition | ▪ Signs and accessibility<br>▪ Authorized personnel only<br>▪ Area conditions<br>▪ Ventilation<br>▪ Compatibility<br>▪ Containers type (sealed / open)<br>▪ Spills and leaks contingency plans (decontamination)<br>▪ Shower facilities<br>▪ Personal Protective Equipment<br>▪ Labeling and proper hazard warning<br>▪ CHBs and Posters<br>▪ Record keeping<br>▪ Fire extinguisher<br>▪ First aid facility availability | ▪ Physical Inspection & Record verification<br>▪ Interview pertinent personnel<br>▪ Consult company standards and reference materials<br>▪ Storage Facility structure including tank, pipelines stability verification |
| 3 | Method of Transfer & | ▪ Closed versus open systems<br>▪ Employee exposure risk<br>▪ Caution Labeling | ▪ Walk-through inspection<br>▪ Interview pertinent personnel<br>▪ Procedures review of loading / |

| Steps | Description | Objective | Methods |
|---|---|---|---|
| | Handling | ▪ Chemical Hazard Bulletins and Posters<br>▪ Personal Protective Equipment<br>▪ Training and work practice | unloading for bulk-delivered products<br>▪ Exposure assessment as warranted |
| 4 | Control Measure include PPE's | ▪ Whether they are required<br>▪ Availability and conditions<br>▪ Whether they are required<br>▪ Availability and conditions | ▪ Walk-through inspection<br>▪ Process review to determine feasibility<br>▪ Interview Pertinent Personnel<br>▪ Compliance of OHS element |
| 5 | Medical Health Check Up & Record | ▪ Whether Medical Health Check up Conducted<br>▪ Compliance of Medical Facility | ▪ Inspection & record<br>▪ Interview Pertinent Personnel<br>▪ Routine medical health Check up of employees those engaged in AFR handling site<br>▪ Availability of Certified Medical staff and resources |
| 6 | Air quality Assessment & Toxicity related Risk Classification | ▪ Recognize high, medium and low risk of work place Toxicity<br>▪ Establish special procedures for handling high-risk products | ▪ Review data from the above steps<br>▪ Air Sample Collection and measurement<br>▪ Determine compliance with Govt. Guidelines & standards |

### 2.1.1 Identification of workplace storage products/materials, Activities and their Hazardous Properties

In this stage, Products, activities and their hazardous properties has been identified through workplace visit. All details of Products and process activities data should be collected and study conducted to know the properties of materials and potential risk at work place. The work place Toxicity related hazard ratings can be determined from Chemical Hazard Bulletins (CHBs), Material Safety Data Sheets (MSDSs), waste profile, Workplace monitoring and/or other related reference materials. On based on Material or generate waste or agents generated during process can be identify and categories in hazardous and non-hazardous. During the assessment, need to note down to raw materials that used during process facility & operation. List out to materials as per Table 2

**Table 2: Lists of Materials / Products**

| Name of Materials | Type/ Nature (Hazardous/Non-Hazardous) | Safety data sheet & waste profile (if applicable) available |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

### 5.1.2 Storage Facility & Condition

In this section, storage facility & Condition has been checked. As per nature of waste, waste storage area should be categorized to store waste materials. Waste material available may be in form of solid, liquid or gas. When materials received from supplier, and emptied in such area. Need to access exposure assessment to personnel that are engage in their work in storage area. Potential exposure to person depends on existing safety control measure, Toxicity of material and air quality status of work environment.

**Table 3: AFR Materials weight, storage & Transportation (Handling) Summary**

| Products/ Material Name | Type (Hazardous/ Non hazardous) | Storage Details | | Storage Location | Storage Type Open area / Roof shed area / Closed area | Mode of Transport from supplier to store to Operational area (Truck / Trailer) | Supplier Name |
|---|---|---|---|---|---|---|---|
| | | Stock position In MT | Maximum Storage Capacity in MT | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

### 5.1.3 Method of Transfer & Handling

In this stage, need to find details information regarding supplier, method of Transport and handling to materials. Materials can be transport through Trailer, container, Rail or other means to origin to plant. In Industries, solid material can be transfer manually, through conveyor or other means and liquid materials can be transfer through Pump, pipe, container or other means. In this stage, study is carried out to know potential personnel health effect and harm to environment during Transfer and

handling.

**Fig. 1: Waste handling & Process Facility**

### 5.1.4 Medical Health Check Up & its Record

Employees health check-up records of Occupational health center (OHC) helps to identify previous health disease. Such disease may be results of any hazardous agent exposure due to inhalation shall be check by assessment team. Availability of Occupational health center (OHC) help to examine employees regularly to identify and diagnose toxicity related illness or diseases in early stage. So, Previous illness record help to find hazardous agent availability at work place and OHC help to minimizing such risk. On based on these, study can be conducted to know air quality status at work place in storage and process facility area of industries.

### 5.1.5 Air Quality Analysis & Toxicity related Risk Classification

To Identify Airborne contaminants in air, Test to different parameter of air quality such as Oxygen, CO, HCHO, TVOC (Indoor & Outdoor), Particulate Matter (PM), Air quality index (AQI) and based on these obtained results, evaluate to associated risk with air quality of work place. If air quality will be poor then there will be risk of exposure to personnel health. Work place air quality can me monitor through Air quality monitor, Multi gas detector or other digital instruments to measure $H_2S$, CO, $PM_{10}$, $PM_{2.5}$, HCHO, AQI likes parameters to identify to air. A standardized criterion can be use to characterize the risks pose at work place to be identify products and process facility at site. Accordingly, to products/materials or process that area using at workplace can be classified as hazardous and non-hazardous, or whether special handling procedures are required for each class. Factors which were considered in the stated standardized criteria included the hazard ratings of the product, quantity storage capacity and conditions, handling procedures, potential

risk of employee exposure, duration of works, likelihood for leaks or spills and the presence and/or lack of safety control measures. On based on air quality analysis, physical walkthrough inspection & record verification, Air quality can be identify. Work environment toxicity risk can be identify and categories into low, medium or high or satisfactory and unsatisfactory.

## 6. Study Overview & Results of Air quality parameter on based on Assessment at AFR handling site in integrated cement plant

A work environment Toxicity assessment was carried out at AFR handling site in an integrated cement plant. Name of plant not included here due to mutual agreed with ISEI & respective company to not open name. In AFR handling & Process Facility area, Plastic waste, Pharmaceutical waste (Liquid & Solid), Spent carbon, Paint sludge, Agree waste, wooden dust, MSW, ARETP were using in which their few materials were hazardous and few were non-hazardous nature. Due to few limitations, details properties with name of materials not including here. Two Types of System were available there, solid AFR handling system & liquid AFR handling system. On based on Air quality analysis and physical walkthrough inspection of different location of material storage and process facility area and verification of records, different area are categorized in Two ways

- **AFR handling site A:** Air quality at work place is satisfactory
- **AFR handling site B:** Air quality at work place is un-satisfactory

AFR materials classification and specific action requirement as per standard include developing special handling procedures, employee awareness training, container labeling, engineering control and administrative control measures is considered during work environment toxicity related risk evaluating as per **Fig. 2.**

It needs to be emphasized that the degree of a risk posed by a given at AFR handling site (B) area can be minimized if special handling procedures are developed and implemented for the safe use of that product as per given recommendation and existing control measure should be available regularly.

### 6.1 Work environment air quality Status at AFR handling site

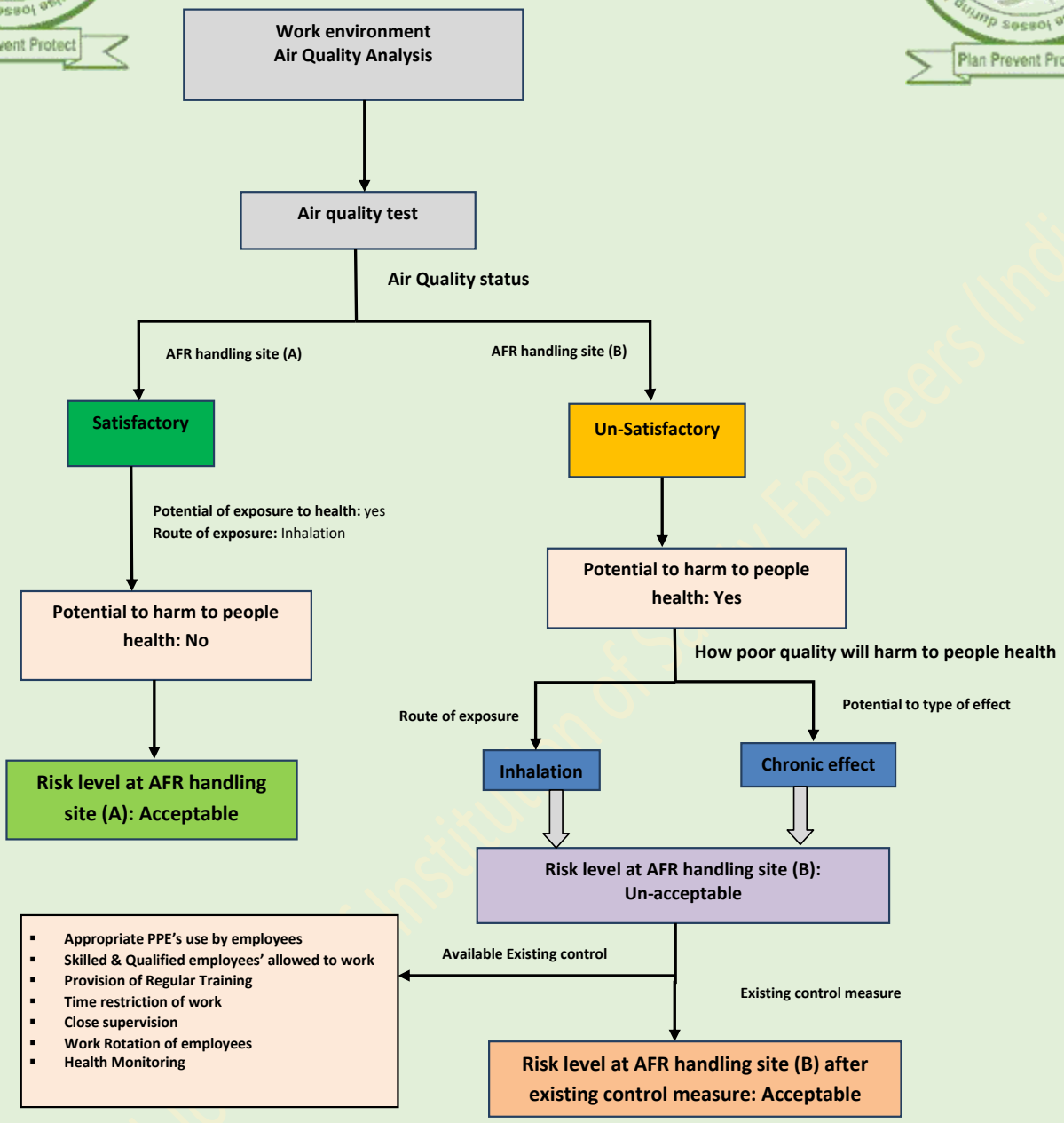


**Fig. 2: Risk Level at Area A & B**

Air quality of AFR handling site (A) area is satisfactory and Air quality of AFR handling site (B) area is unsatisfactory and cause harm to personnel health, if any gaps in existing control measure and in this area the presences of hazardous agents in air were very less and this may effects to personnel health due to long term exposure, if any gaps exist such as not using is suitable respirator.

During walkthrough inspection by Assessment team, this was found that Shredder is programmed to prevent untoward happening in case of overload or any deviation. Double Flap Valves were

provided for Safety Interlock, Shut off Gate provided to prevent possibility of any reverse flow from the Pre-calcine. Best practices adopted during waste material storage, transfer and handling, engaged workmen are well trained and they use appropriate PPE's therefore No or less possibility of exposure of health-related risk.

It needs to be emphasized that the degree of a risk posed by a given AFR product/materials and process facility has been minimized to implement Safe operating procedures and take other necessary safety control measure.

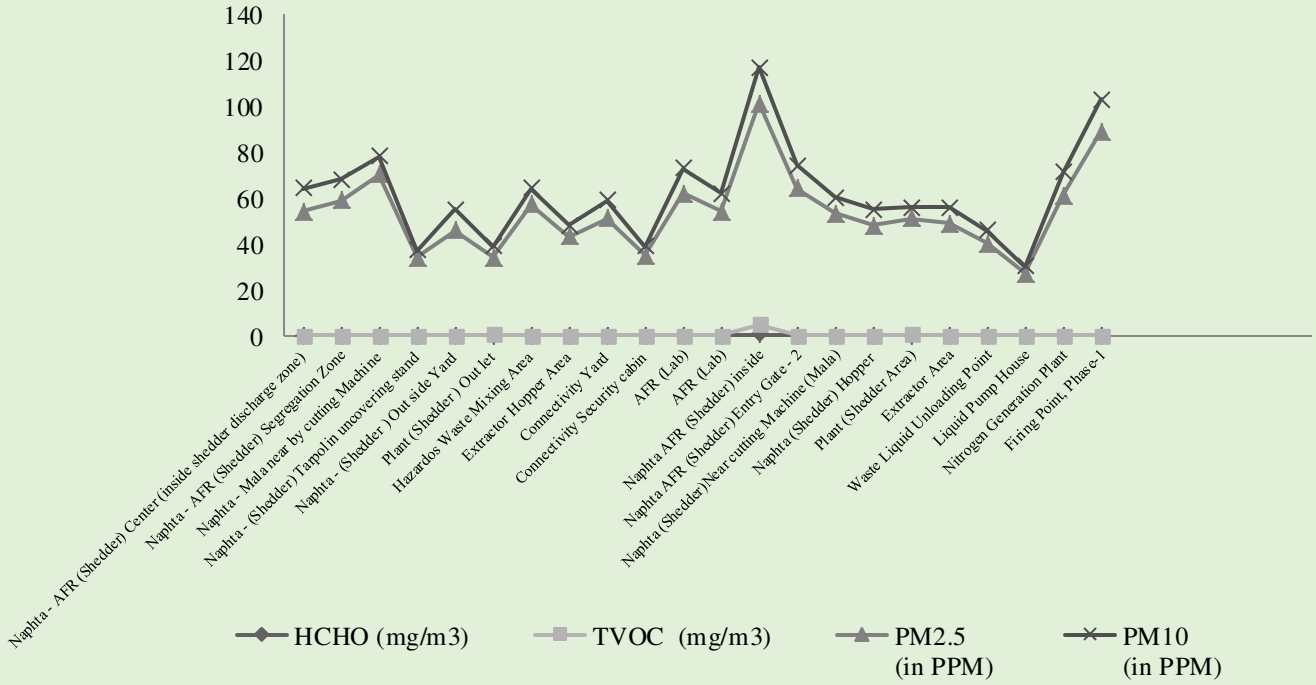


**Fig. 3:** TVOC (Outdoor), HCHO, $PM_{2.5}$ & $PM_{10}$ results at AFR handling site

### 6.2 Permissible Value of hazardous agent in work environment

Formaldehyde Permissible Value at work place is 0.50 PPM and 0.75 PPM is 8-hour exposure limit as Per OSHA. Average outdoor level 0.03 PPM is acceptable at work place. As per OSHA the permissible value of Carbon mono-oxide (CO) is 50 parts per million (ppm) for 8 hours.

**Table 4, Air quality Parameter Exposure limit with permissible value**

| Parameter | Exposure Limit with permissible value | |
|---|---|---|
| **$PM_{2.5}$** | 10 µg/$m^3$ **(Annual)** | 25 µg/$m^3$ (1 hours) |
| **$PM_{10}$** | 20 µg/$m^3$ (Annual) | 50 µg/$m^3$ (24-hour) |
| **$NO_2$** | 40 µg/$m^3$ (Annual) | 200 µg/$m^3$ ( 1 hour) |
| **$SO_2$** | 20 µg/$m^3$ (24 hours) | 500 µg/$m^3$ (for 10 minutes) |
| **Formaldehyde** | 0.1 mg/$m^3$ (30 Minutes). | |

**Sources:** WHO guidelines

**Table 5, TVOC levels and adverse health effects**

| Hygienic Rating | Limit of Exposure | TVOC (PPM) |
|---|---|---|
| Acceptable | No limit | 0- 0.065 |
| Not harmful | No limit | 0.065-0.22 |
| Minor harmful | Less than 12 months | 0.22-0.66 |
| Harmful | Less Than 1 month | 0.66-2.2 |
| Condition Not acceptable | hours | 2.2-5.5 |

**Sources:** TVOC guidelines issued by the German Federal Environmental Agency

## 7. Summary & Discussion on based on AFR handling site

A work environment Toxicity Assessment (WETA) which includes AFR Product/ Process analysis was conducted at AFR handling site of an integrated cement plant unit on 20-21 Dec. 2019 and 31 Dec. 2019 to 1st Jan. 2020 in Gujrat state. The assessment was done in compliance with 41 F, Schedule II of Factories act 1948, HWR, EPA and Hazardous Materials Communication Program (HAZCOM)". The work environment Toxicity Assessment was performed as per the standardized "ISEI work environment Toxicity Assessment Methodology" with the following:

- Company was taken applicable NOC and permission from state govt. and respective

authority.

- Company was a very good record on worker safety and environmental management. This can be attributed to the management's commitment in implementing and promoting corporate objectives on occupational health, safety and environmental goals.
- Company has won several award and recognition in field of Occupational, Health safety
- As per company policy, AFR team not accepts to such material or processes that have potential to create health risk or harm for environment. They check inventory, waste profile and analysis to sample. AFR Team follows all safety rules to control risk during AFR storage, handling and process facility.
- Periodic Health Check up conducted regularly (on every six month) for workmen and certified staff's available in OHC center including certified Doctor (AFIH qualified). Till date, No any Occupational Health related problem occurs at AFR handling site.
- Total Air quality sample collected from 24 locations from AFR handling site in which 20 location, No any risk found to pose of health risk for engaged employees. On Four location air quality was unsatisfactory. Oxygen level at work environment of all location was satisfactory and Carbon-monoxide, $H_2S$ was not found on any location of AFR handling site.
- At AFR handling site, few category of waste material has Hazardous nature that used at AFR handling site and Hazardous waste management plan (HWMP) was not documented properly to ensure compliance effectively
- All HAZCOM elements necessary to work safely with AFR materials / chemicals had been implemented. Material Safety Data Sheets and/or Chemical Hazard Bulletins were conspicuously posted in hazardous AFR waste/chemical handling areas. Elements of operating procedures for handling certain AFR products/Materials had been developed and implemented accordingly.
- Some AFR products that have potential to cause health effect had been identified prior to this assessment based on their hazardous properties, storage requirements, handling procedures and health risks. Relevant Operating Instruction Manuals have been developed to address health, safety and environmental aspects of such chemicals.
- Few chemical products were classified as medium-risk products. The need of special

handling procedures for these chemical products is recommended. The remaining products were classified as low-risk products and their requirement for special handling procedures are of low priority.

- A chemical compatibility analysis was applied. This was necessary for the recognition of incompatible chemical products, which must not be mixed, stored and/or transported in close proximity to one another. The findings were arranged in a compatibility chart which readily illustrates and alerts employees of these products. Only high-risk chemical products were considered in constructing the chart.
- Recommend to supplier to submit safety data sheet of AFR products and materials that nature are Hazardous and driver competency details including Training record.

In general, housekeeping was good, a probable indicator of a committed and enthusiastic workforce. Personal protective equipment was suitable and adequate for the purpose. AFR team monitor CO, $H_2S$, $CH_4$ & $O_2$ Parameter on daily basis storage shed naphtha and plant. Safe operating procedures (SOP) & Hazard identification risk assessment (HIRA) prepared for AFR waste material handling and process handling. Over all observation ISEI Team found that risk is minimized As low as reasonable practicable to implement effective occupational health safety management system.

**8. Conclusion:** The aim of this study was to identify and evaluating probability of potential exposure of toxicity in work environment at AFR handling site or similar operation and process facility area. ISEI methodology has been used to measure and evaluate Toxicity in work environment and contaminants that were presence in air and it can results harm to personnel health. To evaluating work environment toxicity, basically focus to air quality that breathes by employees at AFR handling site. Air quality is monitored through digital air monitor and multi gas detector. HCHO, TVOC, $PM_{2.5}$, $PM_{10}$, $O_2$, like parameter has been measured of different location of AFR handling site and found air quality is satisfactory except Naphta AFR (Shedder) sub-part pre heater, Naphta AFR (Shedder) inside, Plant (Shedder) Mixing Area and Firing Point, Phase-1. Air quality unsatisfactory means contaminants are mixed with air and such contaminants can pose a significant health risk due to inhalation but such contamination in air have not potential to cause harm. This can be effect to personnel health due to long term exposure and if gaps in any existing control measure. Existing control measure at AFR handling site was adequate to control such risk upto Tolerable level.

Apart from this, AQI, $H_2S$ and CO also measured on different location of AFR storage, handling and operation facility area through Air quality Index meter and multi gas detector and found non-

presence of AQI, $H_2S$ and CO in work environment at AFR handling site. Humidity and temperature at AFR site also measure and found satisfactory. Company were adopted best practices at AFR handling site to avoid any adverse health effect, employees use suitable personal protective equipments, un-authorised personnel entry is restricted and medical health check done time to time of all employees those are engaged at AFR handling process facility. Company AFR Team monitor CO, $H_2S$, methane & $O_2$ on daily basis on different location of AFR handling site. AFR Team Prepare SOP and HIRA for activity related to AFR handling and Process facility and ensure its strictly compliance as Per The Factories Act, India and respective legislation and codes.

Firstly, collect data and study to Storage and process facility, Need to identify potential route of exposure to person and effect to environment and based on this, plan and conduct Work environment Toxicity assessment. As per Institution of safety Engineers (India), 6 steps were used (**Table 1**) to identify work environment Toxicity but this is not limitation and steps can be reduce or increase as per requirements of applicable workplace. Material safety data sheet, waste profile of generated waste, consultation with employees, record of previous illness, air quality monitoring and visit at site helps to identify potential risk associated with work environment and exposed to personnel and control to such risk.

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# [3]Study of Disaster Management in India

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**Abstract**

Disaster creates huge destruction, damage to property, personnel injury and death. In past decades several disasters occurred in India and resulted huge losses including people death, people lost their homes and communities. Disaster may be Natural or Manmade. Earthquakes, floods, hurricanes, tornados, fires, explosions are few examples of disaster. In this Paper Basically Natural disaster has been covered and discuss their category. In this study, factor that can increase the risk of harm during disaster has been included with such factors that help to minimize or control disaster related risk. Effective procedure also included in this study to control looses or destruction that arises due to disaster.

**Objective**

Objective to Study & Publish this paper is to know major risk associated with disaster and how to control or minimize to such risk. This paper help to know and ensure basic resources that require to control or minimize losses including injury, death or property damage during disaster.

## 1. Introduction

In Past few decades several disasters occurred in India and effected to life of living thing including people. Several people lost their lives, several sustained injuries, several people lost their home. Disaster has potential to cause harm to people and its harm depends upon nature of disaster, duration of disaster, Population and available existing control measure. Available existing control measure helps to protect to people from any potential severity of harm during disaster. During disaster, effect of harm can be reduce or minimize with the help of adequate measure including adequate resources, disaster awareness etc. Resources include trained personnel for rescue operation, provide medical facility, re-locate to people from disaster area to safe area etc. There is no any adequate measure to eliminate completely to natural disaster but risk associated with disaster can reduce or control to focus on effective control measure. Severity of harm during disaster can be minimize to ensure effective control measure during pre-disaster and post disaster stage. Earthquakes, Floods, Cyclone, droughts, Tsunami, Landslide, Avalanche, Fire, explosion are few examples of disaster. Disaster related risk can be control through effective disaster management plan. Disaster Management is effective procedure to control or minimize risk related

to disaster. Different element and sub-element of Disaster Management contribute major role to prevent or minimize losses of property, save to peoples live and prevent any major destruction. As per study of past decade disaster this has been observed that there has been huge destruction & looses occurred including people death, injury, loss of homes, missing to their family members and other several harm.

**Fig. 1 (a), Kashmir Floods, 2014**

**Fig. 1 (b), Indian Ocean Earthquake & Tsunami**

**Fig. 1 (c), Gujrat Earthquake 2001**

**Fig. 1 (d), Cyclone Fani hammers Odisha, 1999**

**Sources:** Google

## 2. Types of Disaster

Disaster can be classified from several ways and below are few types of disaster

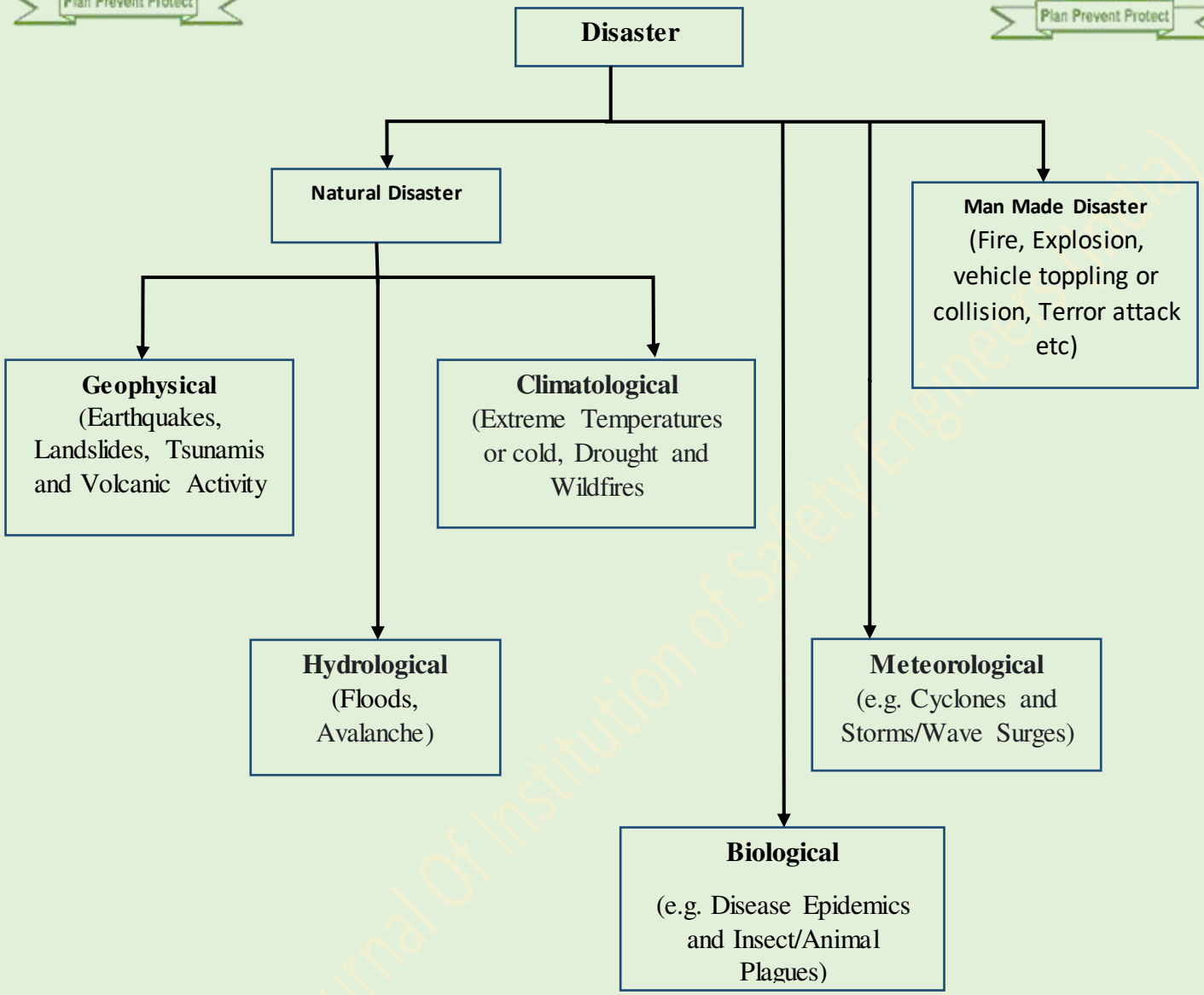


**Fig. 2, Classification of Disaster**

### 3. Disaster in India

India also faced a lots of disaster event and such disaster has been destructed to people live, their home and impacted to state and country economy. Below are Few Disaster of Past decade that results huge losses and destruction in India

| Disaster, Year | Affected area | Causes | Description |
|---|---|---|---|
| Kashmir Floods disaster, Sept. 2014 | Rajouri, Srinagar, Bandipur etc. | continuous torrential rainfall and swelling of Jhelum River | In this disaster more than 550 death occurred, several people injured and huge losses of property. Damaged properties cost was estimated between Rs. 5000 cr and 6000 cr. Due to continuous torrential rain fall, the water of the Jhelum river swelled and entered into residential area of Kashmir. |
| Uttarakhand Flash Floods, 2013 | Rudraprayag, Pithoragarh, Uttarkashi and Chamoli. | Heavy Rainfall & Massive Landslide | In this Disaster more 5700 people lost their live. It effected to 12 district in which 4 districts were worst effected. Heavy rain, massive land slide occurred in June 2013 resulted harm. Several Pilgrims were also effected. |
| Bihar flood disaster 2007 Year: 2007 | Bhagalpur, East Champaran, Darbhanga, Patna, Muzaffarpur, Saharsa, Sitamarhi, and Supaul | Flood due to heavy rain fall | Flood of Bihar was worst flood and effected to several Families of 19 District. Thousands of people lost their live. Millions of People home destroyed. Approx. one crore hectare farmland effected by floods. |
| The Indian Ocean Tsunami 2004 | Southern India, Andaman Nicobar Islands, Lakshadweep island, Indonesia, Sri Lanka etc | Tsunami | In this Tsunami more than 2.3 Lakh people killed. This Tusami was started onthe west coast of Sumatra, Indonesia and effected to 12 countries. The magnitude of this Tusami was 9.1 and 9.3. |
| Gujrat Earthque in 2001 | Kutch, Bhuj, Gandhinagar, Surat, Surendranagar, Ahmedabad, Rajkot, Jamnagar | Earthquake | In This earthquake Approx. People lost their live 20000, Injured 167000 and 400000 become homeless. The scale of earthquake was 7.6 to 7.9 and lasted for 2 minutes. |

Similarly, due to cyclone in year 1999, 10000 people died, more than 3.5 Lakh homes destroyed and two lakh animals were killed. This cycle is known as Cyclone Fani hammers Odisha 1999.

In year 1770 due to Drought/Famine several districts of west Bengal & Bihar effected. This Famine was started in 1769 from failed monsoon and continued till 1773. In this Disaster approx. 1 crore

people killed, 10 million of people died due to hunger. This Disaster is known as Great Bengal Famine 1770. Therefore, Disaster creates huge destruction.

## 4. Factor that increase Risk of destruction during Disaster

Disaster results destruction and effect to Economic, environment & Living Things. Destruction depends upon below factor

**Population Density:** Higher the Population, greater the impacts of disaster and Loss of Property, lives and other losses probability will be more during disaster.

**Environmental degradation:** Removal of trees and forest increase the risk of landslide, reduce ability of rainfall absorption of soil and results higher impacts of loss.

**Urbanization:** Poor planning and using poor quality material during infrastructure development including building construction result higher risk of building collapsing or damaging during disaster and lead to major loss such as people live.

**Disaster Management Plan (DMP):** Ineffective DMP increase the risk of great loss of People lives, Property damage and other harm. Poor resources availability such as Trained Personnel, Medical facility including Medical personnel, Transportation to re-locate/shift to people from disaster zone to safe zone like factor always increase the risk of harm.

**Disaster Awareness:** Poor Awareness among people increases the risk of destruction. People don't know the actual safety measure that should be taken during disaster to save them and minimize or control to loss.

Apart from this risk factor of disaster also depend on types of war, Terror attack, Political issues, and proactive safety measure including information received of potential likelihood of disaster earlier like factor.

## 5. Method to Minimize or Control Risk during Disaster

Disaster related risk can be reduced or minimize through effective identification of potential harm that can occur during disaster event, effective plan for emergency preparedness, response and recovery. Identify to potential Disaster, evaluate to risk to consider probability of disaster event and its severity that can occur during disaster for respective area of state. On based on level of Risk, need to take adequate safety control measure. Need to ensure adequate resources such as trained personnel with rescue team, Transportation, emergency equipment to for needful action during disaster or earlier. Need to create awareness among people to know and save live in case of disaster. Government should arrange such facility to identify and share information to people

earlier regarding potential disaster as based on assessment, detection and possibility shared by respective research center or govt. agency. Population should be re-locate or shift to safe area, if require. Emergency contact no. should be share among people. All applicable element of Pre-disaster and Post-disaster conformance must be ensured. Disaster Management plan (DMP) is best document and written procedure to identify potential risk of disaster, its impacts and mitigation measure to reduce or minimize to loss or destructions. All elements should be included in DMP to avoid any gaps and as per applicable element, strictly conformance should be ensure and time to time conduct emergency disaster response drill to check the system efficiency & improvements. Preparedness, response, recovery and mitigation are Phase of Disaster Management (Fig. 3)

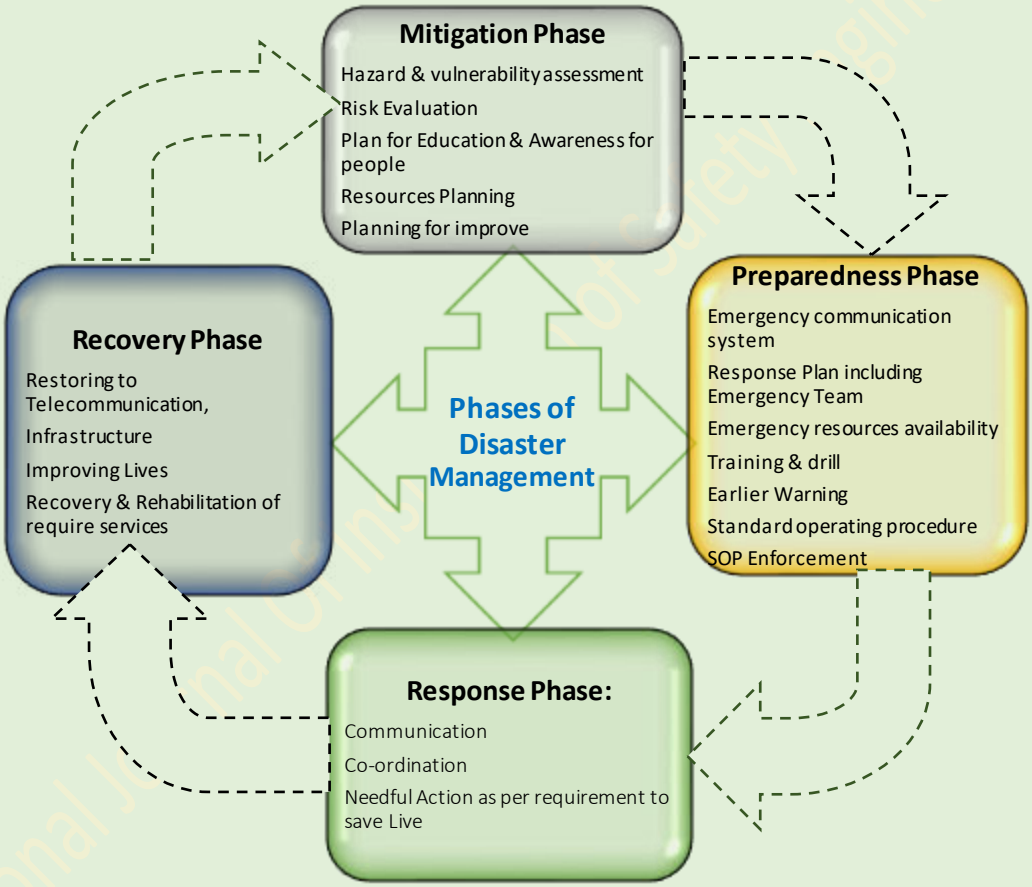


**Fig. 2, Phase of Disaster Management**

## 6. Conclusion

In past decade several disaster occurred in India and huge losses of live, property damage, harm to living things. Disaster may me Natural or manmade. Earthquake, Tsunami, Landslide, heavy rain are few example of disaster. Destruction during depends upon nature of Disaster, Time duration, Population density, Emergency resources including disaster management plan and its effectiveness

implementation. To control disaster related risk need to prepare effective Disaster management plan and see for their effective implementation. We should plan for effective control measure from two ways and first should be consider for Pre Disaster phases such as Prevention, Mitigation & Preparedness and then for Post disaster phase and under post disaster Response, Recovery, Reconstruction like Factor consider. Identify potential disaster event to mitigate associate Risk. On based of Risk evaluation Emergency preparedness and response plan should be prepares and see for their strictly implementation to avoid any major loss during disaster. As per State or District Probability of Potential disaster should be identify and adequate measure should be taken to prevent any loss.

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# [4]Earth-Pit In Respect of Safety

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**Abstract**

Different earth-pit is use for electrical and instrumentation load separately as well for neutral connection (NEP). Necessity of earth-pits is for healthy system. Importance of Earth pit is covered in this paper. Earthing function of any equipment or system depends on Earth pits. So this study is carried to know earth pits importance.

**Key word**

Earth-pit, different earth-pit requirements, Necessity, Safety

## 1. Introduction

Safety or Health Safety & Environment (HSE) term is very much famous with Earth-pits. In every industry earth-pit is necessary for electrical and instrumentation equipment. Almost in every industry we are handling different machinery and different instrumentation items to control and monitoring of the system properly.

Day by day we are depending on various machines and control techniques whereas we are turning into smart system. Earthing is playing a major role here. To maintain every system proper and healthy earthing is very much important.

Now-a-days double earthing is used instead of single earthing and different standards are following for maintaining of earth-pits. Different checklists are maintained for earth-pits and their periodical data is mandatory for each and every audits. Here we will see the earth-pit details and associate activity related respective pits.

## 2. Earth-pits different category

Earth-pit for electrical equipment is placed separately with instrumentation earth-pit as there may be a chance of high current flowing through instruments which can damage that instantly. So, for electrical, separate grid and for instrumentation separate grid to maintain.

Example: - In a plant we have Some 100 hp, 200 hp motors as well some 40hp motors, earth point connected in separate earth-pits and that is connected with grid itself (In an earth-pit we get two values i.e. With grid value and without grid value).

Beside electrical equipment's we have also instrumentation parts like some relay, PT, DPT. For that separate grid to use.

For transformer neutral earth-pit and UPS connection, separate earth-pit to follow.

Generally, grid resistance to maintain 0-1 ohms and without grid resistance varies as per location and separate standard is there to maintain respective resistance.

If earth-pit resistance value does not meet the requirements, Nacl/Charcoal to use in earth-pit to maintain the resistance or the pathway.

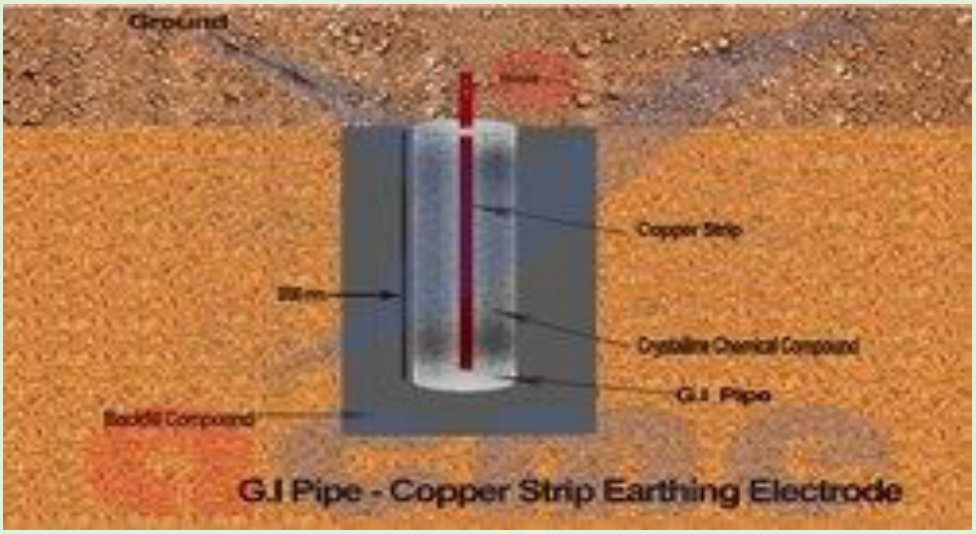


**Fig-1, Earth Pit**

## 3. Necessity of earth-pits

Earth-pit is necessary to create a path for extra charge generated during operation. It is the way of low resistance by which extra current can flow freely and make safe for the respective equipment. As much as low resistance, its effectiveness will be more. Now-a-days double earthing is incorporated in every sector for the safety. If one section is not working then another one will be there.

Potential source where exists, earthing is required that time. Half-yearly earth-pit checking is necessary in max sector. For resistance checking megger is used. With grid and without grid resistance to check. For this check two electrode is used. One electrode is used in 15 Meter range from the respective earth-pit. Another electrode is used in 30 Meter.

Megger is nothing but a high resistance checking meter which measure resistance by using Ohms law. Strip earthing and wire earthing are used in industrial practice.

**Fig-2**

## 3.1 Earth-pit & thunder protection

For thunder protection, copper rod in high mast is generally used or any tall structure is made separately and copper rod is used on that.

For that separate structure, earth connection maintaining done separately. Separate G.I and copper are used for earth connection.

Thunder can cause sudden fire or damage so its earthing must be proper and separate.

## 3.2 Safety Solutions

Following steps to be followed as mentioned below: -

- Earth-pit inspection to be done periodically and maintain record.
- Take necessary steps for high resistance.
- Maintain electrical and instrumentation separate pits.
- Neutral earth-pits to maintain separately.
- High mast or any structure which is used for thunder protection, separate earthing to maintain.
- Double earthing to use.
- Strip-earthing and its thickness to maintain.


**Fig-3**

## 4. Conclusion

- Earthing strips used must be proper and their tensile strength should be good.
- Double earthing to be done.
- Proper maintenance to be done for each and every earth-pits.
- Equipment wise separate earth-pit to maintain.
- Proper tag and resistance value to maintain in each earth-pit.

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RNSN Seriate

## RNSN SERIATE (P) LIMITED

**About us:** RNSN Seriate (P) Limited is private company limited by share. RNSN Seriate (P) Limited is Engineering, Procurement, Construction, Manpower supply & multi solution Engineering Company. RNSN Seriate (P) Limited is an ISO 9001:2015, ISO 14001:2015 & ISO 45001:2018 certified company. Corporate Identification No. (CIN) of RNSN Seriate (P) Limited is U93090CT2018PTC008917. RNSN Seriate (P) Limited also provides Consultancy, Chartered engineering, ISO Auditing & Certification Services.

RNSN Seriate (P) Limited vision is to deliver world class best services and Products to our customer as per their expectation.

**Sustainability:** For sustainable business, RNSN Seriate (P) limited is committed to fulfil Social, Economic & Environmental requirements and ensure compliance as per applicable law, norms & codes. RNSN Seriate (P) limited will take all necessary steps to achieve zero harm, save natural resources and protect to environment.

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### Health, Safety & Environment (HSE) Policy

**RNSN SERIATE (P) LIMITED** is committed to ensure Safe healthy work environment to protect human being as well as Environment. In Order to achieve Health Safety & environment related objective, Policy is:

- Ensure compliance on based on relevant National, International Rules, Regulation, Norms & Codes
- To main high Safety Standard at workplace, we adopt best Safety Practices & Conduct Safety Program regularly.
- To Plan & effective implementation of Safety Health, Environment management system
- Being new organisation, always seek opportunities and Continual improvements in products, process, Services and Peoples to ensure compliance & standards.

RNSN Seriate (P) Limited takes all necessary steps to achieve zero harm & increase stakeholders satisfaction.

**Date:** 30/11/2018 Director

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RNSN SERIATE (P) LIMITED

### Quality Policy

**RNSN SERIATE (P) LIMITED** is committed to Manufacture, Supply products, Provide Engineering & Consultancy Services conforming to customer's quality standards and meet their requirements on time through effective planned activity and continual improvements of products, process, Services & Peoples to ensure compliance as per relevant national and International Norms, Codes & Standard.

RNSN Seriate (P) Limited take all necessary step adopt standard practices to maintain quality of Products, services & increase stakeholders satisfaction

**Date:** 03/12/2018 Director

## TRAINING CALENDER

### Training Calendar (April-June 2021)

| Training Title/ Course | Duration | Schedule | Location | Remarks |
|---|---|---|---|---|
| ISE-SM (Safety Management at work place) | 3 day or Min.24 hours Training | 01/04/2021 to 03/01/2021 | Raipur | E-Learning/ Regular mode |
| ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.) | Min. 96 hours Training | 05/04/2021 to 14/04/2021 | Raipur | E-Learning/ Regular mode Exam date 15/04/2021 |
| Integrated Lead Auditor (ISO 45001:2018, ISO 9001:2015, ISO 14001:2015) | 9 Days | 19/04/2021 to 28/04/2021 | Raipur | E-Learning/ Regular mode |
| First Aid | 1 days | 30/04/2021 | Raipur | Regular mode |
| ISE-TQM (Total Quality Mgt.) | 3 day or Min.24 hours Training | 03/05/2021 to 05/05/2021 | Raipur | E-Learning/ Regular mode |
| Lead Auditor ISO 9001:2018 | 5 day | 10/05/2021 to 14/05/2021 | Raipur | E-Learning/ Regular mode |
| ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.) | Min. 96 hours Training | 18/05/2021 to 27/05/2021 | Raipur | E-Learning/ Regular mode Exam date 28/05/2021 |
| Safety Audit in Engineering Industries | 3 days | 28/05/2021 to 31/05/2021 | Raipur | E-Learning/ Regular mode |
| ISE-SM (Safety Management at work place) | 3 day or Min.24 hours Training | 03/06/2021 to 05/06/2021 | Raipur | E-Learning/ Regular mode |
| Lead Auditor ISO 45001:2018 | 5 day | 08/06/2021 to 12/06/2021 | Raipur | E-Learning/ Regular mode |
| ISE-EM (Environmental Management) | 3 day or Min.24 hours Training | 16/06/2021 to 18/06/2021 | Raipur | E-Learning/ Regular mode |
| First Aid | 1 days | 21/06/2021 | Raipur | Regular mode |
| Lead Auditor ISO 45001:2018 | 5 day | 22/06/2021 to 26/06/2021 | Raipur | E-Learning/ Regular mode |
| Hazard identification & Risk Assessment in Industries | 3 days | 28/06/2021 to 30/06/2021 | Raipur | E-Learning/ Regular mode |
| ISE- IDOHSEM (International Diploma in Occupational Health Safety & Env. Mgt.) | One year | Last Date of Registration 03/04/2021 | Raipur | E-Learning/ Regular mode Exam Date Dec. 2021 (Proposed) |
| Diploma/ Post Diploma in industrial Safety/Fire/Env. | One year | Dec.- Jan. (2020-21) | Raipur/ Rampur | Regular |

Risk assessment & Control, Behaviour based safety, chemical safety in industries, Safety in construction industries, Scaffolding safety, Petroleum & Gas industries safety, Ergonomics, Mock Drill, HAZOP study, Emergency planning, Disaster Mgt., Fire Safety, Environmental Mgt., EIA Like Training also conduct as per Need.

**Note:** Diploma & ISE-IDOHSEM Courses conducted twice in a year. December-January session known as winter session and June-July session is known as summer session.


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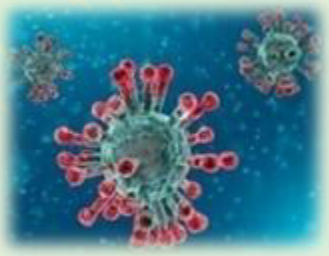

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