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

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This Issue Journal Include:

Volume 3, Issue 1

Effective Handling of Fluids and Liquid Metals using IoT

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Abstract

Fluids and Liquid Metals (FLM) are widely used in industries like steel plants, chemical industries, and nuclear reactors. Handling Fluids and Liquid Metals are a crucial task[5]. Pipelines, propane bobtail trucks, boilers, gas cylinders widely engage with the liquid metals. The structure of the equipment and pipelines designed to withstand several environmental conditions. However, these leakages are the major causes of innumerable losses in nature and industry. FLM leakage can result in serious ecological disasters. This paper discusses the FLM leakage detection mechanism and framework to achieve this. It is hard to avoid the FLM leakage. However, in order to reduce the impact on the environment, it is important to monitor and detect the fire or any other hazards in a timely manner. Early detection of leakages will allow quick responses to avoid FLM discharge.

Keywords: FLM, IoT, SVM, CNN, DNN.

1. Introduction

Transportation and Handling of fluids and liquid metals considered as a major process in industries. Estimated deaths due to transportation of fluids like petroleum products are higher using trucks, ships and rails [6]. The loss due to pipeline [1] leakage incidents is enormous [7]. In the year, 2010 Nearly 8 people killed due to the explosion of a petroleum pipeline [8].

Many fire detection systems generally have simple sensors. This system will have lower accuracy and are sensitive to the sensor failure [2]. For example, sensors like smoke sensor could send false information about heavy dust as smoke.

Existing systems uses physical observation of the FLM chambers or pipelines. Industry could use standard rule based observation sheets. Alternatively, it could be integrated with traditional PLC or Instrumentation based control systems. It is impossible for a normal user to calculate the threshold value and find a dynamic prediction.

This paper aims to identify the different sensors used to handle and monitor the state of FLM. Section 2 describes the different sensors selected for the monitoring process. Section 3 describes

the process of collecting the sensor data, preprocessing it and using Multi AI Technique to do an adaptive prediction and warning system.

2. FLM Leakage Detection Using Sensor

Multiple techniques proposed during last decade. Existing detection techniques categorized as

1. Local and Remote sensing
2. Hardware and Software sensing
3. Ocular / biological sensing
   a. Manual sensing with experienced professional
   b. Visual Testing
   c. Unmanned vehicles or remotely operated vehicle
4. Surface and Internal sensing

Surface level and internal sensing is further subdivides as,

1. Surface level
   a. Sound based sensing,
   b. Electromagnetic sensing
      - Light based sensing
      - Impedance sensing
      - Reflection sensing
   c. Fiber optical sensing
   d. Vapor sensing
   e. Radar based sensing
      - Ground penetration
      - Light detection and ranging (LIDAR) sensing
2. Internal Sensing
   a. Pressure sensors
   b. Digital signal processor

Next subsection briefs out about the various sensing technique.

2.1 Sensing Techniques

Surface level testing /(Acoustic Pulse Technique): Uses fixed frequency range of pulse transmitted on the surface of the pipeline. The delta (difference between the sound pulse and reflected sound pulse) should be constant. The deviation in the delta denotes the existence of leakage. This approach is active or push mechanism where signals directed from the SIGNAL EMMITING SENSOR ➔ EQUIPMENT➔ ECHO DETECTING SENSOR. Another method is passive or pull

mechanism where frequent pulse received from the equipment. Current signal frequency compared with the historical data. If DELTA is approximately 0, then there is no leakage else leakage is present. This system is easy to handle, cost effective and suitable for early detection. However, sensitive to random environmental noise and false alarm triggered.

Fiber Optical Sensing System: Identifies the abnormalities through temperature change in the optical properties of the cable induced by the presence of leakages or cracks. Optical Fiber can act both as sensor and data transmission medium.

Vapor Sampling Methodology: This is applicable in gas tank systems. This methodology helps to identify the small cracks and leakages. Coupling vapor-sampling sensor with other sensors improves the sensing time and provides faster response time.

Infrared Imaging Thermography Camera: Detects the temperature difference in gas tank. This methodology is contactless and non – invasive approach. It is applicable for various condition monitoring application such as heat transfer, tensile failure. This is a highly efficient power for transforming detected objects into visual images, easy to use and process images

Ground Penetration Radar: Ground Penetration Radar is a tool to detect and identify physical structures like buried tanks and pipelines. This is a non-invasive approach utilizes electromagnetic wave propagation and scattering technique. GPR signals are best in timely detection of leakage in underground pipelines, reliable and leakage information is comprehensive. Easily distort this signal in a clay soil environment.

Light detection and ranging sensor: It employs pulsed laser. This technique used for the detecting methane leakage.

Ultra-Light Sensor: Light or fluorescence method uses higher intensity light sources of a specific wavelength for a molecule excitation. Detection of leakage implemented by unfiltered ultraviolet light.

Piezo Electric Transducer: Piezo electric transducers patched on the surface of the equipment or pipelines. Electromechanical Impedance changes with respect to the position of the equipment. Impedance at leakage prone area is different from the normal area.

Capacitive Sensing: Measuring changes in the dielectric constant of the medium surrounding the sensor and used in environmental monitoring. This is best for subsea equipment monitoring. Sensor sensitivity with respect to the leakage size is dependent of the distance between leak position and drift of the leaking medium.

Ocular / Biological Sensing: Ocular/Biological methods uses trained dogs, experienced professionals, smart pigging, drones.

Trained professionals walks around the pipelines, storage tanks, bobtail containers recognizes the cracks , leakages by visual observation or smelling the odor coming out of the crack points. Trained dogs are more sensitive to the change in odor. To improve the observation trained dog monitors with the trained professional.

Remotely Operated Vehicles (ROV) like autonomous underwater vehicles and drones used for remote monitoring. It reduces the extent of human causality. Number of ROV are available for monitoring hazardous environment. This method has higher operational safety is an advantage of unmanned vehicles.

Interior Methods: Interior methods are classified as pressure based and digital signal processing based

Pressure Senso: System continuously monitored and status conveyed to centralized console. Pressure, Flow rate, Temperature, density, volume and other parameters monitored and sent to the Multi IoT Framework. Pressure drops and varies in a closed environment. Proper pressure maintained in the chamber or pipeline and monitored continuously.

If surface pressure == interior chamber pressure, called neutral pressure. If surface pressure > interior pressure then it is called positive pressure. If surface pressure < interior pressure then it is called interior pressure. If leakage occurs, pressure alters and flow speed changes. This negative pressure information sent to Multi IoT Framework and suitable action taken.

Digital Signal Processing: First step is the data acquisition process. In data acquisition process, internal pressure and flow of the fluid is measured. Next step is pre-processing step. Pre-processing step filters the background noise and makes effective feature extraction.Various feature extraction steps employed to extract feature. Extracted feature (pattern) compared with the historical pattern and used for the decision-making. If the compared result is beyond the threshold value alarm triggered.

3. IoT Framework for Adaptive Prediction and Alerting

Behavior of an engine or chamber or boiler or any industry unit might change according to the environmental temperature. Data sensed in same place may change from time to time. Maintaining a static threshold value is not a right option. The dynamic threshold is best for achieving an adaptive prediction and alerting system. It is impossible to calculate the threshold and apply it.

Extraction of feature data from the sensor data is a difficult task. This task simplified by using Artificial Intelligence.

The module Fig 2 has three sub modules

- Data Ingestion Framework
- Context Based Pre Processing
- Multi – AI Based Adaptive prediction framework

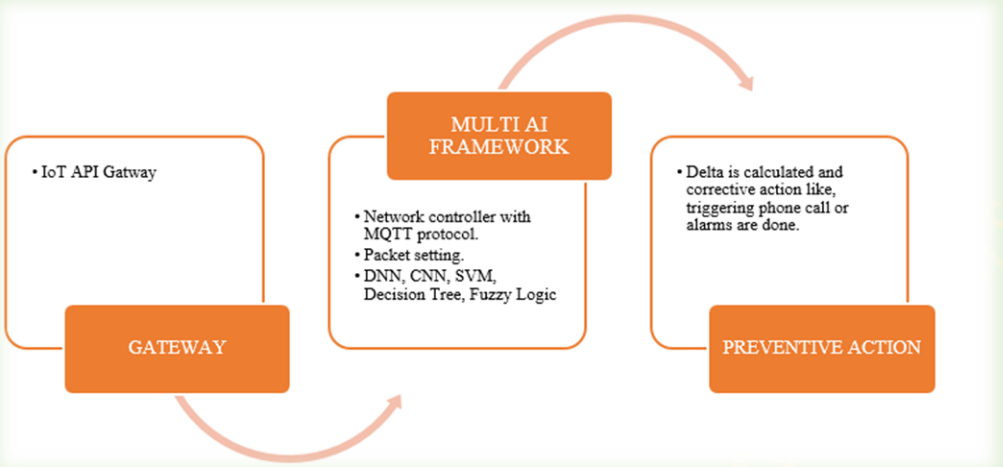

Fig. 1. FLM Leakage and Alerting system.

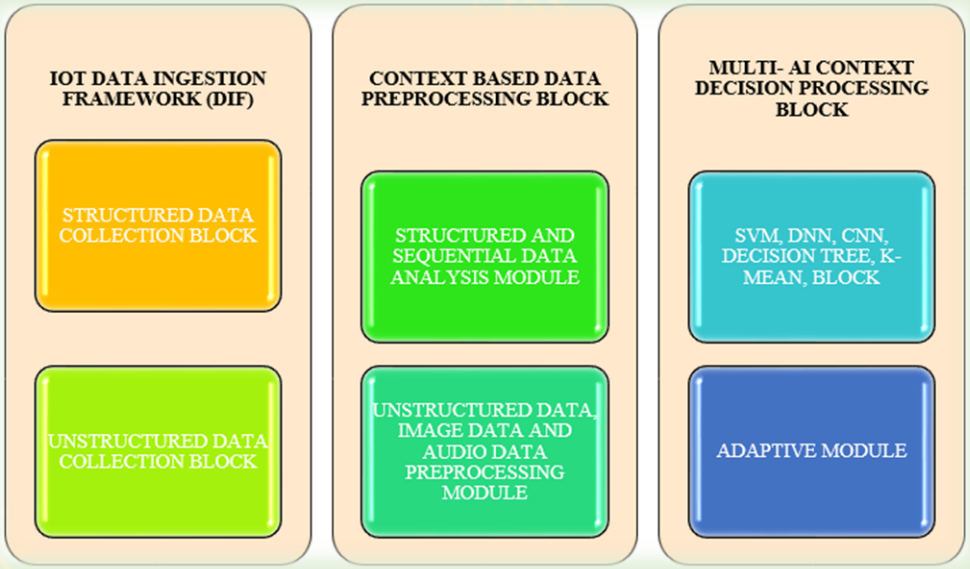

Fig. 2. FLM Modules.

3.1 DATA INGESTION FRAMEWORK

The proposed detection system collects data from multiple IoT gateways (fig 1). IoT API gateway collects the data from heterogeneous sensors sent to a multifunctional intelligence system. IoT Middleware components like MQTT has the ability to connect with various devices [9, 10, 11, and

12]. IoT Middleware connects various devices and transmits data in large-scale IoT systems. TCP based MQTT protocol.

The sensor feeds collected, sent to the context based preprocessing block.

3.2 CONTEXT BASED PREPROCESSING

This context based preprocessing block has multiple Machine Learning algorithms. The selection of algorithm and order of execution could differ from data to data [4].

Sequential data, Text data, Structured, unstructured are separated and processed by respective module. Effective analysis of heterogeneous data achieved by using multiple Machine Learning algorithms.

3.3 MULTI AI- BASED PREDICTIVE FRAMEWORK

ML Algorithm framework divided into shallow learning and deep learning. Shallow learning used for categorizing sensor data. Support Vector Machine (SVM), K-Means Cluster and Decision Tree used to classify and aggregate the sensor data. A deep learning network used to quantify the data and image. Deep Neural Network is used to determine the current value through quantify data and analyze the changing situation through continuous data. Data collected over a period of time hence, immediate data detection is difficult. DNN used to measure the changing situation. Convolution Neural Network analyzes the situation by detecting features in image data. Fuzzy algorithms express the closeness to each situation.

Multiple machine learning algorithms like neural networks, adaptive fuzzy algorithm.

4. Conclusion

This suggested paper list of leakage detection sensors classified and briefed out. Sensors like acoustic sensors, visual monitoring, impedance sensors, fiber optic sensors, and infrared thermal camera are listed. Next, the section describes the data acquisition framework from different sensors with the help of the IoT gateway. Context-Based Data preprocessing block grouped the collected results based on a context. Adaptive analytics has done with the help of the final framework. This proposed approach looks efficient, robust and simple. It suggests a way to handle and mitigate the hazards created due to the Fluids and Liquid Metals. In addition, earlier detection of leakages is achievable and detection of hazards monitored in a timely manner.

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Hazard control method in Construction Industries

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Abstract:

Poor implementation of effective hazard control method in construction industries always increases the potential risk of harm and it results accidents. Accident always create negative impacts of Construction industries business in term of delay project, Poor industries reputation in market, moral decrease of employees etc. and directly it increase the cost of projects. Hazard Control method is effective techniques used to control workplace hazard in Construction industries. Such method Control or reduce the likelihood of hazardous event occurring or Severity of harm of event or both Together. This Study Report is very help to know hazard control method and minimize risk as law as reasonably practicable (ALARP) at work place of construction industries.

Keyword: Hazard Control Method, Need of Safety in Construction Industries, Hazard in Construction Industries, Construction Industries Safety,

1. Introduction:

In India, Construction Industries is second largest industries and play major Contribution to increase GDP. Construction Industries create large numbers of employment opportunities and play major role to social and economic development of country. There are many segments of construction industries such as real estate that includes commercial and residential building construction, Infrastructure includes road, Railways, power like projects and Industrial Project means, construction of Plant, Chemical industries, Pipelines project etc.

Construction Industries is hazardous prone industries. As per Studies, Small Construction Industries, injuries percentage is more than large construction industries. In small Construction Industries, Accident percentage is more due to ineffective enforcement of Safety, Rules and procedure and poor management commitment or poor interest related to safety.

Many study report says that in India, about 48,000 workers die due to occupational accident annually and 38 fatal accidents occur every days in construction section industries.

In Construction Industries, each and every day activity changes and assigns to complete of such activity to migrant labours. Migrant labours come from same region or other region of different states. Some will be skill, some be semi skill and some will be un-skill. New Joined Labour not aware about new construction work site and faces lot of challenges to identify hazard and taking adequate safety precautionary measure due to changing activity nature and work environment time

to time. Similar Situation creates with unskilled labour and this may lead to cause unsafe practices and result accident.

In construction Industries, Types of Activity depends on nature of Projects. Project May be EPC, Mechanical, Civil, Electrical or others. Civil Projects work include excavation, Trenching, reinforcement work, shuttering-deshuttering, Scaffolding erection & dismantling, Brick lining, column/Beam casting, Plaster, Material handling etc. like activity. Mechanical work includes Erection, welding, Gas cutting, Material handling and lifting operation etc. like activity. Electrical Project includes Cable laying, Panel/Transformer erection and commissioning etc.

Therefore, hazard varies activity to activity as per nature of project and risk level depends on available existing control measure and safety awareness among labor including employees.

Figure 1: source (Construction site)

2. Why Safety is important in Construction Industries?

Safety means free from unacceptable risk of harm or from danger or such sources that have potential to cause harm in construction industries. Moral, Legal & Economical Point of view, Safety is very import in construction industries.

Moral responsibility means, being human it is responsibilities of every one to protect own self and others.The accident causes social loss in great magnitude in form of suffering, loss of earning capacity and effected to injured or insured family and society.

Legal responsibilities means, as per Respective State or country legislation, every occupier or employer have responsibility to ensure all safety control measure to protect to their employees,

stakeholder and environment. Occupier means a person who has ultimate control over construction industries is known as employer. It may be Company owner, managing Director or others.

Economical means, Accident results great financial loss of Industries in term of medical expenses, compensation or disablement to the injured or their families, Poor organization reputation, Poor relation with employees and stakeholder, Productivity decreases.

3. Hazard in Construction Industries

Construction industries are hazardous prone industries. Hazard means any sources that have potential to cause harm that means it may lead to cause of Personnel injury, death, Property Damage or combination of these. In construction industries, there are many potential sources of harm which result accidents such as Exposed live power cable, Defective Lifting equipments & Tools, Elevated work platform without hand railing, Unguarded rotating parts of machinery etc. are example. In Construction Industries, Hazard varies Project to Project, associated activity with project and work environment. Few Major Hazard associated with Construction industries are:

- **Fall Hazard**
  - Fall of Person :due to poor workmanship, loss of balance, uneven surface, floor opening, poor work platform, working at height without using full body harness, Defective ladder or stair, slippery floor, Loose material in assess etc. Slip & Trip hazard also comes under Fall hazard
  - Fall of Materials: Due to failure of lifting appliances, Tools & tackles, Loose material Keeping at edge on height or near floor opening, Poor method of Material lifting & shifting etc.
- **Mechanical hazard:** Entanglement, Crushing, Shearing, Cutting, Drawing-in or trapping, Impact, Friction or abrasion, Stabbing or puncture etc. are few example of mechanical hazards.
- **Electrical hazard:** Such as Defective electrical Tools, Loose electrical connection, Over load electrical equipments, Static electricity, may cause of Electrocution, Fire, Burn injury, eye flash, Fall due to electrical shock.
- **Fire Hazard:** Such as Flammable storage near heat sources, Cooking or any sources that have potential to cause of fire and fire accident results loss of lives and property.
- **Physical Hazard:** Such as Heat, Cold, Poor illumination etc. Heat may cause of heat stress, Cold may cause of cold stress,
- **Chemical hazard** like dust, fumes, gases create central nervous system problem & respiratory problem due to inhalation and create skin problem when come in its contact.

- **Environmental hazard:** Such Potential Sources of harm that effect to environment and human being such as dust, fumes, Gases, NOx, SOx, Noise etc. Noise is also comes under physical hazard.

Apart from this, Vehicle movement may cause of hit to person, Hit to object or Collision or topples, **Biological hazard** includes Bacteria, Viruses, Mold and Fungi, Blood and Body Fluids that found at construction site during catering operation facility or Occupational health center facility area may exposed to personnel through inhalation, ingestion, injection or contact with skin. **Radiation hazard** may be Ionizing radiation and non-ionising radiation. X-ray, Gama ray are example of Ionizing radiation and ultraviolet (UV), lasers, radiofrequency etc are example of Non-ionizing radiation, found at site of construction industries. **Ergonomical hazard** includes repetitive movement, manual handling, workplace/job/task design, uncomfortable workstation and poor body positioning. Therefore several types of Hazard found at construction at workplace of construction site.

4. How accident Occur at construction site:

Accident occurs, due to presence of potential source of harm at work place of construction site. When personnel expose with danger then, there is probability of hazardous event occurring and such event results Injury, Personnel death or harm. Accident occurs at site due to unsafe act and unsafe condition. Below are example (Fig.2) of Potential source s of harm that is known as hazard and workers working without using suitable PPE's such as fall arrest system.

Fig. 2, Workmen working at height without ensuring fall protection safety measure, Sources Cons.

Many study report says that In India, about 48,000 workers die due to occupational accident annually and 38 Fatal accident occur every days in construction section industries and overall workplace death are Twenty Times higher than U.K.

As per Bureau of Labour Statics (BLS), U.S approximately 150,000 injuries occur due to accident each year at construction site and major numbers of Injuries occurs due to fall hazard and second one is contact with equipment is significant cause of injury for workers at construction site. Most injuries occur at construction site involves workers back, spines and trunks and majority of accident occur between age 25-34 year old.

In year 2005, As per National Institute for Occupational Safety and Health (NIOSH), Total 1224 workers died at construction site, and construction industries is most dangerous industries.
As per The Occupational Safety and Health Administration (OSHA), one Construction worker injured in every Ten construction workers due to construction site accident. Major Numbers of injury occurs due to Fall hazard at construction site due to OSHA.

As per RIDDOR, In Construction industries, 30 fatal injuries to workers and seven to members of the public occurs during year 2018-19. During 2015-19, Average of 36 fatalities to workers and five to members of the public occurred each year. The major Numbers of Fatality occurred due to fall from height.

5. How Hazard control method help to prevent accident

Hazard control method help to control work place risk. If work place Risk in construction Industries will be Tolerable level, then there will be no potential to harm to people or Organization or environment. Tolerable means, Risk is acceptable level as per organization policy. Adequate safety control measure reduce likelihood of event occurring or severity of harm whenever even occur or both together and work place risk has been controlled. Hazard control method is control work place hazard. Elimination, Substitution, Engineering control, Administrative control, PPE's are example of hazard control method.

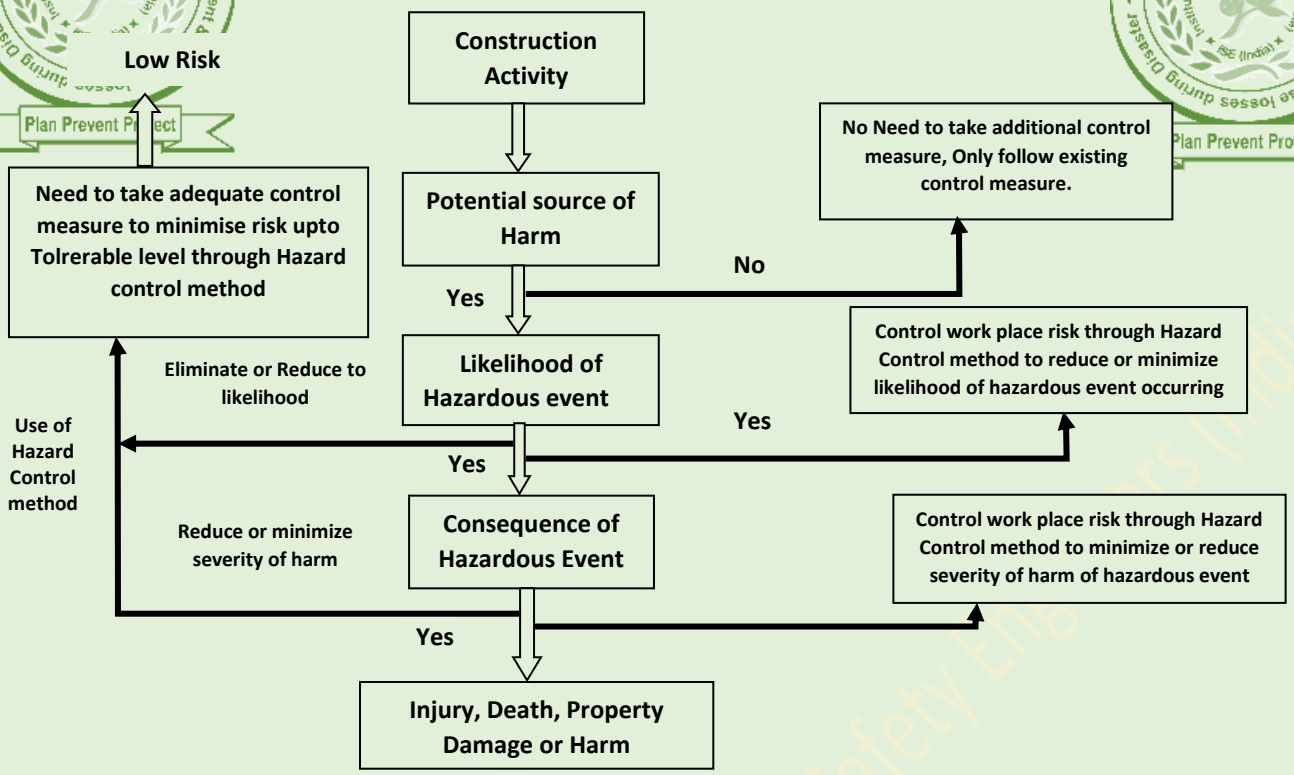

Fig. 3, Risk Control at work place through Hazard Control method

5.1 Hazard Control method in Construction Industries

Method that is used to control hazard at construction industries work site is known as hazard control method. Hazard control method is also known as Hierarchy of hazard control method. Following below are steps that is used to control minimize risk As Low as Reasonable Practicable to reduce or eliminate likelihood of hazardous event occurring or Severity of harm of event or minimize to both (Likelihood and severity of hazardous event) together.

Hierarchy of hazard control method

- **EL - Eliminate** Cover hazard, Kill to hazard etc.
- **SL - Substitute** Use other route/Procedures, other material etc.
- **IS - Isolation** Put up temporary barrier, LOTO etc.
- **EC- Engineering Control** Construct Permanent wall, Mechanical Guard etc.
- **AC - Administration Control** Put up notice, Job rotation,Training, Enforcement of safety rules, Supervision etc.
- **PPE - Personal Protection Equipment** Use of Safety helmet, Safety Shoes, etc.

Most effective

Eliminate to hazard is best option to control construction industries hazard. Therefore need to adopt Hazard control method step by step. Personnel Protective equipment is last consideration because it not eliminate to hazard, only minimize severity of harm.

6. Conclusion

Construction Industries is hazardous prone industries, So effective hazard control method is very helpful to control workplace risk. Accident occurs at construction site due to unsafe act and unsafe condition. Workplace risk can be controlled to Eliminate to hazard or prevent unsafe practices or to take needful action to prevent hazard and unsafe practices together. Hazard Control method is best method to control workplace risk at construction industries work site. Elimination, Substitution, Isolation, Engineering control, Administrative control & use PPE's are method of hazard control. Elimination is best method and PPE's is least one because PPE's not eliminate to hazard, it only minimize the severity of harm.

Effective hazard control method help to Prevent accident and protect to environment in construction industries. Enforcement of Safety rules, regulation, can make Accident free to construction work site. Close supervision help to control unsafe act and motivate to workers to follow safety rules. Safety Activities such as Training, Reward program help to create awareness among site workmen including employees and control work place risk of construction site.

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Fire Accident in Building of Developing Country, India

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Abstract:

Fire in building is major threaten for now a days in India. Each year, several people killed, injured and huge losses of property due to building fire accident. To ensure adequate Safety Control measure to avoid fire accident in building is most essential components occupants and owner of building. In past few decade in India, fire Accident occurred time to time in Commercial building, multi storied building, Hospital, shopping mall, Factory warehouse and residential like building and resulted of huge losses of property and lives. Objective to Publish this paper is identify potential risk of fire in building, causes of fire and to ensure adequate fire safety measure to save people lives and protect to property. In this paper, few case studies included to know cause of fire and ensure adequate safety control measure to prevent similar future fire accident.

Key word: Fire Safety in building, Fire Prevention & Control, Cause of Building Fire, Consequence of building Fire, Method to Prevent Building fire, NBC, NFPA

Objective:

- Identify Potential risk of fire and minimize or control to building related fire risk.
- Ensure adequate Safety control measure to avoid fire accident in building.
- To save people lives and property.
- To prevent fire to economic growth of society and country.
- Identify and Installation of fire fighting system including Fire Fighting, detection and suppression system.
- To ensure engineering measure to use fire resistance Barriers such as walls, partition and floors.
- To create Fire safety awareness among occupants of building.
- To Check and ensure existing control measure is adequate or not to prevent building fire.
- To Ensure Fire related parameter to identify fire related source and control them.

1. Introduction

Fire accident in building is major threatening for developing country. Developed countries have less building fire risk respect to building of developing countries. In Developed Country, Fire Safety rules, regulation, guidelines and codes is strictly enforced, therefore building owner ensure all Fire Safety related compliance, during building design, construction and later to control building

fire risk. India is developing country and here are major threaten of fire accident in building. Fire accident results huge losses of lives and property damage. In India, each year fire accident occurs in several building due to negligence and not follow safety rules of building owner or occupant people. Risk, related to fire accident depends on nature of building (such as Commercial building, multistoried building, Hospital, shopping mall, Factory warehouse), existing fire detection & fire fighting system, material used in building and fire safety awareness among occupants of building.

Fig. 1, Sources

According to NCRB, India in year 2015 total of 18,450 cases of fire accidents were reported in which 17700 people were killed and 1,193 injured. 42.1% deaths were occured in residential building due to fire accidents. Such Fire accident occurred in different state of India and majority of fire accident occurred in Maharashtra that was 22% of Total fire accident of India.

As per The National Crime Records Bureau Data, Total 113961 People lost their lives due to fire accident during 2010 to 2014. Major death occurred in Maharashtra state and it is approx. 24293. During 2010-14, percentage of women victims are more than man, the number of women victims was 75039 or 65.8% of all the deaths. The number of male victims on the other hand was 38917 or 34.2% of all the deaths. In year 2014, Fire accident reported was 26025 and in year, 2014 it was reported 19513 there this data shows percentage of accident decrease. The temple fire in Kollam that claimed more than 100 lives has renewed focus on fire accidents. The data available with the National Crime Records Bureau (NCRB) indicates that fire accidents of all types caused more than 1.13 lakh deaths from 2010 to 2014, at a staggering average of 62 deaths per day. Fig. (2), Shows Total numbers of Fire Accident and death during 2010 to 2014.

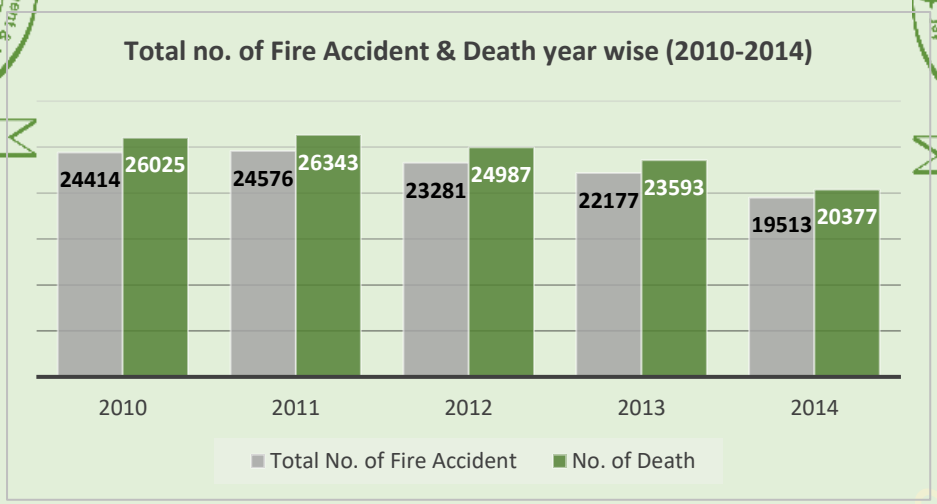

Fig. 2, Sources NCRB,

As per NRCB, Electric short circuit, by fireworks, Gas cylinder and stove bursting are major cause of fire accident and apart from this smoking, use of heater etc. are cause of fire accident. Maharashtra is first state where fire accident occurred more respect to other state of India. Few Indian states name are given in figure (3) that shows total No. of fire accident occurred during 2010-2014 in different state.

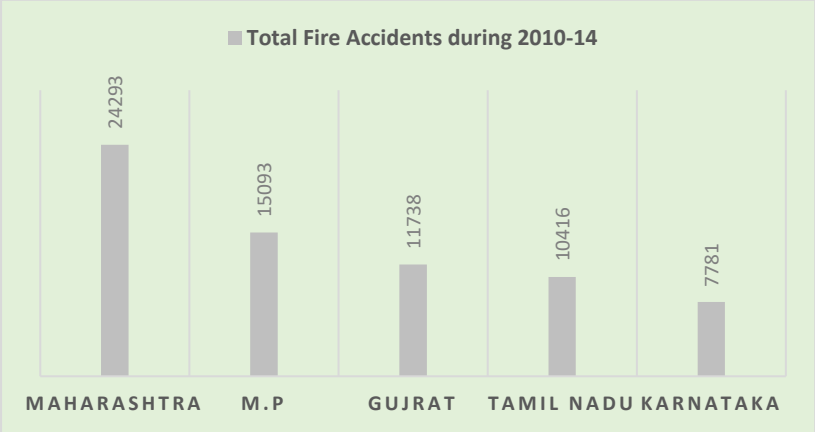

Fig. 3, Sources NCRB,

2. Causes of Fire accident in Building

In building, there may be several cause of fire accident such as electrical Short circuit, Sparking due to loose electrical connection, Over Load electrical equipment, due to cooking appliances, Smoking, use of heater etc. Probability of fire Incident depends on nature of building such commercial, residential, warehouse, public building and presence of potential sources (Flammable materials), that results fire. Commercial building, multistory building, warehouse, hotel like building have potential of high risk of fire due to not follow safety laws and procedures and its results major harm in term of Death and property damage. Cause of Fire in building are:

- Inadequate storage of Combustible material in room of building.
- Cooking and cooking appliances, Heater, Oven used in building,
- Short circuit, loose electrical connection or overload electrical equipments and systems, Static electricity.
- Use of Candles and lighting, Smoking in building
- Flammable material storage or Fuel (LPG) gas cylinder storage near heat sources or live electrical equipment in building area.

Apart from this Fire Crackers, bursting of stove like factor also responsible to cause of fire.

In building, poor fire safety Parameter consideration during design such as fire exit, adequate height of building, ventilation, un-availability of fire fighting and detection system increases risk of fire. Poor method of flammable material storage and unawareness of Safety among people always also create risk and potential of fire accident occurring.

According to the National Fire Protection Association (NFPA), the most common causes of fires in commercial buildings are cooking equipment, heating equipment, electrical equipment and system, Smoking cigrates. Common cause of building fire are given in **Figures 4.**

Cooking

Heating

Electrical equipment (Loose connection/Overload equipment)

Smoking

Candles

Hot Job near Combustible materials/ Fuel (C_2H_2/LPG) cylinder

Fig. 4, Common causes of building fire

As per case study carried out by Institution of safety Engineers (India) in month Dec. 2019, To collect data from different sources such as newspaper, Internet of past decade occurred fire accident and found that major numbers of fire accident were occurred, due to malfunction of electrical equipment and system including short circuit, sparking due to loose electrical connection, overload

electrical equipments, electrical heater and second cause of fire accident are cooking and cooking appliances. Third cause is intentional fire such as misuse of heat source e.g child playing with lighter, matches, use of fire crackers, criminal activities etc. Apart from this flammable material storage near heat source, use of candles and incense stick, smoking were also cause of building fire in few cases.

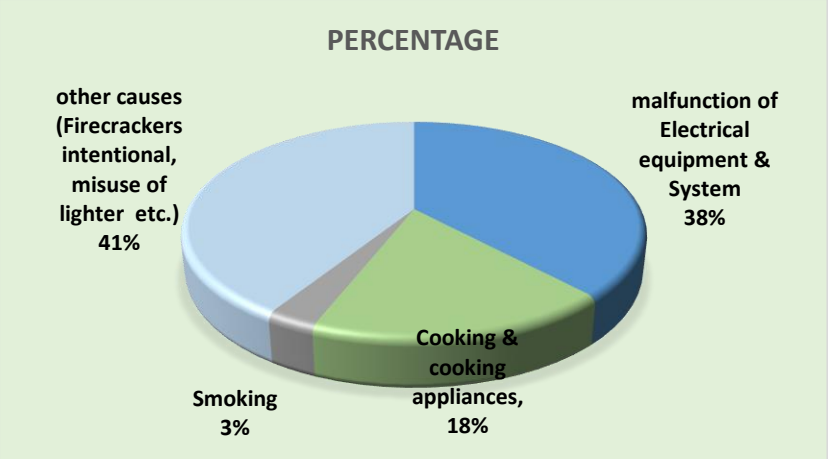

Fig. 5, Sources: As per ISEI case studies

2.1 How Fire Occur in Building

Fire is chemical reaction in which Combustible material combine with oxygen when external source of heat is applied. Combustion occurs continuously when oxygen, heat and a fuel source present (Fig.).In environment of building area, Oxygen is already available and combustible material come in contact with heat sources then fire take place. During fire, heat, smoke and light release and rapidly increases producing flammable vapors.

Fuel + oxygen (presence in air) = combustion of materials (mainly CO_2) + Heat Energy and light.

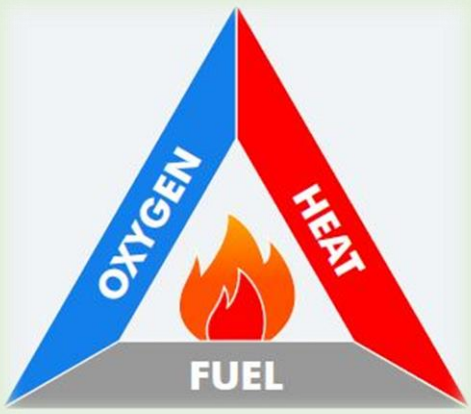

Fig. 6, Fire Triangle

Heat sources may be in the form of malfunction of electrical equipments, sparking due to loose electrical connection, cooking, smoking, misuse of lighter, use of heater etc. Flammable material may be in form of used material in building (wood), home appliances including cooking gas cylinder etc.

3. Commercial building fire (Categories wise) As per NFPA

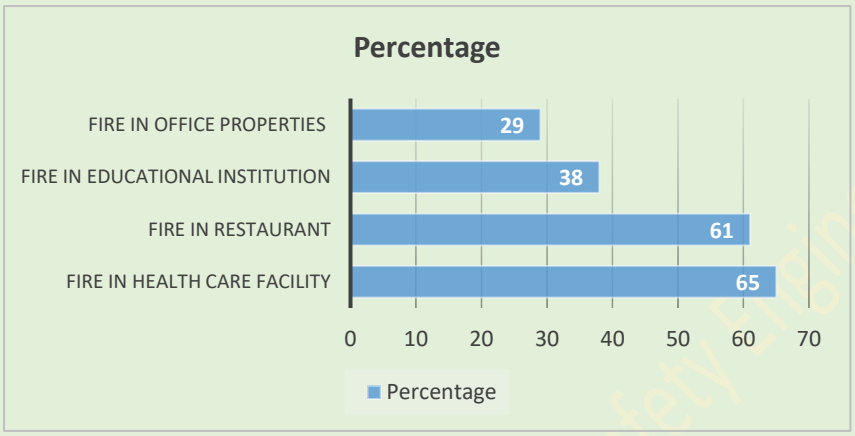

Fig. 7, Sources, NFPA, Fire due to cooking equipment

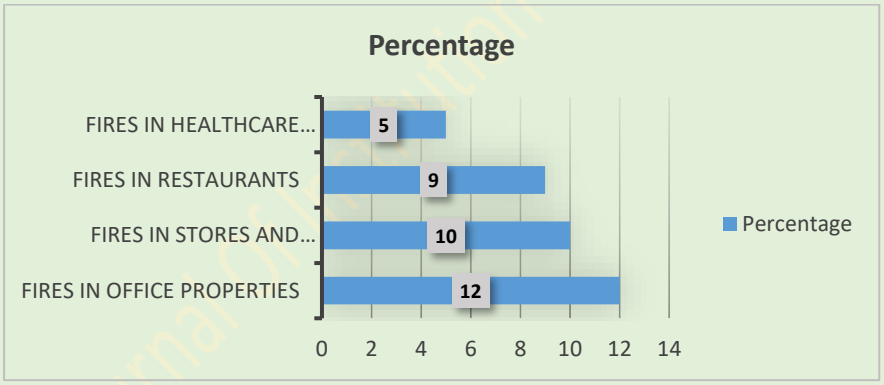

Fig. 8, Sources, NFPA, Electrical & Lighting Equipment

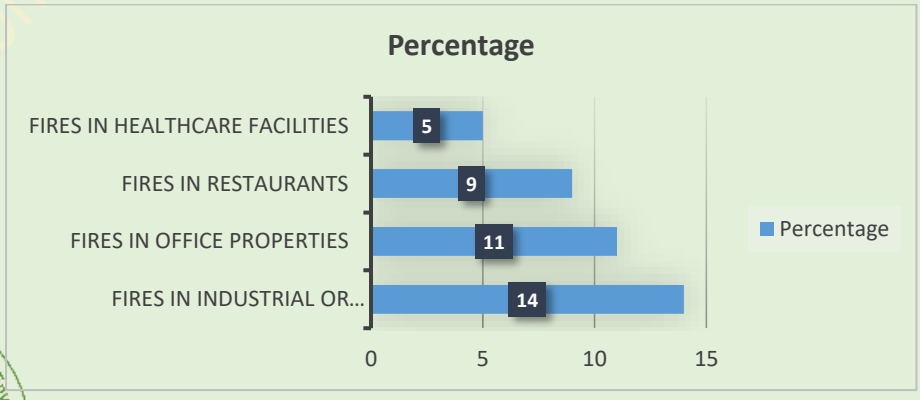

Fig.9, Sources, NFPA, Fire due to Heating Equipment

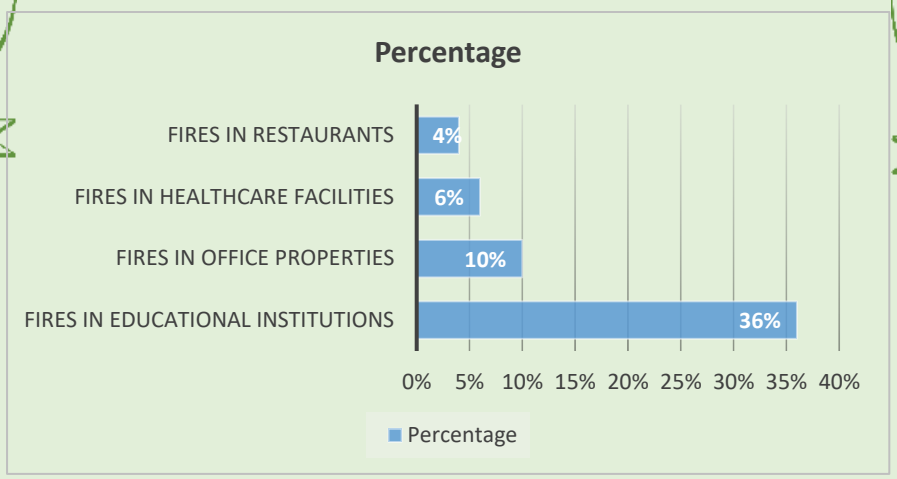

Fig. 10, Sources NFPA, Intentional Fire

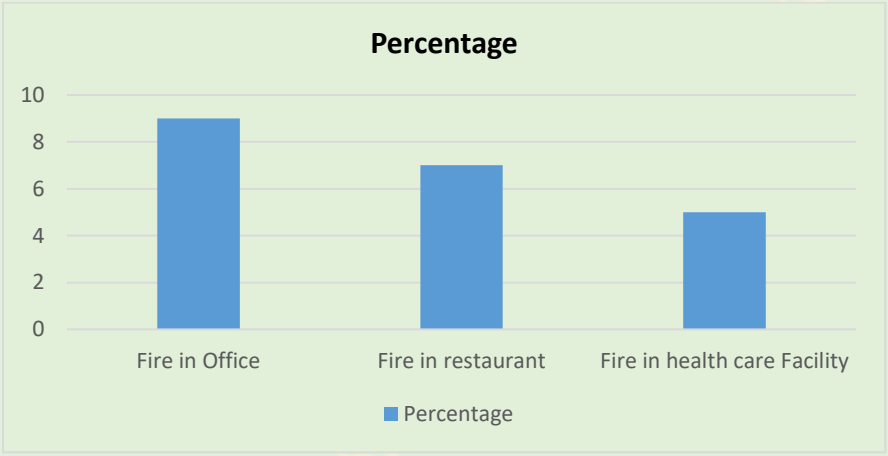

Fig. 11, Sources, NFPA, Smoking material

4. Consequence of Fire and Causes of Death in Fire Accident

The most obvious consequence of fire accident is damage to building, Property and loss of lives. In details, if analyze the impacts of fire accident, then found unexpected losses occurred that can't recover easily or within short time period. Fire accidents lead to cause of Personnel death, injury and huge economic loss of society and country. Major fire fully burnt to building property It results poor country reputation as well as owner of building. Steel lost their Two-third strength, if temperature is increased 600 ^{0} C therefore building strength also reduced. Timber and other material their nature is flammable can completely burn.

Most common cause of death during fire is suffocation due to inhalation of smoke, it include carbon mono-oxide (poising) and other toxic gas such as hydrogen cyanide due to burning plastic. Inhalation of carbon monoxide (CO) and other toxic gases that generates during burning, effect to human respiratory system, personnel unable to breathe and maintain required level of oxygen in body parts and its results Death. Carbon monoxide (CO) remove oxygen from blood stream rapidly

enters all parts of the human body, including blood, brain, heart, and muscles. As per OSHA limits long-term workplace exposure levels to less than 50 ppm averaged over an 8-hour period. On average, exposures at 100 ppm or greater is dangerous to human health. Other Toxic gases such as phosgene can cause itchy eyes and sore in throat; at higher levels it can cause pulmonary edema and death. Released Smoke during fire are made of components, Particles, Vapours and toxic gases and effects to CNS, Heart, Kidney and such organ failure of human body results death.

Oxygen Level in atmosphere and Personnel health

O_2 Level in atmosphere	Description
21 percent	Normal outside air (Good for human health)
17 percent	Impaired judgment and coordination
12 percent	Headache, dizziness, nausea, fatigue
9 percent	Unconsciousness
6 percent	Respiratory arrest, cardiac arrest, death

Table 1, Sources NFPA

In building Fire, hot steam, hot gases releases and material become hot due to burning and when Personnel come in contact with hot steam or Hot material, it lead to cause of burn injury and injury depend on Temperature value of hot material, hot steam or temperature of nearby place. Temperature above 50 degree are dangerous and may lead to cause of burn if temperature increases. Death occurring after a fire is effect of burns, infection, respiratory system failure, organ failure such as Kidney or heart failure, Abnormal clotting etc. is caused of major burn and most death occurred due to fire is within one days.

5. How can minimize the losses during Fire

Effective Fire safety control measure including emergency response plan (ERP), help to control risk related building fire. Losses depend upon Type of Fire, Nature and availability of material in building, Occupants in building and existing fire safety control measure. Effective existing Fire Safety control measure reduce the severity of harm of fire event. Fire Safety Control measure may be in form of presence of Fire Fighting System, effective implementation of Govt. rules and guidelines, Fire Safety Awareness among people, Evacuation plan, availability of emergency exit, emergency lighting, Avoid loose electrical connection and use of standard electrical equipment including power cable, distribution board etc. Immediate Rescue operation and presence of fire

fighting team can take needful action on time to prevent spread to fire and save lives. Avoid to use lift during fire accident. Incipient stage, shouldering stage and flame are stage of fire, if we control in initial stage then less probability of harm.

6. How to prevent Fire in Building

Fire accident in building can be control by to ensure adequate fire safety control measure parameter. Safety Control measure parameter may be in the form of passive or Active (Fig.12).

During design and construction, need to consider all parameter that are helpful to reduce risk up to acceptable level. Main objective to consider fire safety parameter is to minimize risk to prevent death, injury or building property or others who will be involve controlling fire and rescuing services during case of fire. During building design consider adequate ventilation, design large area into small area to provide effective fire barrier which is known as separation wall or compartments, Provide adequate exist including emergency escape route/exist for safe evacuation during fire.

Building material selection and construction such as use of non-combustible materials, fire resistant coating with building wall or structure, use less smoke emitting materials. Avoid using quick fire spread or flammable material for decoration in escape routes and kitchen room. Escape route must be constructed with high fire rating materials. Provide emergency lighting and signage in exist and access, it help to evacuate to occupants of building easily during fire. Room height should be adequate. Ensure Minimum two staircase with adequate hand railing and width of stair. The maximum travel distance from inside of the building to outside should be not more than 30 meters. Ensure Assembly point nearby building. Depute fire watchman to monitoring building time to time and take needful action to minimise fire related risk. Impart training time to time of occupants of building to create fire safety awareness. Display emergency contact no. including fire Station contact no. Ensure adequate fire prevention& Control system in building (Fig.12). Underground wiring, standard cable and power supply through adequate rating of circuit breaker, avoid to overload to electrical equipments help to reduce of potential risk of fire. Avoid to misuse of heat source such as lighter, matches and store to fuel gas cylinder such as LPG gas in suitable and safe place and check leakage time to time through soap bubble. Avoid smoking near wood furniture items or other flammable materials. Always ensure fire prevention system including detection, fighting& suppression system. Ensure all applicable compliance during design, construction and after using to building as per guideline of National building code (NBC) of India, National Fire Protection Association (NFPA) and respective state government guidelines and codes.

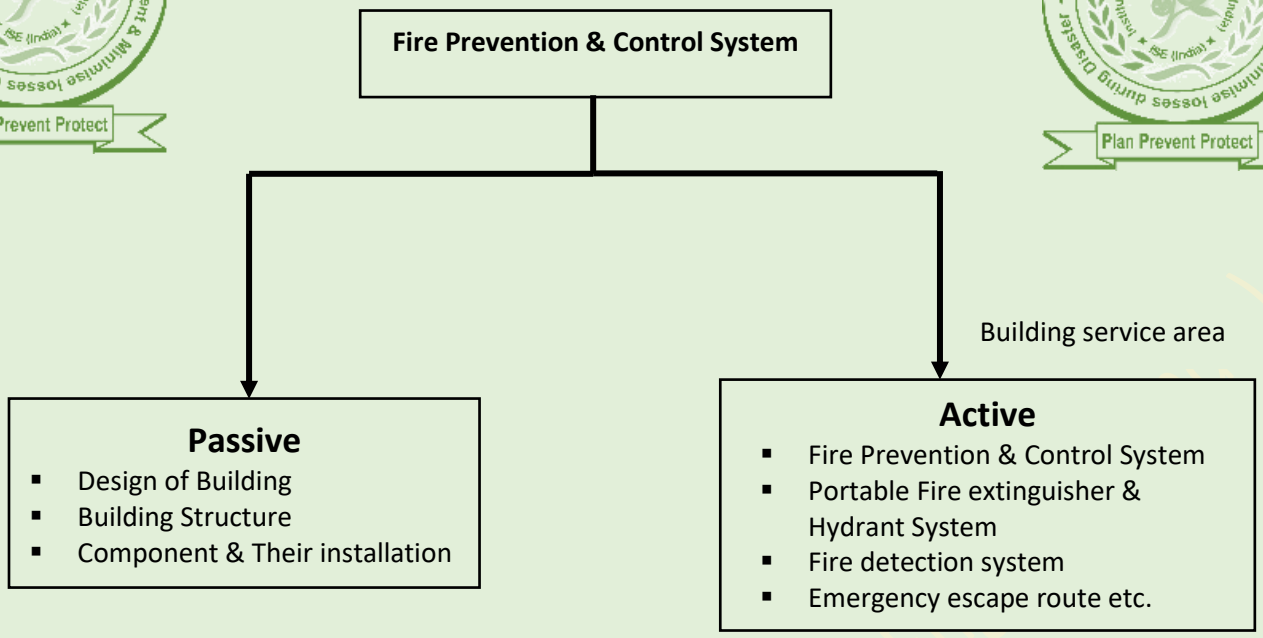

Fig. 12, Fire Prevention &Control system

7. Few major Fire Accident in India

Fire Accident in Hotel Arpit place, Located in Karol Bagh Delhi

On Date 12 Feb. 2019, early morning Fire Occurred in Hotel Arpit place, Located in Karol Bagh Delhi. In this Fire Accident at Least 17 People Killed, several injured and Approx. 35 People were rescued. As per local media the caused of deaths occur due to suffocation during fire. Video recorded by eyewitness were showing many people jumping from building to save their lives and it results injury and death also. As per ," firefighter statements published in Hindustan Times newspaper, Corridor was paneling with wooden and fire spread in corridor rapidly, so, people couldn't use the corridor to leave the hotel during fire.

As per information received from witness, cause of fire was electrical short circuit. Structure was not fireproof, old wooden was used in door and building for decoration, Non-availability of fire exit and lack of firefighting system availability was caused of huge loss as per witness. Sources (BBC News) & other news sources.

Surat fire : 22 person killed in coaching center blaze

On date May 26, 2019, Time 3:45–4:00 p.m. Fire broken out in Fourth stories building and coaching classes were running on top of building that was shade build. Fire Started from ground floor and spread rapidly and resulted at least 22 People killed in which 21were students and 1 was teacher. Television footage showed, many students were trying to escape by Jumping off from building top and its also resulted injury and death due to fall.

As per Information received from witness, the cause of fire was short circuit and poor fire safety measure availability of building resulted huge loss. (Sources: Newspaper)

New Delhi building Fire on 8 December 2019

In early morning, fire broken out when factory workers were slipping and at least 43 people were killed, most of them were factory workers, sleeping on various floors inside a building. This six-story building was using as small factory for making paper products and purses.

Main cause of huge loss was poor fire protection devices, Non-availability of emergency exits and outdated electrical systems. Inadequate ventilation was also cause of people death due to asphyxia Sources. As per government sources, this building was no fire NOC. (Sources: Newspaper)

8. Conclusion

Fire in building creates major threat of loss of lives and damage to property. It totally effect to society and country economy. Fire Safety Management is major parameter used to control fire. In initial, during building construction, consider safety parameter such as Fire resistance Material, Emergency exit and underground wiring including suitable earth leakage circuit breaker. Effective enforcement of Govt. rules related Fire Safety, Ensuring Compliance as per NBC, NFPA help to Prevent Fire related risk. People should know how to operate Extinguisher and hydrant system and it should be in good working condition. Fuel gas cylinder such as LPG should keep away from electrical source, heat sources and well ventilated space. During Cooking, Take all precautionary measure to prevent fire. Time to Time, need to check gas leakage through soap bubble and as per recommendation of manufacturer follow all guidelines. Keep emergency contact no. and immediate report to local govt. authoring for needful action, if any fire accident occur. Small fire can be control through Fire extinguisher. Always consider engineering factor such as adequate height of building, adequate access including emergency exit and ventilation system in building. Avoid loose electrical wiring and use of defective electrical tools.

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Safety Culture in Organization: A Review

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Abstract

Safety culture is main parameter of any organization to identify success or failure of their business. Positive Safety culture Plays vital role within organization to create safe Healthy work environment to control work place risk through positive thought, effort and dedication of employees. At current Scenario, safety is very important parameter of any business for every organization. Safety culture is associated with organization business and it helps to grow organization profit. This study is carried out to identify positive and negative impacts of Safety Culture; Evaluation method of organization safety culture, method to develop positive safety culture, causes of negative safety culture and obstruction create during developing positive safety culture like points is discussed. Therefore, this paper is very helpful to learn and create positive safety culture in any organization to prevent accident and achieve excellent organization reputation.

Keywords: Positive Safety Culture, Accident Prevention, Safety Culture Evaluation Method, Method to develop Positive safety culture

1. Introduction

Safety culture is major key element of success or failure of any organization business. Safety Culture may be positive or negative within organization, it depends on organization top management commitment and enforcement of Safety rules, regulation and codes. Positive Safety culture means, employees contribute their dedicated efforts, values, belief and acts accordingly to control work place risk and maintain high safety standard within their organization. Poor Safety Culture means employees not contribute their belief, effort, values to control work place risk and its results organizational harm in term of accident, Property damage, Poor organization reputation, decrease of productivity and can result prosecution by respective government authority and effects to organization. In simple word, we can say that Poor safety culture lead to cause of organization failure. Poor Safety Culture is also known as negative Safety culture.

Positive Safety Culture always helps to gain profitable business and it increases organization productivity. In other Term, impacts of Positive culture may be increase organization reputation, increase work efficiency of worker, control work place risk, employees belief and

follow safety laws, procedures, guidelines and its results increase productivity and achievement of zero harm. Safety culture is major key element that shows organization safety performance and safety performance depends on organization positive or negative safety culture. Organization is defined as an entity where multiple people are engage to perform activity as planned by their team, institution or an organization or industries. Safety culture parameter, help to shown industries reputation and increase their profitability among top organization in country as well as world level. Safety culture is defined as employees belief, perception, values and effort that helps to prevent unsafe practices and control potential sources of harm at work place.

An organization with a poor or negative safety culture should recognize and accept to cause of their failure (causes of poor safety culture) and need to seek opportunities to improve in their safety management system of organization to develop positive safety culture.

2. How positive safety culture help to Prevent Accident and success of organisation

Positive safety culture creates positive behavior among employees including workmen and organisation employees dedicatedly follow all safety rules, procedures and guidelines to mitigate workplace hazard and prevent unsafe practice. In simple ways, we can say that Positive safety culture of any organization control or minimize risk up to tolerable level. Following are few benefit of positive safety culture.

- Create safety awareness among organization employees including workmen.
- Employees dedicated to follow safety, rules and regulation through self-desire.
- Positive safety culture create good reporting culture, it help to identify safety related deficiency and taking corrective/ Preventive action.
- Safety culture creates good work environment, employees give priority first to safety. Employees care for its own safety and other of organization.
- Help to execute company Safety laws, Procedure & Guidelines easily.
- Create positive behavior and employees dedicatedly to involve in safety activity such as training, meeting etc.
- Boost to moral of employees and support to create fearless work environment among employees.
- Help to achieve excellent organization reputation and increase productivity.

Organization------- Positive Safety culture -------- Risk Level Low ---------- No harm

Achieve excellent organisation reputation, to achieve EHS objective

Fig. 1, Results of Positive safety culture

2.1 Safety Culture versus Probability of organization Success (percentage)

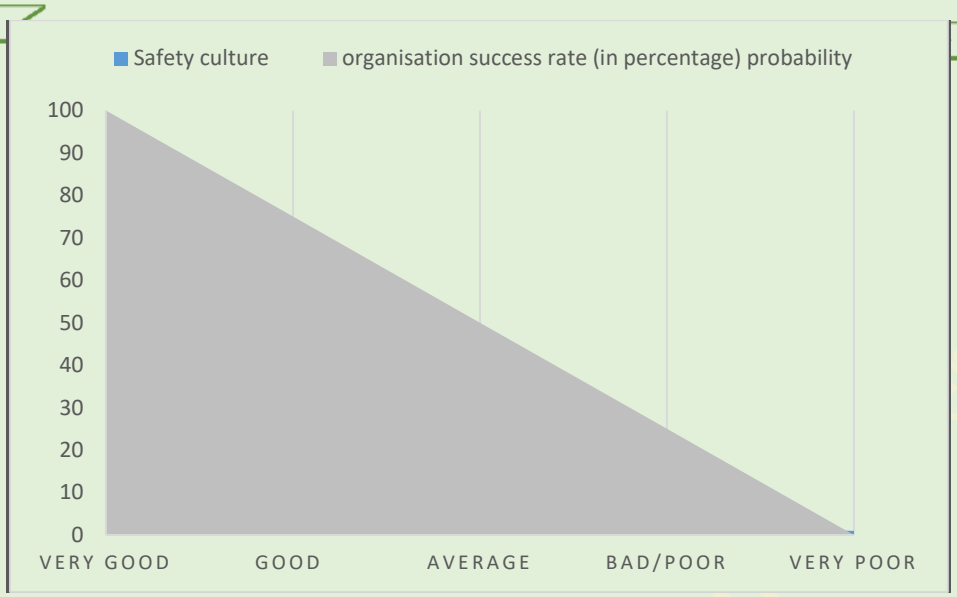


Fig. 2, Safety Culture versus Probability of organization success

Safety Culture Classification	Safety culture rating	Success rate Probability (Percentage)
Very good	5	100
Good	4	80
Average	3	60
Poor/Negative	2	40
Very poor	1	20

Table 1, As Per ISEI manuals

3. Impacts of Safety Culture in organization

Impacts of safety culture may be positive or negative. Positive Safety culture within organization results, Positive impacts in term of control workplace risk, increase business opportunities and became organization success. Poor or negative Safety culture within organization results, negative impacts in term of accident, poor market reputation, harm and business failure. Safety culture impacts are given in fig. (3).

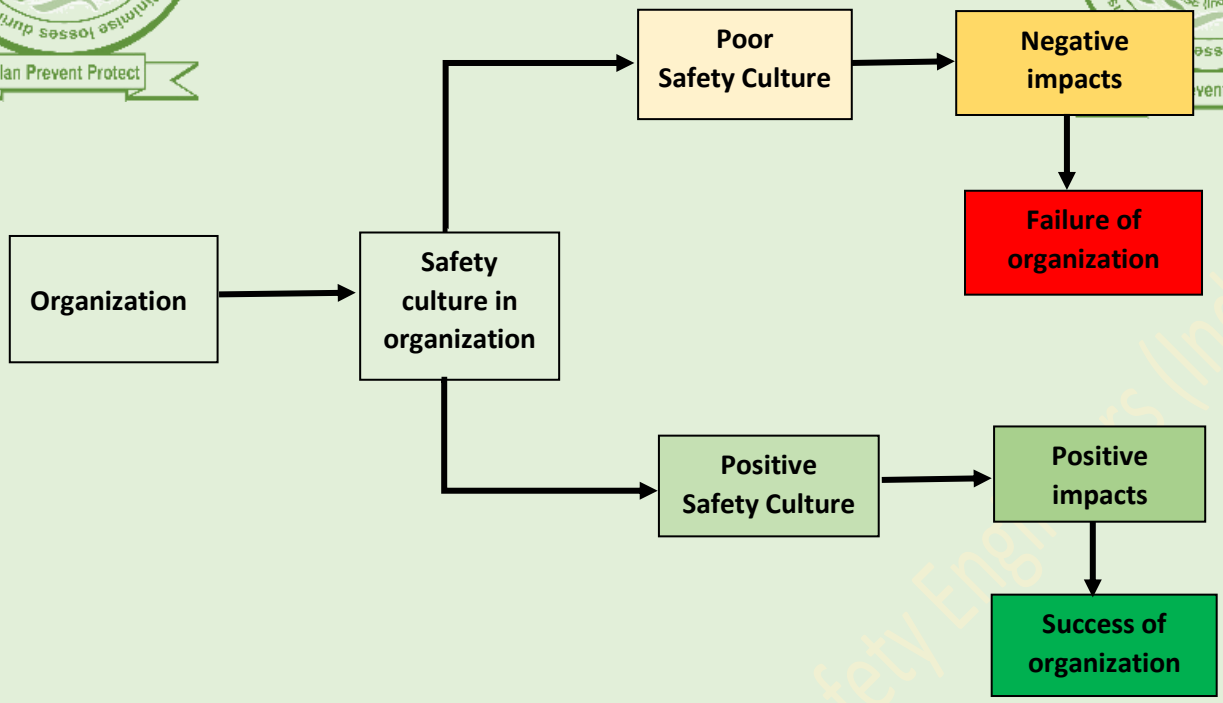


Fig. 3, Impacts of Safety culture within organization, Sources ISEI manuals

4. Causes of poor Safety Culture

Poor Safety Culture is also known as negative safety culture and it results organization failure in term of poor organization reputation, major harm, prosecution by legal authority in case of any fatality or major accident, decrease productivity etc. There may be several causes of Negative safety culture in organization. Few Major causes are

Poor Management Commitment: Main cause of poor safety culture is ineffective management commitment. Top management only considers organization profit instead of safety on first priority. Management not imagine or consider to indirect cost of poor safety culture, that how poor safety culture lead accident and result to business failure. Due to lack or no interest of Top management, safety culture decreasing day by day.

Objective & Target: In few organizations, ineffective or no objective related to safety decided by Management also results poor safety culture. If objective decided but target not fixed to achieve these objective within certain duration is also lead to create obstruction in positive safety culture.

Ineffective enforcement of Safety laws: Ineffective enforcement of safety laws, procedures and codes increase risk of harm at work place. There may be several causes of poor implementation of safety laws and procedures due to incompetence leadership and poor method of communication, poor method to identify work place hazard, Poor enforcement of respective state safety rules due to

in-effectiveness enforcement of law by govt. authority, No support from top management to executive (Middle) level employees, always resulted to create negative safety culture.

Poor reporting culture: Poor reporting culture help to create negative safety culture. Cause of poor reporting culture may be fear work environment, heavy workload, ineffective implementation of SMS including no procedure and guideline to report non-conformity (N.C), Near miss, Incident. Blame culture is also part of negative safety culture. Whenever any employees report to near miss or any N.C then concern person, take in negative way instead of taking positively and working to resolve issue and control work place risk.

Poor Resources: Resources is also cause of safety culture, Resources may be in terms of Suitable and standard Personnel protective equipments, Skill manpower including safety personnel, Training center etc. Non- availability or poor availability of resources increase negative safety culture day by days within organisation.

In simple ways, causes of poor Safety Culture may be Poor management commitment, thinking on Profit first before Safety, Culture of Fear, Ineffective Leadership and poor method of communication, Noncompliance of Safety rules, standard, rules and procedures, No provision of safety induction for new employees, Training and not conducting motivational program like factor create Negative safety culture among organization. Poor health condition, Negative thoughts, behavior and attitudes of are main human factor of Poor safety culture.

5. Method to evaluate Safety Culture within organization

Several parameter used to evaluate safety culture within any organisation. Following are Few major parameters:

Key performance Indictor: Key performance indicator is major element to evaluate safety culture of any organization. Accident Rate (A.R), Frequency rate (F.R), severity Rate (S.R) are few important parameter to check organization safety culture. Accident Rate (A.R), Frequency rate (F.R), severity Rate (S.R) can be calculated as per guidelines of IS 3786.Apart from this Activity rate, leading, lagging indicator like parameter is very helpful to evaluate organization safety performance and culture.

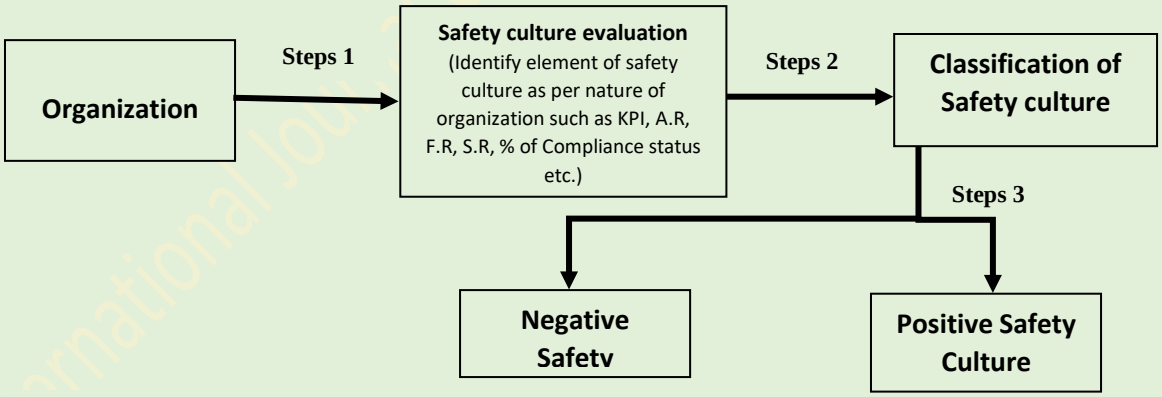
Physical visit at site: Physical visit at site, help to identify potential sources of harm at work place and unsafe practices. On based on this, risk level at site can be evaluated. Housekeeping, PPE's compliance, Compliance of machine guarding, Compliance of welfare amenities, compliance of respective state legislation and codes, compliance of work permit, Lockout/Tagout system can be checked to evaluate organization safety culture.

Consultation with employees: It will help to ask question and identify employee behavior. It will also help to identify management commitments, supports from management to lower level employees to resolve safety issue and their involvement in safety activity, to know working hours and required resources such as trained personnel, Safety material available at site is adequate or not. Mainly, it helps to identify behavior of employees and how they contribute their effort to control workplace risk.

Compliance status: Check the status of compliance as per respective state government safety rules, standard & procedures to evaluate safety culture of organisation. Compliance status of Safety observation report, compliance status of Near miss and Incident investigation, Compliance status of work permit system, Hazard identification and risk assessment (HIRA) done of applicable activity and adequate control measure taken as per HIRA documents, Notice received from government authority for safety violation and their compliance status, Safety audit conducted and their compliance status like parameters are identified as per nature of organization and check their compliance status to evaluate organisation safety culture.

In simple method, Safety KPI (key performance indicator), Compliance status of safety, rules and regulation and consultation with employees and physical visit at site are main keys to identify organisation safety culture. In Fig. 4, Safety culture is divided in two categories and suitable procedure with steps wise is given to evaluate safety culture and recommendation to improve safety culture.

Safety Culture evaluation Method



- Identify failure and cause of poor safety culture
- Decide control measure, Discuss with top management personnel and workmen representative
- Implement the new system, corrective/ Preventive measure of safety culture failure
- Check & Review time to time

- Need to ensure existing control measure regularly
- Evaluate Safety Culture Periodicallv

Fig. 4, Safety Culture evaluation method as per ISEI manuals

Note: A.R means accident rate, F.R means Frequency Rate, S.R means severity rates

6. Method to develop positive Safety Culture

Positive safety culture in any organisation can develope through effective implementation of Safety management system (SMS), to ensure compliance as per respective state Safety rules and regulation, to improve reporting culture, avoid to develop blame culture, Effective hazard identification, risk assessment and risk control method, delegate role and responsibility clearly, involvement of workers in safety activity with management, To create strong trust between management and employees, Top management must recognize to all employees like factor help to develop positive thought and behavior among employees.

Identify all element of Safety management system that is applicable for organization and ensure compliance accordingly. Safety Policy, Planning, Implementation & Operation, Measurement and evaluation, checking and corrective action, management review are elements of safety management system. Safety Culture is results of implementation and compliance of Safety management system (SMS). Effective implementation of Safety management system create positive thought and attitude among employees. Effective communication, motivation, Training are also parameter of positive safety culture.

Strong management commitment, Management thinking on safety first on priority, avoid to develop culture of Fear, Effective Leadership, Compliance of Safety rules, standard, rules and procedures are effective parameter to develop positive safety culture. Provision of safety induction for new employees and need based Training is major factor. Positive safety culture is based on high level of trust and respect between employees including workmen and management of the organization. Work place must be free from any potential source of harm, employees behavior must be positive and they should enough knowledge and skill to ensure safety control measure in their work environment and motivate to others to adopt safety rules and practices.

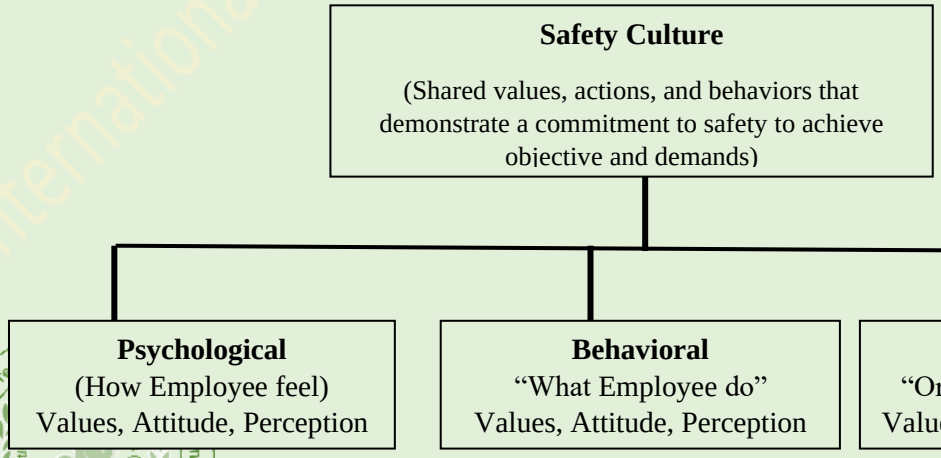


Fig. 5, Sources, Three-part model of safety culture (adapted from Cooper, 2000)

7. Conclusion

Safety culture decides organization success or failure. Safety Culture can be categories as Two Types Positive Safety Culture and negative Safety Culture. Positive Safety Culture within any organisation minimize risk upto tolerable level. At current scenario, Safety is most important parameter for every organization to grow their business. Failure to ensure safety compliance or non-compliance may lead to cause of major organizational harm in term of fatality, Property damage, damage to environment and it results organisation failure. In many states, governments has implemented strictly safety laws therefore management focused of safety on priority. Strong management commitment, effective implementation of safety rules, regulation, codes, effective reporting culture, close supervision, adequate resources is main element of safety culture. Positive safety culture is based on high level of trust and respect between different level of employees such as top management level, middle management level, and Lower management level including workers.

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Novel coronavirus COVID-19 Precaution

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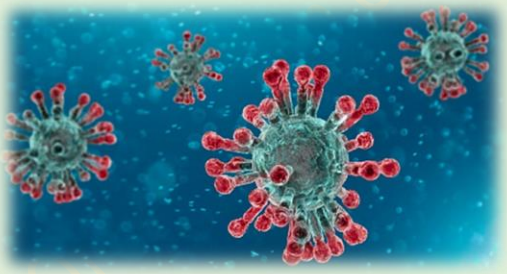
1. Introduction:

Novel Coronavirus (COVI) Diseases is increasing rapidly in the world and day by day death percentages also increasing. Firstly COVID infected person was identified in china in December 2019 and Now Majority of country of this world is effecting from COVID-19. nCoronaviruses (CoV) are a large family of viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). A novel coronavirus (COVID-19) is a new coronavirus that has not been previously identified in humans. Novel coronavirus is a respiratory virus which spreads primarily through droplets generated when an infected person coughs or sneezes, or through droplets of saliva or discharge from the nose. Currently, there is no known treatment or vaccine available.



2. How does COVID-19 spread?

- Droplets produced by coughing and sneezing, especially by a patient in close proximity
- Close personal contact, such as touching or shaking hands that are not washed or sanitized.
- Touching an object or surface with the virus on it, then touching your mouth, nose, or eyes before washing or sanitizing your hands with alcohol based hand rub
- Living in the same household or same place as a COVID-19 patient in close contact.
- Close contact with a COVID-19 patient, without adequate precautions, by healthcare workers or other patients and visitors in healthcare facilities

3. Symptoms of COVID-19 infection

- Dry cough, Fever, Breathing difficulties, shortness of breath
- Rapid heartbeats or Chest Pain or sensation in chest.
- Pneumonia
- Severe acute respiratory syndrome
- Kidney failure
- Death may occur (sever case)

As per Studies, in few cases diarrhoea symptoms is also found in COVID-19 infected people and corona infected people can be identified and confirmed only through **Test**.

4. Standard recommendations to prevent infection spread include:

- Regular hand washing with alcohol Sanitiser at least 20 second or with soap and water at least 40-60 second.
- Clean & disinfect frequently touched objects & surfaces.
- Covering mouth (Tissue etc) and nose when coughing and sneezing, through tissue immediately in closed bin after use.
- Avoid close contact with anyone showing symptoms of respiratory illness such as coughing and sneezing.
- Avoid to travel in effected country/ Area.
- Use suitable mask, whenever required.
- Need to Create Awareness among society people and always maintain physical distancing.
- In case of any similar symptom found, immediate report to Approved clinic or Health Centre or call on respective state emergency contact Number.

5. Conclusion: Currently, No any effective treatment and no vaccine is available, Treatment is given on based on symptoms & patient's clinical condition. Physical distancing is best option to prevent infection from nCOVI. Clean to hand time to time with alcohol based sanitizer. That person who immune system is strong has less risk from COVID-19 respect to weak immune system person. Basically nCOVI symptoms may appear within 2-14 days after exposure.

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Centers for Disease Control (CDC) USA
WHO & News Sources

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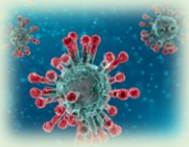
ISE (India) Training Calendar (April-2020 to June-2020)

Training Title/ Course	Duration	Schedule	Location	Remarks
ISE-TQM (Total Quality Mgt.)	24 hours Training	02/04/2020 to 04/04/2020	Raipur	Cancelled
ISE-SM (Safety Management at work place)	24 hours Training	07/04/2020 to 09/04/2020	Raipur	Cancelled
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	Min. 96 hours Training	13/04/2020 to 21/04/2020	Raipur	Cancelled
Lead Auditor ISO 45001:2018	5 day	25/04/2020 to 29/04/2020	Raipur	
Workshop on Safety in Engineering industries	2 days	01/05/2020 to 02/05/2020	Raipur	
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	E-learning	Last Date of Registration 01/05/2020	Al-Hasa	Exam Date 15/05/2020
First Aid	1 days	04/05/2020	Raipur	
ISE-SM (Safety Management at work place)	24 hours Training	07/05/2020 to 09/05/2020	Raipur	
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	Min. 96 hours Training	12/05/2020 to 20/05/2020	Raipur	Exam Date 21/05/2020
Lead Auditor (14001:2015)	5 day	25/05/2020 to 29/05/2020	Raipur	
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	E-learning	Last Date of Registration 30/05/2020	Al-Hasa	Exam Date 12/06/2020
ISE-EM (Environmental Management)	3 day or Min.24 hours Training	02/06/2020 to 04/06/2020	Raipur	
Integrated Lead Auditor (ISO 45001:2018, ISO 9001:2015, ISO 14001:2015)	6 day	08/06/2020 to 13/06/2020	Raipur	
ISE-SM (Safety Management at work place)	3 day or Min.24 hours Training	15/06/2020 to 17/06/2020	Raipur	
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	Min. 96 hours Training	19/06/2020 to 27/06/2020	Raipur	Exam Date 29/06/2020
ISE- IDOHSEM (International Diploma in Occupational Health Safety & Env. Mgt.)	One year	Last Date of Registration 30/07/2020	Raipur	Exam Date Dec. 2020 (Proposed)
ISE- IDOHSEM (International Diploma in Occupational Health Safety & Env. Mgt.)	E-learning	Last Date of Registration 30/07/2020	Al-Hasa	Exam Date Dec. 2020 (Proposed)
Diploma/ Post Diploma in industrial Safety/Fire/Env./EHS	One year	June-July (2020-21)	Raipur/ Rampur	

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.

For more details visit **www.iseindia.in** or mail **info@iseindia.in** Call **+91-6266474225, +91-8720831773**



"Protect yourself and your family From Novel Corona Virus infection to take adequate precautionary measure"