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Institution of Safety Engineers (India)

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

www.iseindia.in

About us: Institution of Safety Engineers (India) is established in year 2012 under ZJEW Trust, Registered under Public Trust Act in India, **Govt. Registration No. 5240** with objective to prevent accident, Protect Environment & minimise Losses during Disaster. Institution of Safety Engineers (India) is An ISO 9001:20015 certified institution and working to save Natural resources & control pollution. ISE (India) imparting EHS related Training to society and needy people for creating employment opportunities.

Services: Institution of Safety Engineers (India) provides Services to Industries, organization, Institution or needy related to Safety Health Environment & Quality. Such Services help to Control Risk at work place, Protect environment, improving Quality & Safety performance in Organisation. Highly Qualified, Skilled & Experienced Professional perform such Task from Institution of Safety Engineers (India) ends. Services Provide by Institution of Safety Engineers (India) is here under:

- Services for ISO Auditing & Certification (ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, ISO 45001:2018) etc.
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- ISE-IDOHSEM (International Diploma in Occupational Health Safety & Environmental Mgt.), Duration One year.
- ISE-TQM (Total Quality Mgt.), Duration 24 hours.
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Award: To promoting Safety Health Environment & Quality Management System in organization, Institution of Safety Engineers (India) accept application and reward to elected person, organisation & Institution.

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This Issue Journal Include:

Volume 2, Issue 4

LINE OF FIRE!!! – PROTECT YOURSELF

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Abstract:

Am I in the Line of Fire?

Being in the line of fire indicates that you or someone else is placed in the path of something that could cause injury or something more severe. Here are a few questions to ask yourself:

- Do I recognize if others are in my work area?
- Do I take the time before every task to check my surroundings and my equipment to determine what the safest position is?
- Do I consider myself when I think about what could go wrong with my task?
- Have I eliminated every hazard that I could?
- How many times a day do I realize I am in the line of fire?
- Did I use my Human Performance Tools?

Objective

It is important to understand what the "line of fire" is and how to avoid being in it to avoid any serious injuries.

- What is "Line of Fire"
- Common areas of concern
- Line of Fire examples
- Work activities and equipment involving line of fire
- The basic process of Line of fire.

1. INTRODUCTION

WHAT IS "LINE OF FIRE"? Line of Fire, which was originally a military term, is now commonly used in industrial safety.

• Situations where workers put themselves in harm's way by virtue of thetype of work they are carrying out.

• Lack of awareness

• Lack of education

• Hazards can be hard to recognize and can Cause injury

• Incapacitate

• In severe cases, kill the employee or co-workers.

2. COMMON TARGET AREAS OF CONCERN

- Heavy Equipment
- Machinery
- Manufacturing
- Assembly
- Hand and Power Tools
- Material Handling
- Mobile Equipment

3. LINE OF FIRE EXAMPLES

- Dangers presented by the sudden release of tension
- Gravity
- Moving machinery
- Path of travel
- Flying debris and projectiles

The line separating safety from danger is sometimes quite small. To avoid crossing that line, we must

1. Always be aware of the hazards around us
2. Understand the machines and operations in our work areas.
3. Take the time to think about the possible consequences that may result from where we place our bodies or the actions we perform.

When we do this, we can avoid suddenly finding ourselves in the **"line of fire"**

"what you don't know can hurt you"

In many years we witnessed a lot of life changing moments which resulted from not taking a few minutes to consider whether we are in the line of fire, or in the safe line of work.

We maybe in our offices doing our daily task and reports, or in our workplaces at mechanical rooms, electrical rooms, pump rooms, storage areas, or doing our daily inspections we cannot deny that there are occasion where we unconsciously place ourselves in the line of fire, perhaps because of certain external and internal factors around us. Mostly of these moments are from our human factor- the error of omission which we fail to perform a procedural step, error of commission which we perform extra steps that are incorrect or performs a step incorrectly or lack of hazard understanding. But what is line of fire in connection with our daily task?

4. LINE OF FIRE

Line of fire is when we place ourselves in danger from heavy equipment, machinery, hand and power tools, material handling, mobile equipment brought about by internal and external distractions (frustrated, tired, in rush), complacency, or lack of hazard understanding.

Line of Fire is the path an object will travel and create a risk of injury.'You are in the line of fire when you are at risk of coming into contact with a force that will, or may hurt you'

This could be:

Material handling

Working at height

Mechanical lifting

Loading activity

Moving machinery

Fig. 1

According to *"Joseph Baldwin a consultant at Baldwin EHS Consultants"* **Line of fire hazards** are one of the most deadliest hazards found in Manufacturing and Construction, second only to Slip, Trips and Fall. Each year hundreds of workers are injured by Line of Fire accidents. Deaths from Line of Fire injuries number into the hundreds.

Approximately 27% of work place deaths are related to **Line of Fire** accidents

Three Mechanism of Injury

Stored energy

- Contact with Stored energy

Striking Hazard

- Struck by or Striking against an object
- Includes falling objects

Crushing Hazards

- Caught in, on or between an object

in the United States of America.

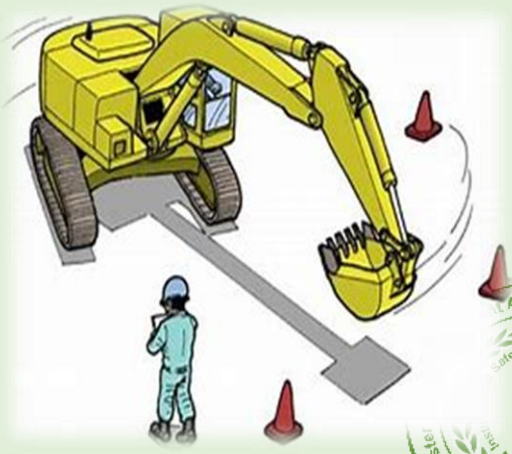

Fig. 2

Work activities and equipment involving line of fire

- Lifting/hoisting
- Moving vehicles/heavy equipment
- Hand and power tools
- Moving parts
- Electrical equipment
- Objects with roll potential
- Objects with fall potential
- Tensioned lines and equipment

Through the years ***Institution of Safety Engineers (India)*** *as* an organization has been promoting safe system of work through information, instruction, training and supervision, with a collaborative effort from every Head of the department.

Being in as a member SMISE, I witnessed in my Company that most of our lost time accidents are more of behavioral aspects, which sprung from our subjective worldview of health and safety. Health and safety is not only HSEQ department responsibility it is ***everyone's responsibility*****.**

Not just one person it is EVERYONE- whether you are a Manager, an ordinary Technician or a Cleaner you have the responsibility to ensure your safety.

Institution of Safety Engineers (India) way is to be health and safety committed and honoring that commitment through continuous information, instruction, training and supervision towards good and positive health and safety culture with everyone's collaborative effort.

Where should we go from here? We should reduce and minimize our exposure to **line of fire** incidents and we should be aware of the 3 major factors of every incident, accident at our workplace. These are human, organization and technical aspect.

Human Aspect: We should be aware and identify the hazard before starting the work and apply the control measures in place. If you're in doubt, ask your Supervisor or your Engineer. Ensure you are trained of the method statement and risk assessment of the task and be fully aware of the risk involved and possible consequence that could result from what you are about to do.

Organizational aspect: ***Institution of Safety Engineers (India)*** to ensure procedures and policies are in place and are being followed, like method statement and risk assessment, standard operating procedure, COSHH assessment for chemicals, ongoing learning and training for all employees.

ensuring safe workplace, daily morning briefing and tool box talk, and regular inspections and supervision.

Technical aspect: that we should always use the right tools and equipment for our job with good condition and safe to use and putting hazard signage for machinery or equipment like MEWP (mobile elevated working platform.

What should we be doing every day, as a member of **Institution of Safety Engineers (India)** we follow ERICP to a brighter future of positive and good safety culture.

Eliminate the hazard- this can be done by not exposing yourself from the hazard.

Reduce: reduce the exposure to the hazard or changing the hazardous materials to a safer one that is use of water-based paint instead of enamel.

Isolate: de-energize the hazard or machinery by applying electrical or mechanical LOTO (lock out tag out) or putting barricade to separate the work from the public.

Control

Engineering control: putting additional equipment to minimize the hazard. It does not eliminate the hazard but rather isolate people from hazard, example having local exhaust ventilation.

Administrative control: putting processes or procedure to changes the way people work, employee training, signage and warning label,

Personal protective equipment- having gloves, helmet, mask, shoes, and so on.

Final take-always

- Be aware of the constantly changing work environment around you Identify 'Line of Fire' hazards in your risk assessment
- Eliminate the need to work in the line of fire where practicable
- Document and implement the controls of your risk assessment
- Monitor 'Line of Fire' hazards through adequate supervision.

THE BASIC PROCESS IS:

1. **STOP** – Engage brain before you act
2. **LOOK** – Identify any hazards
3. **ASSESS** – What damage could those hazards causes
4. **MANAGE** – Implement controls, tell others
5. **SAFELY** – Complete the task

Remember, nothing that we do is so urgent that we cannot take time to do it safely. What you don't know can hurt you and what you knew can help you.

Together, you and me and everyone of us let us be safety committed and honoring this commitment by working safely. Your safety is your responsibility ... together we go home safely.

Remember if conditions change and the potential for a line-of-fire injury is identified we must use our Stop Work Authority immediately, so that corrective action can be taken.

Your body is a moving object – keep it out of harms ways!

WE CAN WORK TOGETHER TOWARDS A MUCH CLEANER AND SAFER WAY!

If it is not safe … Don't do it!

References

- *Safety talk ideas*
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Occupational Health & Safety in Cement industries

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Abstract:

India is developing country and cement Industries Playing vital role in development of economy of country. In India, there are different cement company such as Ultra tech Cement, Abuja Cement, Shree cement. Cement Industries has Positive and negative impacts. Positive impacts mean such industries create employment opportunities and good for economy development of country. Negative impacts means harm to environment and it causes of environment degradation, negative impacts also cause of injury and create occupational disease among people. This study is carried out to know impacts of cement industries and pollutants generated during different phases of cement production and identifying effective control measure to minimises or control to negative impacts. So this paper is very helpful to control environmental and occupational health risk of cement industries.

Key words: Occupational Health Safety, Impact of cement industries, Occupational Diseases, Environmental & Social Impacts, Safety control measure.

Objective:

- Identifying Occupational health hazard &minimising risk as low as reasonable practicable
- Controlling environmental hazard
- Reducing work injury & cost arises due to accident
- To protect plant personnel and private citizens.
- To prevent or minimize damage of property and protect to environment.
- Prevention of Accidental emissions from stacks.
- Provide measurable systems for verifying OHS performance & finding opportunities for improvement.
- Maintain better relation with stakeholder & enhancing organisation reputation

1. Introduction

Cement industries playing vital role to development of country and create employment opportunities and this is known as positive impacts. Safe workplace in cement industries plays vital role to prevent occupational health diseases and increasing business opportunities. Different pollutants such as Particulate matter, Sulphur oxide, nitrogen oxygen generates and cause of environmental degradation and ill health and it is known as negative impacts.

The manufacturing units of a cement factory such as raw mill, Preheater, kiln, coal mill, cement mill, storage silo & packing section are point sources of pollution emission. The cement sector is

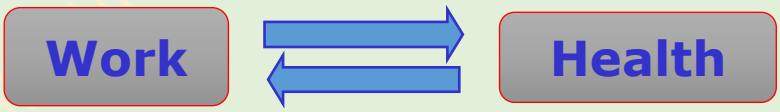
the third largest industrial source of pollution, emitting of sulphur dioxide, nitrogen oxide, and carbon monoxide and it effect to environment and health of people. Exposure of cement dust can develop lungs cancer, pneumoconiosis, respiratory system damage, skin irritation, dermatitis, skin burn, conjunctivitis, headache, fatigue, eye injury as well as stomach and colon problem. According to studies reported with respect to oral cavity, the mostly reported diseases in workers are inflammation of gums (gingivitis), dental caries, calculus and pockets formation, loss of surface area of teeth and also periodontal diseases. This depend on duration of exposure of dust. Eye also effected when cement dust particles enters in eye. Pollutants generated from cement manufacturing industries also effect to structure, Tree & animals. Apart from this Noise generated from cement industries and exposure beyond permissible limit also effect to our hearing system.

Joint ILO/WHO Committee on Occupational Health (1950)

Occupational health is the

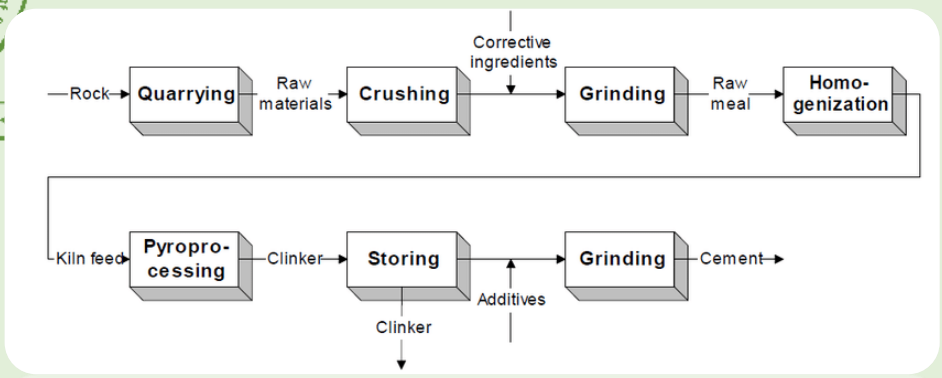
- promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations;
- the prevention amongst workers of departures from health caused by their working conditions;
- the protection of workers in their employment from risks resulting from factors adverse to health;
- the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities

and; to summarize: the adaptation of work to man and of each man to his job



2. Cement production Process, Characterisation, Composition & Types

The cement production process consists of drying, grinding and mixing limestone and additives like iron and bauxite ore into a powder known as “raw meal”. The main raw material used in cement industry are limestone ($CaCO_3$), sandstone (SiO_2), clay, bauxite (N_2O_3) and gypsum ($Ca_2SO_4.2H_2O$) and involves the release of various particulates, dust, gases and heavy metals. The raw meal is then heated and burned in a pre-heater and kiln and then cooled in an air cooling system to form a semi-finished product, known as a clinker. Clinker (95%) is cooled by air and subsequently ground with gypsum (5%) to form Ordinary Portland Cement (OPC).



Cement Production Process

Cement may be defined as, calcined mixtures of clay and limestone, usually mixed with water, sand, gravel, etc., to form concrete, that are used as a building material for civil work. It may also be defined as a powdery substance used for binds or unites.

Portland cement consists essentially of compounds of calcium oxide (CaO) (61% - 67%), silicon oxide (SiO_2) (19% - 23%), Aluminum tri oxide (AL_2O_3), (3-6%), ferric oxide (Fe_2O_3) (2% - 6%), magnesium oxide (MgO) (1% - 2%) and also selenium, thallium and other impurities.

Basically cement are two types, natural and artificial cement. The artificial cement is also called Portland cement. Portland cement is further classified into Portland blast furnace cement (PBFSC), Sulphate Resisting Portland Cement, Ordinary Portland Cement (OPC), Portland Pozolona Cement (PPC), Rapid Hardening Portland Cement, Oil Well Cement, Clinker Cement, White cement. Apart from these, some of the other types of cement that are available in India can be classified as: Low heat cement, High early strength cement, Hydrophobic cement, High aluminium cement, Masonry cement.

3. Impacts of Cement Industries

Producing cement has significant positive and negative impacts. On the Positive side, the cement industry create employment and business opportunities for people. This play vital role for economic development of country. Negative impacts include disturbance to the landscape, and disruption to local biodiversity from quarrying limestone (the raw material for cement) like activity and effect to living thing.

Safety issues vs. Occupational Health issues in cement industries

Safety	Occupational Health
We can usually see something coming & hitting the person. (except acute exposure to gases)	We can't see.
Result is immediate.	Result is delayed, may be after years!
Safety risk assessment (QRA), checklists etc. are required.	Personal exposure monitoring is required.
Awareness among employees and contract worker is comparatively better!	Comparatively less!
Common is –"Pain/suffering to us"	

Known Facts

- Occupational Diseases are **notifiable & compensable** diseases in almost all geographies.
- For most of occupational diseases – **no cure**. Almost all are **preventable**.
- Occupational diseases have a **long latent period** – not felt as priority.
    - Silicosis takes 6 to 9 years to develop
    - NIHL takes 8 to 12 years to develop

- Liver cancer takes 20 to 30 years to develop

In this study we will discuss about Negative impacts.

3.1 Negative Impacts:

The cement sector is the third largest industrial source of pollution, emitting more than 500,000 tons per year of sulphur dioxide, nitrogen oxide, and carbon monoxide.

Chronic exposures in cement industries, workers suffer from impairment of respiratory system function, lungs cancer, Headache, fatigue, stomach and colon. It also effect oral cavity & eye, the commonly reported symptoms concerned with oral cavity of cement industries workers are inflammation of gums, calculus and pockets formation, dental caries and non carious tooth surface loss. Basically three types of air pollutants are released to the air during cement manufacturing which includes particulate matter (PM), nitrogen oxides (NOX) and sulphur dioxide (SO2).

Portland cement is caustic, so it can cause chemical burns, the powder can cause irritation or with severe exposure this may causes of lung cancer and can contain some hazardous components such as

crystalline silica and hexavalent chromium. Environmental concerns are the high energy consumption required to mine, manufacture, and transport the cement and the related air pollution including the release of greenhouse gases (e.g., carbon dioxide), dioxin, NOx, SO2, and particulates.

In cement industries, most health problems are chronic cough, phlegm production, impairment of lung function, chest tightness, skin irritation, conjunctivitis, stomach ache, headache, fatigue, carcinoma of larynx, colon also effected due exposure of such hazardous agent. Cause of such diseases are unavailability or poor condition of dust collection system, Poor housekeeping, Non availability of personal protective equipment's (PPE's), use of defective personal protective equipment's (PPE's) or not using personal protective equipment's (PPE's) due to unawareness, so workers do not adequately protect themselves through personal protective device. Such conditions are also consistently associated with concentration and time of exposure, Personnel hygiene & behaviour, Personnel tolerance level, susceptibility, State of matter, & regular use of appropriate personal protective equipment. Route of exposure are inhalation (breathing in), absorption through skin or eye &ingestion. Exposure of Noise beyond permissible limit also create headache, nausea, increase in blood pressure and long term exposure may cause of noise induced hearing Loss. Pollutants emits during operation effect to environment.

Generated Pollutant Data as per Cement Sustainability Initiative (CSI)

Key Performance Indicators as Per CSI (Europe), Data (reported 2011 unless otherwise specified)

Sl. No.	KPI	Range	Companies Reported
i	Specific NOx emissions (g/ton clinker)	844 - 1,915	14 reporting members
ii	Specific SOx emissions (g/ton clinker)	77 - 1,247	14 reporting members
ii	Specific Dust emissions (g/ton clinker)	58 - 613	14 reporting members

As per CSI, Table 1

3.1.1 Environment Impact

Generated pollutants during different process stage in cement industries always effect to environment. It mix in air, water and land and polluted them. Such pollutants enter in our body through inhalation, skin absorption & ingestion and effect to our health. Major pollutants are NOx, SO_2 & CO. These include emissions of airborne pollution in the form of dust, gases and fumes during quarrying, material handling and crushing like activity. Noise and vibration also generate

during machinery and equipment operation and other operational process during cement manufacturing, that effect to environment and human being.

Inhalation of SO_2 causes Irritation of throat, nose etc and causes death when in high concentration. It also creates respiratory and cardiovascular disease. SO_2 is also a primary contributor to acid deposition, or acid rain. Same as inhalation of CO_2 causes asphyxiation or breathlessness. High concentration of CO_2 may cause of death also. Carbon monoxide (CO) also reduces oxygen delivery to the body's organs and tissues, as well as adverse effects on the cardiovascular and central nervous systems. CO also contributes to the formation of smog (ground-level ozone), which can cause respiratory problems. Nitrogen oxide (NOx) can cause or contribute to a variety of health problems and adverse environmental impacts, such as ground-level ozone, acid rain, global warming, water quality deterioration, and visual impairment. Affected populations include children, people with lung diseases such as asthma, and exposure to these conditions can cause damage to lung tissue for people who work or exercise outside. Cement manufacture contributes greenhouse gases both, directly through the production of carbon dioxide when calcium carbonate is heated, producing lime and carbon dioxide and indirectly through the use of energy, particularly if the energy is sourced from fossil fuels. The cement industry produces about 5% of global man-made CO_2 emissions, of which 50% is from the chemical process, and 40% from burning fuel. The amount of CO_2 emitted by the cement industry is nearly 900kg of CO_2 for every 1000kg of cement produced.

4. Hazard Control method in Cement Industries:

In cement Industries, Occupational Health hazard can be controlled through environmental control and Hazard control method including Health monitoring.

4.1 Environmental Control

Environmental control Comprises improvement in general ventilation system there by diluting the Dangerous dust, gases and fumes to such concentration level so as to maintain the permissible limits prescribed for the relevant contaminants. Total Enclosures of hazardous process with exhaust system by using the principle of segregation may be used as effective control method. This is called engineering control method. Enclose to conveyor like system is best method to control dust emission that emit during raw material handling and spread in working atmosphere. This help to Protect environment and preventing occupational diseases.

All filters, Lines and connectors, shall be designed to prevent leakage of particulate or contamination. Regular monitoring must be done to identifying such leakage and taking corrective action on same time to prevent dust emission in atmosphere.

Noise is also source of pollution that effect to people to create headache, Nausea, develop

hypertension and long term exposure may cause of noise induced hearing loss. Noise may be reduced to use enclosure, Barriers and functional sound absorber.

Electrostatic Precipitator (ESP), Bughouse Filters, Monitoring equipment like device also used in cement industries for dust control. ESP control devices ionize contaminated air flowing between the electrodes. The charged particles (contaminants) travel to the oppositely charged plates. The particles on the plates are removed. These particles can be dry dust or liquid droplets (liquid droplets are more efficient). The particles that are removed from the plates are knocked off to the bottom of the ESP. ESPs have high efficiency and low pressure drops.

These devices are used after the roller mill and after the cement kiln in the production of cement to reduce emissions of particulate matter such as cement kiln dust. Often spray towers are used before the ESP (Fig. 2) in order to moisten the particulates, increasing ESP efficiency. In Baghouse Filters, polluted air is filtered through the bags. The bags are closed at the bottom, and are exposed to a clean air chamber at the top. The bags are cleaned by short bursts of pressured air. The bags contracts and snaps which releases the particulate layer. Bughouses are used in cement production at the top of material storage silos and gas separators. They help prevent any particulate matter escape the process. Anything collected in the bag filters (Fig. 3) is simply release back into the process to be used in the cement making. Generation of Electrical Power to use waste flue gases that contains CO2 is also good method to protect environment and prevent occupational health diseases. Power is generated through waste Heat recovery boiler (WHRB) to use waste flue gases. Apart from this water sprinkling system, enclose to conveyor belt to prevent dust emission, Sweeping m/c like equipment also used for controlling dust.

4.2 Occupational Health Hazard Control

- Recognize the hazard and eliminate it or Control at source through dust collecting system or other engineering control method. Water sprinkling & ensuring good housekeeping on regular basis is also best method to controlling dust and preventing occupational health diseases.
- Maintain dust control systems on regular basis for keeping them in good working order. Conduct air monitoring to measure worker exposures and ensure that controls are providing adequate protection for workers.
- Cement industry workers should wear suitable personnel protective equipment like high-efficiency particulate arresting or high-efficiency particulate air (HEPA) mask, safety goggles and mandatory get pre-employment and medical surveillance on periodically. Use safety gloves also for preventing dermatitis like disease. Displayed post warning signs inside factory & Provide training to workers and staff's for creating awareness and taking suitable safety

control measure. Report all occupational Health disease to OHS centre & Govt. authority. This will help to reducing the risk of Occupational hazards of cement dust in the cement industry workers.

- All disease that created inside plant due to cement dust, fumes and gases, Noise must be investigated and preventing measure must be taken to avoid similar future diseases.
- Use Enclosure, absorber and barrier like devices for reducing noise level and use Ear plug and goggle like PPE's is a techniques to protect ear and eye from such diseases.
- Risk must be identified in every process and operational activity and take adequate control measure for minimising its level as low as reasonable practicable (ALARP) to prevent occupational health diseases and Protect to environment.

Hazard is controlled through hazard control method that is known as hierarchy of hazard control measure. To use of PPE's last consideration of hierarchy of hazard control method because not eliminate to hazard, it minimise severity of harm.

The Limestone mining also need focus on the following to improve the Occupational Health & safety compliances.

- Initial and periodic medical examination
- Training of medical officers in Occupational health and hygiene.
- Training of medical officers for use of standard ILO chest radiographs for classification of pneumoconiosis
- Hierarchy of controls for prevention of Occupational diseases
- Rehabilitation of affected persons
- Equipment and other arrangements to safe guard from occupational illness.

4.3 Health & Biological monitoring

Health Monitoring:

Check & Monitor	At the time of Employment	During Employment	At the time of separation
Fitness to work (for specific jobs)	Yes	Yes	--
Medical checks for exposure (for specific SEGs)	Yes (for baseline records)	Yes	Yes
Wellness checks	--	Yes	--

Fitness to Work – Why?

- Safety of person
- Worsening of Personal Health & life expectancy
- Productivity
- Baseline Record
- Occupational Diseases & other diseases' burden
- Statutory Compliance
- Well informed decision making process

Periodic Checks– Why?

- Early detection of adverse Health effects and abnormalities
- Job rotation in case required
- Helps for Intervention / health promotion strategy
- Checks effectiveness of preventive & control measures
- Preventing spread of communicable diseases
- Statutory compliance

Biological monitoring (BM). Why?

- BM can assess total uptake in body by all routes
  - Inhalation
  - Ingestion
  - Skin Absorption
- BM can assess efficacy of…
  - PPE
  - Engineering controls

Procedural Control / Human factors

Biological Monitoring:

Assessment of overall exposure to chemicals by measurement of the chemicals or their breakdown products in

Blood Urine Breath



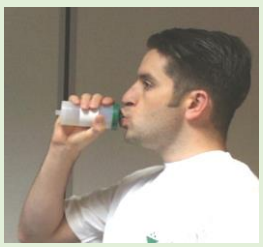


Fig. 1a

- Biological markers represent events or changes in human biological systems as a result of exposure or disease.
  - ✓ Markers of exposure,
  - ✓ Markers of effect
  - ✓ Markers of susceptibility
- Represent an individual's **total dose**
- Evaluation of an individual's **total exposure**
- Believed to be **more predictive of health effects**

Examples of chemicals that can be assessed by biological monitoring

Biological Monitoring (Measuring the Chemical itself)	
In blood	Lead, Cadmium, Polychlorinated Biphenyls
In urine	Cobalt, Nickel, 4,4'methylenebis-(2-Chloroaniline)
In Breadth	Tetrachlorethene, Carbon Monoxide

Biological Monitoring (Measuring a metabolite)		
In Blood	Bromide	From Methyl bromide exposure
In Urine	Mandelic acid	From Styrene
	Trochloroacetic acid	From Trichloroethene

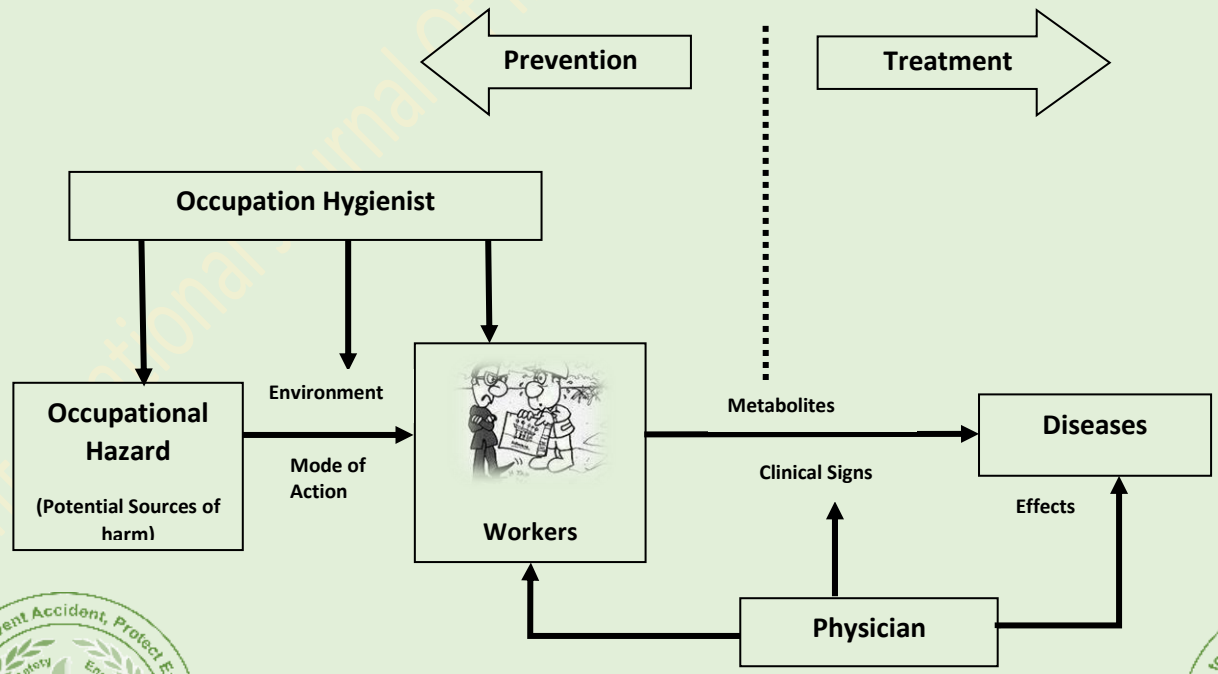


Fig. 1b, Occupational Health Safety in cement industries

Conclusion: The main sources of health disease in cement industries are Polluted air. SOx, NOx, CO type different Pollutant emits and mix with air and spread in work environment may cause of occupational & Health diseases due to inhalation, ingestion & direct contact. Dangerous agent such as dust, fumes, gases also effect to eye and other living thing. Noise generated from machinery, equipment and other operation of cement manufacturing may causes to hearing loss due to exposure beyond permissible limit. Apart from dust, fumes and gases and other hazard associated in cement industries like Mechanical (Entanglement, Contact, Sharp edge etc), Electrical (Electrocution, Shock, fire), Fall hazard, Vehicle movement, Physical (Heat, poor illumination), Chemical hazard, Fire hazard (Naked flame, Hot material) etc. Risk can be minimise to control workplace hazard to take adequate control measure and effective implementation of Occupational Health Safety Management system. Safe work place minimise Numbers of injury and increases productivity of organisation. Potential source of harm in cement industries can be controlled through hazard control method.

Permissible levels of certain hazardous substance in work environment

Substances	Time weighted Average concentration (TWA) in ppm (8 hours)	Short Term exposure Limit (STEL) in ppm(15 minutes)
Carbon monoxide	50	400
Sulphur dioxide	2	5
Nitrogen dioxide	3	5
Ozone	0.1	0.3

Table 2, Sources - Schedule II of The Factories Act 1948 (India)

Noise value, Noise Regulation (Regulation & Control) Rule-2000 (India).

Category of Area/ Zone	Day Time Limits in dB (A) Leq*	Night Time Limits in dB (A) Leq*
Industrial Area	75	70
Commercial area	65	55
Residential area	55	45
Silence Zone	50	40

Table 3, Sources - NRR-2000 (India)

Note: Day time means 6:00 AM to 10:00 PM and Night Time means 10:00 PM to 6:00 AM,

Fig. 2 (Source)

Fig. 3 (Source)

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- The reference is taken from Cement Sustainability Initiative website.

Municipal Solid Waste Management (MSWM): A review

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Abstract

In this world, developing countries are facing lot of challenges to control associated risk with municipal solid waste due to poor method of collection, transport, treatment and disposal. Municipal Solid waste creates environmental issue such as polluting to air, water, land and it results public health issue. It degrades our climate, modifies our environment as well as create hazardous situation that is harmful for living things. Some Municipal solid waste is useful when it is recyclable, re-use, or use this waste to convert energy. In this study, existing waste management system of developing country has been reviewed and recommendation has been made to control waste generation and adopting safe method to waste storage, transportation, disposal and management. So this paper is very helpful to know potential harm associated with municipal solid waste and control such effect to save environment and living thing.

Keywords: Municipal solid waste (MSW); waste management; Municipal Solid waste classification, Waste disposal method, Environment Protection

Objective:

- Identify types of municipal solid waste
- To protect to environment from degradation
- Keep environment safe and clean
- Minimize or reduce waste generation
- Ensure effective method of disposing and recycling
- Ensuring Compliance of MSW rules
- Protect to personnel health from hazardous agent of MSW
- Utilize to waste to convert waste to energy

1. Introduction

In this world, Developing country is facing lot of challenges during managing municipal solid waste (MSW). Associated risk with MSW always effect to environment and it may lead to cause of environmental degradation and harm for living thing and such hazardous condition create from MSW due to poor waste management system and its ineffective implementation. Effective waste management system help to control associated risk with MSW. Municipal Solid waste (MSW) includes household waste, wastes from hotels and restaurants, construction and demolition debris, sanitation residue, and waste from streets that is under municipality. In India Approx. 67 million tons

of MSW generated per year and it increase approx. 5 % every year. In India, It is estimated that solid waste generated in small cities and Town is 0.1 kg, medium cities and Town is 0.35 kg and large cities and towns is o.5 kg per capita per day respectively and annual increasing waste generation 1.33%. In United States (US), 2015, about 262 million tons of MSW generated in which 52.5% land filled, 25.8% recycled, 12.8% burned with energy recovery and 8.9% composted. Developed country have enough resources and technology to manage waste safely, so they use resources; adopt standard practices and effective method during transportation, storage, handling, processing and disposal to MSW. In developed country, more percentage of MSW re-use to recycle or use to convert energy or in other form. Therefore, Potential risk of harm associated with MSW in developing country is more respect to developed country.

Municipal solid waste creates problems due to Poor storage, collection and disposal method, non-availability or less availability of resource to recovery including technology. Effective design and operation of municipal sanitary landfills, enforcement of respective government rules related to municipal solid waste management help to control waste related risk and prevent to environmental from degradation. Majority of municipal solid waste is food waste and residential waste. In-effective enforcement of MSW related law and poor awareness people always lead to increase associated risk with MSW.

2. Municipal solid waste Generation in India

In India, urban area approx. annually 62 million tones averages waste generated out to 450 grams of waste per person per day in which municipal solid waste generation per person is 170 gram for small town and 620 gram for large city. CPCB-NEERI conducted study during 2004-05 in Delhi, Mumbai and Chennai and found waste producing these cities is 5,922 TPD, 5,320 TPD and 3,036 TPD respectively. In 2011, CPCB accessed and found Delhi, Mumbai, Chennai, Hyderabad & Kolkata is biggest waste generated cities. Waste generated in 2011 in Delhi 6,800 TPD, Mumbai 6,500 TPD, Chennai 4,500 TPD, Hyderabad: 4,200 TPD, and Kolkata: 3,670 TPD.

As per CPCB report, municipal solid waste generation in year 2010-11 is about 1,27,486 Tons per day. The same was about 1,00,000 TPD (Tons Per day) in year 2000 as per report (May, 2000) of During 2004-05, CPCB conducted survey through NEERI in 59 cities and estimated 39,031 TPD MSW generation.

Table I: Statistics of Municipal (MSW) generated in different State of India India

States	MSW (TPD) 2000	MSW(TPD) (2009–2011)	Collected (TPD) (2009–2011)	Treated (TPD) (2009–2011)	Growth (%)
Andhra Pradesh	4376	11500	10655	3656	163
Assam	285	1146	807	73	302
Delhi	4000	7384	6796	1927	85
Gujarat	NA	7379	6744	873	–
Karnataka	3278	6500	2100	2100	98
Kerala	1298	8338	1739	4	542
Madhya Pradesh	2684	4500	2700	975	68
Maharashtra	9099	19204	19204	2080	111
Manipur	40	113	93	3	182
Meghalaya	35	285	238	100	713
Orissa	655	2239	1837	33	242
Punjab	1266	2794	NA	Nil	121
Rajasthan	1966	5037	NA	Nil	156
Tamil Nadu	5403	12504	11626	603	131
Uttar Pradesh	5960	11585	10563	Nil	94
West Bengal	4621	12557	5054	607	172

Source: CPCB (2000b, 2013)

Table II: Total MSW generated, collected and MSW per capita generation

Description	Data	Year
Total MSW generation (in MTPD)	0.141064	**2014**
MSW generation per capita (in MTPD)	200 – 600	**2016**
Waste Collected (in MTPD)	0.1,27,531	**2014**
Waste processed (in MTPD)	0.034,752	**2014**

Sources: CPCB, India

Note: MTPD means million Ton Per day

3. Composition & Nature of waste

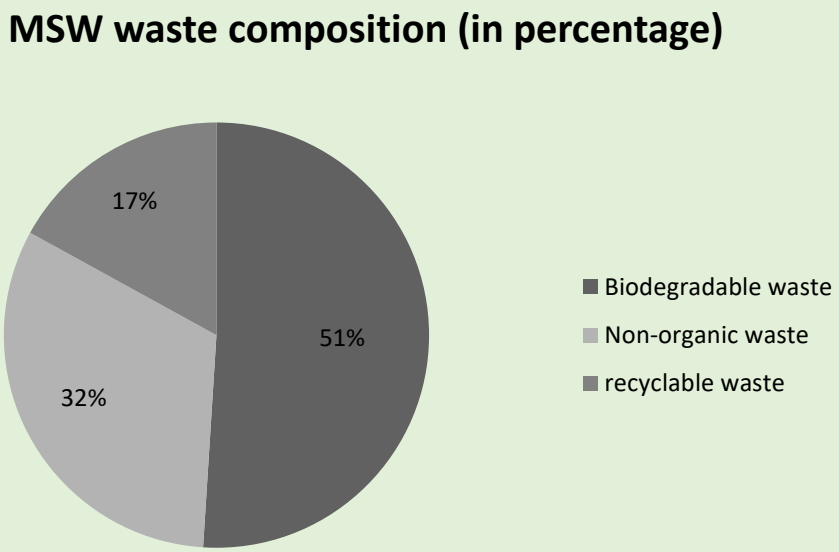
The composition and nature of municipal solid waste varies municipality to municipality. Majority of composition of Municipal solid waste include, Organic waste and it is also known as biodegradable waste, second is Non-organic waste and third is recyclable waste.

In simple language, it can be categories in Hazardous waste and nonhazardous waste. Non-hazardous is very dangerous to environment as well human. Paint, hazardous chemicals, pesticides, electrical & electronic appliances are example of Hazardous waste. Food waste, green waste, paper are few example of non- hazardous waste. MSW Waste generate from residential, commercial, institution and industrial area. Classification of Solid waste is hereunder

Table III: Solid waste Classification

Waste Classification	Example
Biodegradable waste	Food and kitchen waste, green waste, paper etc.
Recyclable materials	paper, cardboard, glass, bottles, jars, tin cans, aluminium cans, metals, certain plastics, fabrics, clothes, tires, batteries, etc.
Biomedical waste	Expired pharmaceutical drugs such waste that generated from diagnosis, prevention or treatment or research of disease in hospital, clinic, medical research laboratory etc.
Electronic (E) waste	Electrical and electronic appliances, light bulbs, washing machines, TVs, computers, screens, mobile phones, alarm clocks, watches, etc.
Hazardous waste	Paints, chemicals, tires, batteries, fertilizers etc.

In 2007, A study of Indian metro cities where population over 1 million estimates MSW composition (by weight) to be 41% organic or biodegradable, 40% inert, 6% paper, 4% plastic, 4% textiles, 2% glass, 2% metals and 1% leather. In 2014, according to India Planning Commission MSW study, 51% of MSW is organic or biodegradable, 32% is inert or non-organic and 17% is recyclable waste.



Sources, India Planning Commission MSW study, 2014

4. Challenges:

To controlling risk related to municipal solid waste is challenging job for every country. Indian Government have made certain rule and regulation such as Municipal Solid waste rules to using, transferring and disposing MSW in safe manner. Municipal Solid Wastes (Management and Handling) Rules, 2000 replaced as solid waste rules in 2016by Indian government. Due to

ineffective enforcement of MSW rules and poor awareness among society people is main challenge to reduce waste generation and its safe disposal. Apart from this, resource is also major factor and due to non-availability of resources including technology and Transport facility, MSW can't be dispose or transfer or recycle safely or combustible solid waste can't be used to generate Power. Adequate numbers of waste bin not provided in municipal area is also factor to create hazardous situation. Poor supervision is also factor to control to municipal solid waste.

5. Municipal solid waste management

Effective method of collection, Storage, Transportation, Processing is main parameter of Municipal Solid waste management system (MSWMS). Basically recycling, composting, disposal, and waste-to-energy converting is main element of MSWMS. Storage means, such place, which identified to store MSW and it can be also known as designated place of MSW storage. Storage may be container or any place that is used to store to waste. Collection includes gathering of Municipal solid waste, Processing and recovery includes, Separation of waste materials as per their nature and category, use for recycle or re use or use for electrical power generation.

To collect waste materials, it Transfer through transport to such location where vehicle will be emptied. This location may be materials processing facility or a transfer station or a landfill disposal site.

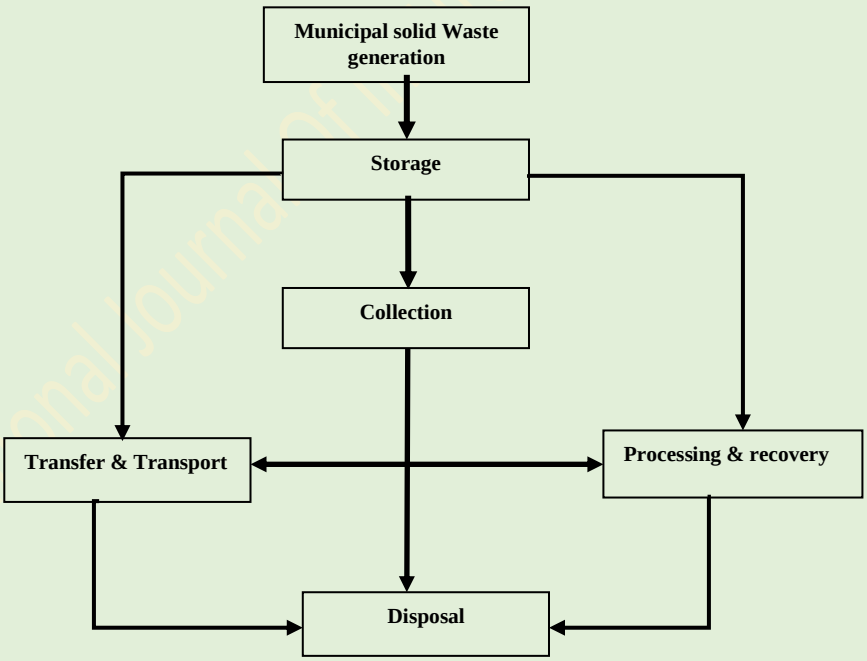


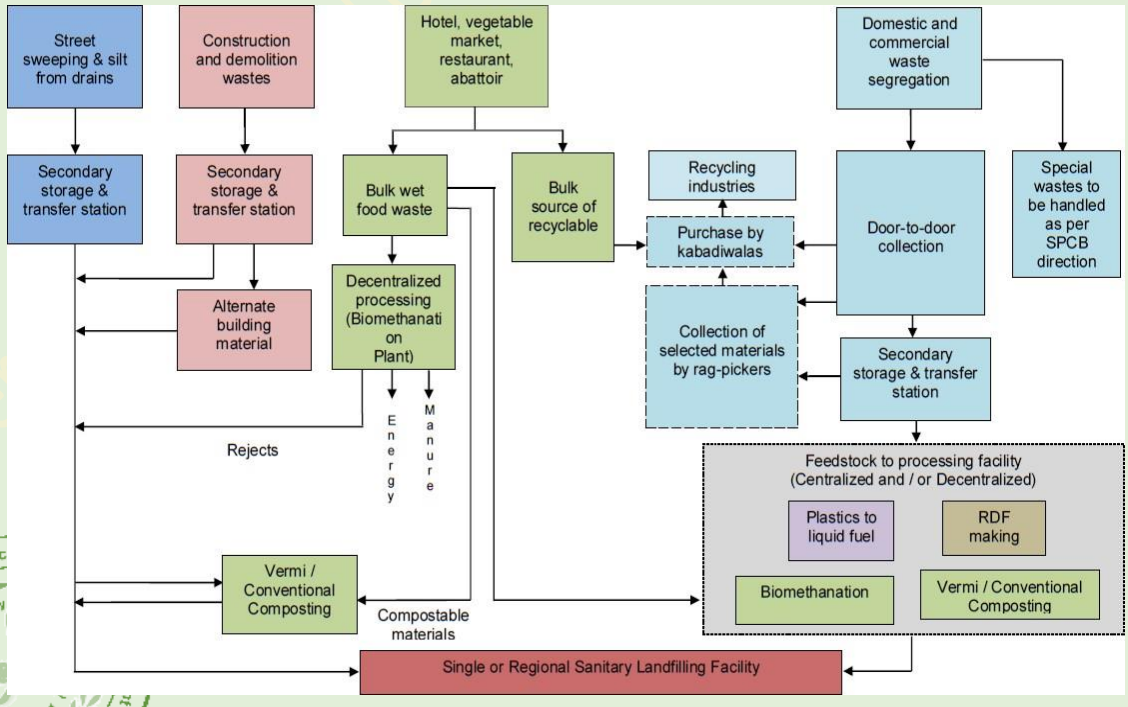
Fig. I: Components of Municipal solid Waste management System

India government also lunched different program such Swachh Bharat mission to clean up nation from waste. Government have made rules to control waste generation and manage to MSW. In India, Generally Municipal Authority have allotted bin or container in different area of municipality,

Generated waste from residence or other municipal area collected in allotted bin or container of MSW area, Municipal vehicles come and collect to waste and dispose or transfer on such place where is identified for dumping, or recycling or used to generate power. In India, many municipality have adequate resources for handling and managing MSW and several municipality have less resources and due to less resources, Municipal authority faces several challenges during storage, collection, Process and disposing to Municipal Solid waste in safe manner.

Effective Landfill & Energy generation from MSW is best option to control municipal waste. Landfills are created by land dumping. Effective Land dumping methods help to prevent environmental degradation and avoid land pollution. As per govt. guide lines land fill must be done because landfills can cause of pollution and can intoxicate ground water due to ineffective landfill and availability of toxic/ hazardous waste with MSW. Usually landfills are surrounded by large walls or fences hiding the mounds of debris. Large amounts of chemical odor eliminating agent are sprayed nearby surrounding area of landfills to hide the evidence of the rotting waste.

Combustible MSW can be used to generate electricity. Such waste will be used as fuel to generate heat and steam and steam will be used to operate to turbine and generate electricity. So, Waste convert into energy from Municpal soild waste is good option to generate electricity. Burning of MSW also reduce waste quantity. Several large landfills used generate electricity by using the methane gas that is produce from decomposing biomass in landfills and this can be used to generate electricity. In 2016, 71 U.S. power plants generated about 14 billion kilowatthours of electricity from burning about 30 million tons of combustible MSW.



Source: Planning Commission Report (2014).

Fig. II: Integrated MSWMS for Population less than 1 Lakh

Conclusion: Municipal Solid waste has negative impacts on environment and it may cause of environmental degradation if safe and effective method not used during storage, handling and disposing. MSW can be reuse, recycle and also be use to generate energy as per their nature. MSW should be segregated, stored and dispose properly as per their nature and properties. Some MSW may be Combustible and it can be used as electricity generation. Some MSW can be reuse or use after recycle. During Landfill always take effective measure to avoid pollute to land or formation of hazardous environment nearby by damp area. Large dump area can also use to electricity generation from formed methane Gas. Few MSW can be used as compost due to their property and convert waste into compost to use suitable method of compost making. MSW such as greenery vegetable waste, food waste, ash can be landfill and latter it can be use as compost. Awareness among municipality people is very essential to reduce waste generation and handle properly. Government should frame and strictly enforced the Law related to MSW.

Adequate numbers of bin or container must be provide in municipality area and dispose time to time by municipal authority. Adequate measure will help to control MSW generation and their associated risk.

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Training Calendar

ISE (India) Training Calendar (January-2020 to March-2020)

Training Title/ Course	Duration	Schedule	Location	Remarks
ISE-SM (Safety Management at work place)	3 day or Min.24 hours Training	02/01/2020 to 04/01/2020	Raipur	
ISE-TQM (Total Quality Mgt.)	3 day or Min.24 hours Training	08/01/2020 to 10/01/2020	Raipur	
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	Min. 96 hours Training	13/01/2020 to 21/01/2020	Raipur	Exam Date 22/01/2020
Workshop on Behaviour Based Safety in industries	2 days	27/01/2020 to 28/01/2020	Raipur	
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	E-learning	Last Date of Registration 28/01/2020	Al-Hasa	Exam Date 14/02/2020
Lead Auditor ISO 45001:2018	5 day	03/02/2020 to 07/02/2020	Raipur	
ISE-SM (Safety Management at work place)	3 day or Min.24 hours Training	11/02/2020 to 15/02/2020	Raipur	
First Aid	1 days	17/02/2020	Raipur	
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	Min. 96 hours Training	19/02/2020 to 27/02/2020	Raipur	Exam Date 28/02/2020
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	E-learning	Last Date of Registration 28/02/2020	Al-Hasa	Exam Date 27/03/2020
ISE-EM (Environmental Management)	3 day or Min.24 hours Training	04/03/2020 to 06/03/2020	Raipur	
Integrated Lead Auditor (ISO 45001:2018, ISO 9001:2015, ISO 14001:2015)	6 day	09/03/2020 to 14/03/2020	Raipur	
ISE-SM (Safety Management at work place)	3 day or Min.24 hours Training	16/03/2020 to 18/03/2020	Raipur	
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	Min. 96 hours Training	21/03/2020 to 30/03/2020	Raipur	Exam Date 31/03/2020
ISE- IDOHSEM (International Diploma in Occupational Health Safety & Env. Mgt.)	One year	Last Date of Registration 16/04/2020	Raipur	Exam Date Dec. 2020 (Proposed)
ISE- IDOHSEM (International Diploma in Occupational Health Safety & Env. Mgt.)	E-learning	Last Date of Registration 16/04/2020	Al-Hasa	Exam Date Dec. 2020 (Proposed)
Diploma/ Post Diploma in industrial Safety/Fire/Env.	One year	December 2019-20	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

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