International Journal of Institution of Safety Engineers (India)

Volume-2, Issue-1, January-March 2019; Available online at www.iseindia.in

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.

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- ISE-SM (Safety Management at work place), 24 Hours Duration.
- ISE-ICCOHSEM (International Certificate Course in Occupational Health Safety & Environmental Mgt.), Duration 96 hours.
- ISE-IDOHSEM (International Diploma in Occupational Health Safety & Environmental Mgt.), Duration One year.
- ISE-TQM (Total Quality Mgt.), Duration 24 hours.
- Integrated Lead Auditor (ISO45001:2018, ISO 14001:2015, ISO 9001:2015), Duration 6 days & Lead Auditor (ISO45001:2018,), Lead Auditor (ISO 14001:2015) & Lead Auditor (ISO 9001:2015), Duration 30 hours each.
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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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Fall, Slip &Trip (FST) Hazard at workplace

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ABSTRACT

In this world, each & every day several peoples injured at work place due to fall, Slip &Trip (FST) hazard. FSTs also cause of serious injury and fatality. Over all injury, Major numbers of fall related Injury occurred or people losses their life at workplace. Greater risk of fall, Slip & Trip at work place are due to poor work place condition and unsafe behaviour of people. Major injury or fatality occurred when person sustained in injury in head, neck or other sensitive body parts. Basically fall are two types, fall from Elevated area or on same level. To control Risk due to fall, Slip, Tripp is challenging job for everyone.

Objective to publish this paper is to study & analyse the causes of fall, slip & trip and ensuring their suitable control measure to prevent similar incident. In this paper case study is carried out to collect accident data from different sector to identify causes wise accident and selected effective procedures to prevent person falling. So This Paper is very helpful to control injury or fatality that occurred at workplace due to fall, slip & trip.

.Keywords:

Work Place Risk Control, Causes of fall, Slip & Trip (FST) Hazard, Fall, Slip & Trip (FST) related Injury prevention method, Work place Safety Factor, Effective Safety Management system, Engineering Administrative & Health Factor Contribution in Fall, Slip & Trip related injury.

Objective

- Study & Analyse of Fall, Slip & Trip (FST)hazard
- Risk Control at work place
- For preventing Fall, Slip & Trip related injury
- Cost control to prevent Fall, Slip & Trip related injury
- Identify Factor those lead to cause of Fall, Slip & Trip related injury
- Design parameter to control Fall, Slip & Trip hazard.
- Behaviour issue & control
- Fulfilling statutory requirements.
- Increasing employees morale and maintain better relation with stake holders.

1. Introduction:

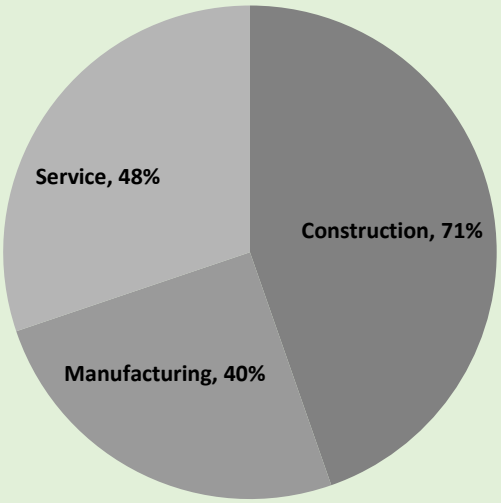
At current scenario, each and every day several people injured due to fall, slip & Trip related injury. To control fall, Slip & Trip related injury is challenging job for every organisation. Injury causes pain and Loss of Earning capacity and badly effect to organisational growth. Accident decreases organisation employees morale including workmen.

Fall, slip & Trip are major causes of workplace injury and in over all injury, fall, Slip & Trip related injury percentage is more than other injury. Greater risk of person falling at workplace are caused of ineffective method selection of work, Poor planning, poor factor consideration during workplace design and poor quality materials used with access and work platform. Person can fall from Elevated area or on same level. Poor condition of work place, Slippery floor, Railing missing of stair case, Floor Opening, loose material in access, Cable in access, Over speeding or use of defective equipments like ladder are causes of fall, slip & trip. In simple way we can say that poor condition of workplace and unsafe people behaviour are main causes of Person fall. Poor Health condition like factor also leads to cause of person fall.

Fall **Slip** **Trip**

Fig. 1

Institution of Safety Engineers (India) carried out a studies in different sector industries in year 2018 including Construction, Manufacturing and Service sector industries to identify cause of fall, slip & Trip (FST) related injury and found that Construction sector industries is more fall prone industries respect to other sector industries. As Per Institution of Safety Engineers (India), **71 percent Fall, Slip & Trip related injury occur in Construction Sector industries of overall injury, 40 percent Fall, Slip & Trip related injury occur in manufacturing sector industries of overall injury and 48 percent Fall, Slip & Trip related injury occur in service sector industries of overall injury.** In every 7 injury result 1 serious injury. Elevated falls and same-level falls are basically two types of fall. 63-65 percent fall related injuries occur during working on same level or walking. 35-37 percent fall related injuries occur during working in elevated area. Elevated fall are more danger than same level fall because elevated fall have potential of multiple and serious injuries. 65 Percent elevated falls are less than 3 meter height.



Fall, Slip & Trip related injury percentage sector (Construction, Manufacturing & Service) wise Fig. 2

According to Occupational Safety and Health Administration (OSHA), falls, Slip & Trip cause 15% of all accidental deaths. According to the Centre for Disease Control and Prevention (CDC) and the Bureau of Labor Statistics (BLS) U.S,

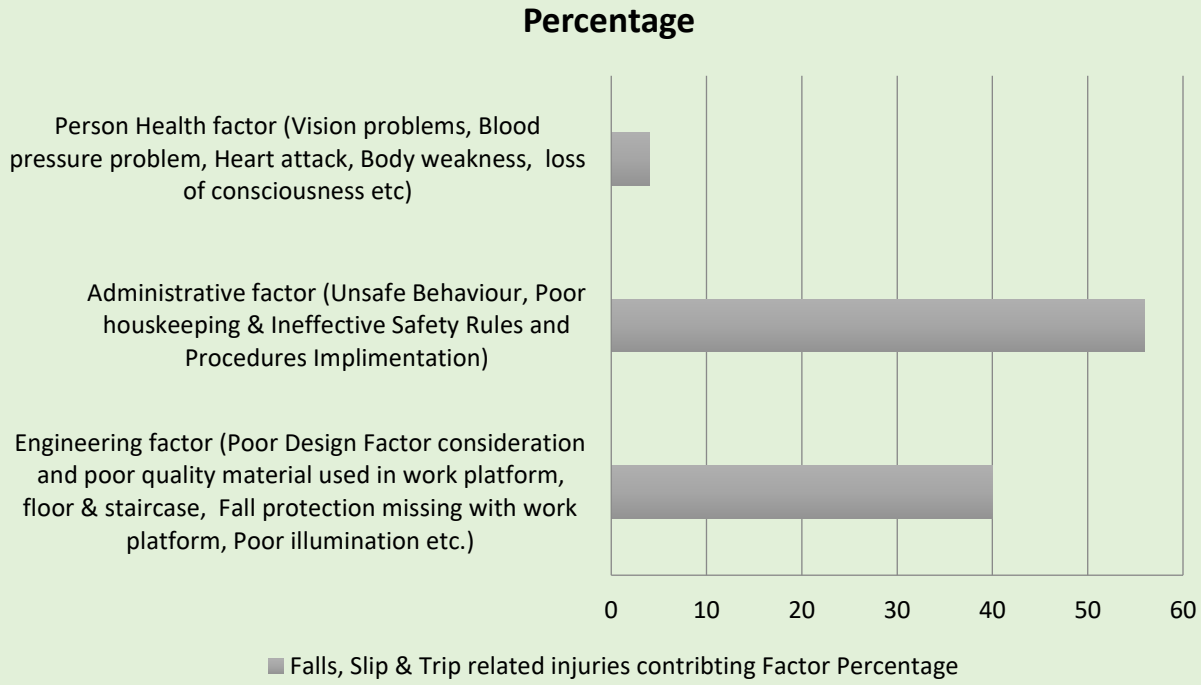
- 65% fall related Injuries occur during working on same level working and walking
- 16 % injuries occur in manufacturing sector on Same level fall
- Over one million Americans people suffer every year from Fall, Slip & Trip Related injury
- In every 6 FST related injuries, 1 result lost time injury.
- Over all elevated fall, 60 Percent elevated fall are from height less than 10 feet.
- Elevated fall are more serious than Same level fall
- An estimated 20-30 Percent People suffers with serious injury such as Fracture, Head injury
- In U.S approx. 19,565 people die due to unintentional fall related injuries
- Approx. $40,000 per incident cost bear by employers from Fall, Slip & Trip Related Injury

2.1 Cause & control prevention strategies of fall, Slip & Trip (FST)

On based on accident data collection, Institution of Safety Engineers India) categorised cause wise fall, slip & trip related injuries and found that **40 percent engineering Factors** (Defective & Non-standard work platform, Poor condition of Access and Stair, poor slope or uneven floor, Railing missing, Defective material used with work platform such as stair, scaffold, Poor Illumination at workplace etc) are responsible of overall fall, slip & trip related injuries.

Overall **56 Percent** fall occur due to **Administrative factor** (Human factor, Lack of Training, Ineffective implementation of safety Rules & procedures, Poor safety culture, not use of fall arrest system etc) including 31 percent of poor housekeeping (Slipper Floor, loose material in access, obstruction on floor, Power cable

laying on floor or access etc). **4** Percent Fall related injury occur at workplace due to **poor health factor** such as Vision problems, Blood pressure problem, Heart attack, Body weakness, loss of consciousness etc. Exposure of Toxic & dangerous chemical can also lead to cause of fall due to unconsciousness but not included in this study report. Good housekeeping can be ensured at work place through administrative control, So Housekeeping is considered under administrative Factor.



Cause wise injury on based on data collection from Construction, Manufacturing & Service Sector Industries

2.1.1 Cause of fall, Slip & Trip

Poor housekeeping, slippery or uneven floor, unsafe behavior including not using fall protection/ arrest system during working in elevated area, poor illumination of workplace, Poor health condition of person, Defective ladder or workplace or platform, hand railing missing, Floor opening, cable laying on floor etc are cause of Fall, Slip & Trip. In simple ways cause of fall, slip & Trip can we justify in following ways.

2.1.1.1 Common causes of falls: Poor Condition of workplace, Obstruction in access, uneven surfaces, use of defective ladder, Not using fall arrest system, Poor housekeeping, unsafe behavior, Inadequate access, Defective staircase, Fall protection missing on work platform, Obstruction during carrying objects may cause of person fall.

1.1.2 Common Cause of Slip: Slippery floor surface e.g oil spillage, wet floor, More slope, Inappropriate footwear, slippery rug of ladder, over speeding, Poor Housekeeping, Poor drainage system, over speeding, working or walking on round shape materials like small diameter pipe etc lead to cause of Slip hazard.

2.1.1.3 Common causes of Trips: Poor housekeeping, Material storage in passageway/ Access, Uneven floor surfaces, Cable in access, Obstruction or defect on floor, Poorly maintained floor, Cracked tiles,

defective floor, poor condition of Stair, exposed steel bar on floor, worn of loose full paint/ trouser lead to cause of trip hazard with exposed material of floor or platform.

2.1.2 Fall, Slip & Trip Related injuries prevention method:

2.1.2.1 Engineering Control: Non-standard work platform (Poor safety parameter consideration for floor, stair & work platform, Poor Slop of floor, Floor opening, inadequate work platform (railing missing, Toe guard missing, Floor opening, Inadequate access), Poor quality (defective) material selection and poor method use for scaffolding erection, Poor illumination like factor increase the potential of fall related injury.

Always Ensure, Slip resistance floor, even floor, Suitable railing with stair and ensure fall protection at work platform. Ensure adequate illumination at workplace to notice hazard easily and avoid person fall. Suitable illumination reduces the likelihood of person falling. During working and movement, people easily notice to hazard. Ensure all safety parameter related to lighting like lighting should be no adverse health effect and no potential to cause of person falling. Ensure emergency or back up lighting arrangement to prevent person fall in case of power failure. Engineering control is best option to control risk of Fall, Slip & Trip. Adequate engineering control measure should be taken to prevent fall, Slip & Trip related injury on based on respective Province and state Laws and standard.

2.1.2.1 Administrative Control: Ineffective administrative control increase unsafe behaviour within organisation and increases the risk of fall, slip & Trip. Ineffective implementation of safety rules & procedure, inadequate Training, Poor supervision increases unsafe behaviour among organisation people.

Administrative Control play vital role to prevent fall, slip & Trip related injury. Effective **e**nforcement of Rule & procedures prevent to fall, slip and Trip related injury. Safety awareness activity like Training, motivational program and display of safety signage and notice always help to create safety awareness among employees to develop positive safety culture at workplace. Carry out Risk assessment & close supervision by skill and experience person to identify workplace fall, slip and trip related hazard and prevent untoward happening.

Use of fall arrest system reduces the consequence of injury. When person working more that 1.8 meter height they must be use personnel fall protection. Suitable foot wear help to avoid slipping and preventing to person falling. Use of Personnel Protective equipments PPE's) is related to behavioural issue, so safe behaviours is considered under administrative control because behaviour related issue could be resolve through administrative control method.

Poor housekeeping are major contributing factor that lead to cause of fall, Slip & Trip related injuries, So always ensure good housekeeping at work place. Avoid to keep materials in access. Avoid to laying power

cable in access, Clean to floor regular and floor should be free from slippery. Suitable mark to access and barricades to floor area where are potential of person falling will help to prevent fall related accident.

2.1.2.3 Health Control: Poor health condition such as Vision problems, Blood pressure problem, Heart attack, Body weakness, loss of consciousness can cause of person fall. To avoid similar incident always ensure good health and take consultation with health specialist time to time. Create work place stress free.

3. Conclusion

Fall, slip and trip are major cause of injury at workplace of overall injuries. Fracture, Pain, Swelling, multiple injury, fatality like accidents occur at workplace due to fall related incident. Head injury, Neck injury, Spine injury are main cause of serious and fatal injury.

Fall, Slip & Trip Related injury can be controlled through Engineering Method, Administrative Control method and to ensure people good Health Condition. Ensure adequate illumination at workplace to notice hazard easily and to avoid person fall. Carry our Close supervision and motivate to people to avoid unsafe practices. Always use fall arrest system during working in elevated area. Effective implementation of safety rules and procedures help to prevent unsafe practices and condition and control to fall, Slip & Trip related injury. Health Check program should be conducted time to time and develop behaviour based safety culture among employees including workmen to prevented fall related incident.

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Study of Machinery Safety in Industries: A review

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Abstract: *In industries numbers of injury or fatality occur due to several reasons in which one is machine related accident. Any machinery or parts of machinery that have potential to cause injury or death is one of cause of industrial accident. Un-guarding to rotating parts of machine, electricity, Hot surface of machinery, Fire, Noise, Temperature etc. are different types of machine related associated hazard in industries but in this study, Machine guarding and similar safety devices that help to prevent machine related incident is considered. Rotating parts of machines has potential to cause injury or fatality.Objective to publish this paper is to know machinery safety principle and protect to workmen/ supervisors from exposure of mechanical hazards. This paper is very helpful to control machine related incident.*

.Keywords:

Machine Guarding, Machinery Safety, Risk Control, Types of Guard, Machinery related incident prevention method.

Objectives

- Ensuring Compliance to fulfil statutory requirements as per Section 21 of Factories Act 1948 (India) or respective state &country law and regulation, In India.
- Eliminate/substitute or reduce to machinery related risk.
- Protect to person from potential source of incidents through engineering control.
- Enhance& sustenance organisation reputation and morale of employees.

1. Introduction: Machinery Safety is very important to protect to workers from exposure of potential sources of harm of machinery or their parts. In Industries different types of potential sources of injury or death found in which one is concern with machinery that is known as Mechanical hazard. Mechanical hazard has potential to cause of injury such as cut, bruises, crushed or fatality. In Industry Numbers of Injury occurred every day due to unavailability of guard on rotating parts of Machines. Nip point is main source of machinery related accident.

Human and mechanical failures are causes of Accidents in industries. In other way we can say that unsafe act and unsafe conditions are cause of machine related accident. Unguarded rotating parts or sharp edge of any parts of machinery or any particles that are ejecting during machine operation and harmful for human are potential sources of machine accident. Person sustained injury or fatality occur when expose with

mechanical hazard such as Machinery Traps, entanglement, contact, ejection, unexpected start-up of machinery etc. Younger and older person are particularly vulnerable.

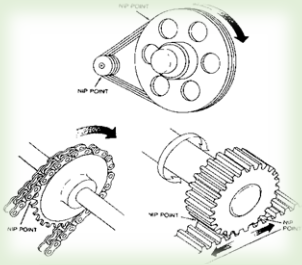


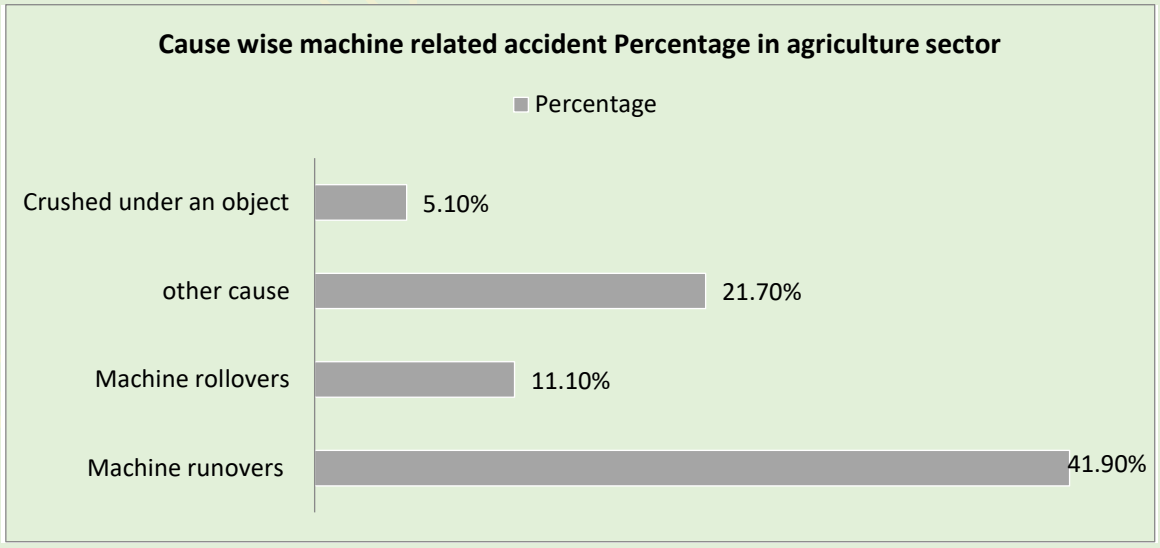
Fig. 1, Nip point

In year 2014, As per National Crime Records Bureau (NCRB) total number of deaths by factory/machine accidents in India was 797. The top 10 states of factory/machine related accidents in India were Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Tamil Nadu, Punjab, Haryana, Chhattisgarh and Delhi.

As per EUROSTAT report in year 2003-2005, 500 machinery related fatal accident occurred in EU. Machine related accident caused more than 3-day work absences in the EU more than 170,000 times in year 2005.

As per ILO, 2.3 million person including workers around the world succumb to work related accident or diseases every year in which 600 deaths occurs in single day.

As per Farm Injury/ Fatality Statistics of Canada, 1769 Fatalities occurred during year 1990-2005 in which 70.9 percent fatalities occur during agriculture machine operation.



Farm injury/ Fatality Statistics of Canada, Year 1990-2005

2. Principle of Machinery Safety

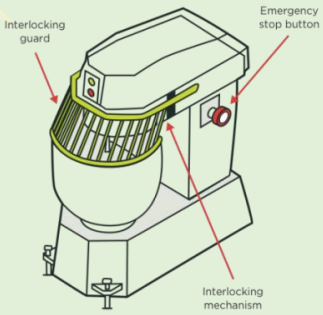
Machine guarding and safety devices such asTrip Devices, Two Hand control Device and over run deviceare a precautionary safety feature on engineering equipment or machines. Machine guarding is safety device that cover to hazardous parts or areas of machine to prevent to contact with person body parts. There are four basic types of machine guards:

- Fixed guards
- Interlocked guards
- Adjustable guards
- Self-adjusting guards

Fixed Guard: Fixed guards are most common types of safety device due its simplicity and effectiveness. Such guards are fixed permanently to equipment and can only be removed during maintenance or other work as per need with small effort.

Fixed guard, Fig. 2

Interlocked Guard: Such guard shut down to machine automatically when guard is open or not lock properly, so it is very effective to eliminate hazard.



Interlock guard, Fig. 3

Adjustable Guard: Such type of Guard is used in point of operation of band saw like machine. This guard can be adjusted manually.

Adjustable guard, Fig. 4

Self-adjusting guard: Such type of guard is used in Saws machine. It pushed away when materials is fed into the machine during operation.

Self-adjusting guards, Fig. 5

Machinery Safety Devices: Machinery Safety device such as Trip Devices, Two Hand control Device, over run device also use with machinery to control machine related accident. A Safety Device is a protective appliance other than guard that eliminate or reduces to severity of hazardous event before access to a danger point or area.

3. Principle to Prevent Machine related Accident:

Machinery related incidents can be prevented by following way:

Engineering Control: Engineering control is best option to control Machine related accident. Ensure guard of rotating machines or parts of Machinery that have potential of injury. Safety devices such as Trip devices, Two Hand control Device, over run device also used to protect to people from exposure of mechanical hazard.

Ensure adequate illumination and suitable work platform. Work environment should be ergonomically fit for operator. Carry out regular inspection and maintenance of mechanical safety devices and guard. Never remove machine guards. Use Log out Tag out & try out system during maintenance work.

Administrative Control: Unsafe behaviour is dangerous and this can be lead to cause of Accident. To create positive behaviour safety culture, plan and conduct training, safety awareness/ motivational program and reward to workmen to increase safety awareness and prevent unsafe practices. Effective implementation of Safety Management system, Rules & Procedures will help to prevent human failure and positive safety culture at work place. Ensure trained operator or workman to operate machine. Impart refresher and need based training time to time. Unauthorised person will be restricted to enter hazardous machine area. Display Safety Signage, notice and instruction nearby machinery and Ensure Shut down permit before starting maintenance operation on machinery. Avoid to wear loose belts, Jewellery, Long & loose hair, loose and Long pants, Scarves, Ties around moving machinery or equipment's. Use suitable personnel protective equipment's (PPE's) and always ensue good health of machine operator to prevent human error. Avoid to

use alcohol or other drug that effect to central nervous system (CNS). Carry our regular and close supervision by competent person. It will help to prevent unsafe practices i.e human error.

4. Conclusion: Human and mechanical failure are main cause of machine related accident and machine related accident can be prevented through engineering control or administrative control method. Engineering control such as to provide guard on danger parts of machinery or to use of safety devices is most effective method to prevent machine related accident. Ensure suitable illumination at workplace and all parameter related to ergonomics must be ensured. Ensure good health of operator and impart training time to time. Effective implementations of Safety rules and procedure help to control machine related accident. Carry out regular supervision to motivate to operator to prevent human error. Hazard identification & Risk Assessment (HIRA) must be carried out for machine operation.

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Training Calendar

ISE (India) Training Calendar (April-2019 to June-2019)

Training Title/ Course	Duration	Schedule	Location
ISE-SM (Safety Management at work place)	3 day or Min.24 hours Training	03/04/2019 to 05/04/2019	Raipur
Integrated Lead Auditor (ISO 45001:2018, ISO 9001:2015, ISO 14001:2015)	6 Days	22/04/2019 to 27/04/2019	
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	Min. 96 hours Training	02/05/2019 to 10/05/2019	Raipur
Lead Auditor ISO 14001:2015	5 day	27/05/2019 to 31/05/219	Raipur
ISE-SM (Safety Management at work place)	3 day	06/06/2019 to 08/06/2019	Raipur
ISE- ICCOHSEM (International Certificate course in Occupational Health Safety & Env. Mgt.)	Min. 96 hours Training	13/06/2019 to 21/06/2019	Raipur
Lead Auditor ISO 45001:2018	5 day	25/06/2019 to 29/06/219	Raipur
Diploma/ Post Diploma in industrial Safety	One year	December 2018-19	Raipur/ Rampur
ISE- IDOHSEM (International Diploma in Occupational Health Safety & Env. Mgt.)	One year	Last Date of Registration 30/08/2019	Raipur

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 organisational Need.

For more details visit www.iseindia.in or mail info@iseindia.in Call 07509487141

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