



Safety and  
health principles  
and definitions  
**Guidance book**

A set of principles  
outlining the  
steel industry's  
approach to  
safety and health

## Contents

- 3 Our commitment
- 5 The principles
- 6 Areas of focus
- 8 Six safety and health principles
- 20 Definitions and calculations

“Nothing is more important than the safety and health of the people who work in the steel industry.”

worldsteel Board of Members

## Our commitment

The industry is committed to maintaining a safe and healthy workplace and acting on safety and health incidents, risks, and opportunities.

We consider safety and health to be an integral component of doing business, and it starts with each one of our people.

The safety and health of our people is our core value and must not be compromised in the face of other business challenges. This applies to everyone involved in the industry, including business leaders, employees, contractors and other third parties such as suppliers, customers and visitors.

worldsteel has developed this guidance book to encourage member companies to apply the principles and the metrics for their organisation and set the standard for the industry. This booklet provides guidance to worldsteel members on the meaning of the principles. Definitions and calculations have been included to ensure a common standard.

Individual companies have different goals and procedures. The principles should be adapted to meet specific contexts (internal and external) and corporate environments.

Is safety and health a core value and integral component in your organisation?  
Is this reflected in your safety policy and organisational mission and objective?

## Six safety and health principles for the steel industry

01



All injuries and work-related illness can and must be prevented.

02



Managers are responsible and accountable for safety and health performance.

03



Employee engagement and training is essential.

04



Working safely is a condition of employment.

05



Excellence in safety and health drives excellent business results.

06



Safety and health must be integrated into all business management processes.

worldsteel's Board of Members believes that clearly defined principles will result in an enhanced safety and health culture, as well as improved business results across the industry.

Through the adoption of the principles by the leaders of the member organisations, worldsteel and its members demonstrate their commitment to an injury-free and healthy workplace.

The principles are based on the experience, knowledge, company policies and values of worldsteel members.

## Four areas of focus

Companies need to apply the six principles to the following four focus areas to ensure comprehensive safety and health management.

### Safety culture and leadership

The safety culture of an organisation is the product of individual and group values, attitudes, competencies, and patterns of behaviour that determine how people and systems act and respond in relation to risks and opportunities. Safety culture and leadership evolve gradually over time as people go through

various changes, adapt to environmental conditions and solve problems. To create a truly robust safety culture, organisations need to proactively position safety as an integrated value for all workers. To attain this level of safety culture, significant commitment and a drive towards continuous improvement are required.

### Occupational safety management

Occupational safety management promotes the safety of employees, contractors and visitors by preventing personal injuries in the workplace, and has a strong focus on primary prevention of exposure to hazards.

### Process safety management

Process safety is a blend of engineering, operations and management skills focused on preventing catastrophic accidents, particularly structural collapse, explosions, fires and toxic releases associated with loss of containment of energy or dangerous substances such as toxic gases, molten metal, chemicals and petroleum products.

The manufacturing of steel involves processes with intrinsic hazards that need careful management. The measures needed to control these hazards are often complex. The focus of process safety management is not limited to protecting the people within the company but also includes the environment, assets and surrounding community.

### Occupational health management

In its widest definition, occupational health management encompasses the physical, mental and social well-being of the people working in the company. The focus is placed on long-term effects of exposure to hazards. The health of workers has several determinants, including risk factors at the workplace leading to cancers, musculoskeletal diseases, respiratory diseases, hearing loss, circulatory diseases, stress-related disorders and others.



## Six safety and health principles

Principle

01

### All injuries and work-related illness can and must be prevented.

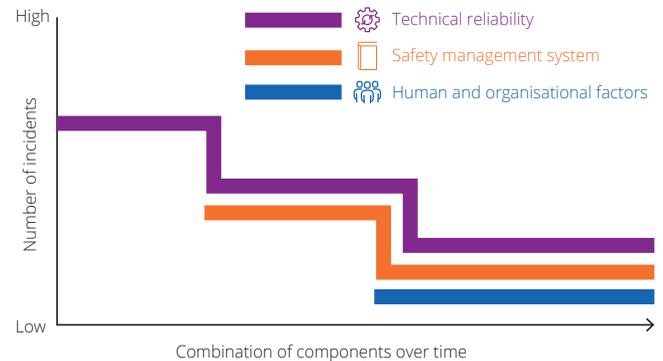
An essential framework to prevent work-related injuries and illness (especially serious events) should consider the following:

- 1. Risk Management** is an essential component to identify hazards, assess risk and determine appropriate controls (applying the hierarchy of controls).
- 2. Integrated safety and health management systems** are there to keep everybody safe and healthy: our people, our contractors, suppliers, customers, and the community. Systems bring order, standardisation and operational discipline to safety.
- 3. Ensuring the reliability of every piece of machinery and process** is an important component of the strategy used to help companies avoid adverse events and incidents that impact people, environment, communities and business continuity.
- 4. Human and organisational performance** are the cornerstone for safety and health excellence.
- 5. Accident investigation** should strive to find systemic root causes.



We are committed to a workplace where all people are protected; because everyone deserves to feel safe and valued.

thyssenkrupp



## Managers are responsible and accountable for safety and health performance.

Leaders should ensure a safe and healthy workplace by empowering and supporting people to identify and freely report potential risks and develop effective controls to keep them safe.

It is expected that every person who works for the steel industry should be aware of potential risks, and to fully comply with health and safety standards and procedures, whilst contributing to their continual improvement.

It is essential that managers lead the safety and health agenda and initiatives in a consistent way. It lends credibility and thoughtfulness to every task, big or small. By leading the initiatives consistently, managers demonstrate their leadership and commitment.

Managers should set priorities and objectives based on risk. They should also provide resources for safety and health functioning and maintenance. This active involvement shows that there is a genuine desire to succeed.

Managers are responsible and accountable for safety and health performance.



Include safety and health objectives in performance assessments and other career advancement decisions.

Ensure effective safety and health competence for managers in your organisation

## Employee engagement and training is essential.

Everyone must be involved in a meaningful way, daily, to support injury and occupational illness prevention. Through constant exposure to safe practices, people will develop behaviour that ensures each task is performed safely.

Engaged and empowered employees will choose to work safely themselves and ensure others do as well. They will also feel comfortable contributing their ideas for safety and health improvement and act on safety incident risks and opportunities. Involvement and recognition of the

employee will promote good safety and health results.

Training is an essential part of an effective safety and health system. Employees should know how to keep themselves and those around them safe and healthy.

All employees must undertake the necessary training and acquire the skills and tools to do their job safely. Employees need to show a willingness to be trained and must apply their acquired knowledge and skills. With the right training, each person can perform independent job risk assessments.

Engaged, empowered, and competent employees will choose to work safely for themselves as well as for others.

Consult your employees and contractors every day about safe and healthy ways of working. Are they aware of the inherent hazards and risk associated with their tasks?

Provide your employees with adequate training and competence to protect themselves and their colleagues.



## Working safely is a condition of employment.



By making adherence to safe work practices a condition of employment, we foster the importance of safety and health in the workplace.

It is important that everybody is psychologically and physically fit to work. This includes fatigue, illness, physical restriction, or emotional distraction (mental health issues included). Employees, and anyone undertaking work, must not be impaired by illegal or legal drugs, including alcohol.

It is the responsibility of every employee to understand and comply with all relevant safety and health rules and safe work practices. Each individual employee must take personal responsibility for the safety and health of themselves and others.

Every employee is empowered to stop any work or process if they believe it to be unsafe or unhealthy. For many companies, there could be a substantial cultural barrier to encourage such actions. It is a management responsibility to make sure that employees feel empowered and confident to take such a step.

Human error is normal, therefore, blame shouldn't be attributed to individuals. All factors essential and contributing to incidents should be identified and consequences for deliberate disregarding of the rules clearly articulated and transparent.



Every employee is empowered to act on safety and health incidents, risks, and opportunities

Does everyone on your site work safely? What are the actions taken to ensure safety and health performance?

## Excellence in safety and health drives excellent business results.

Caring about the well-being of our people is the essence of successful leadership. Good safety and health is good business and has a positive impact on employees. Engaging people in safety and health discipline also contributes to improved business results.

Prevention of injuries and occupational illnesses creates a competitive advantage by having our most valuable resource – our people – at work. All resources are jeopardised by workplace incidents, which result in production losses and downtime for investigations. The costs of incidents (with or without injuries) and occupational illnesses undermine competitiveness.

A robust safety management system will help managers to reduce loss through incident prevention.

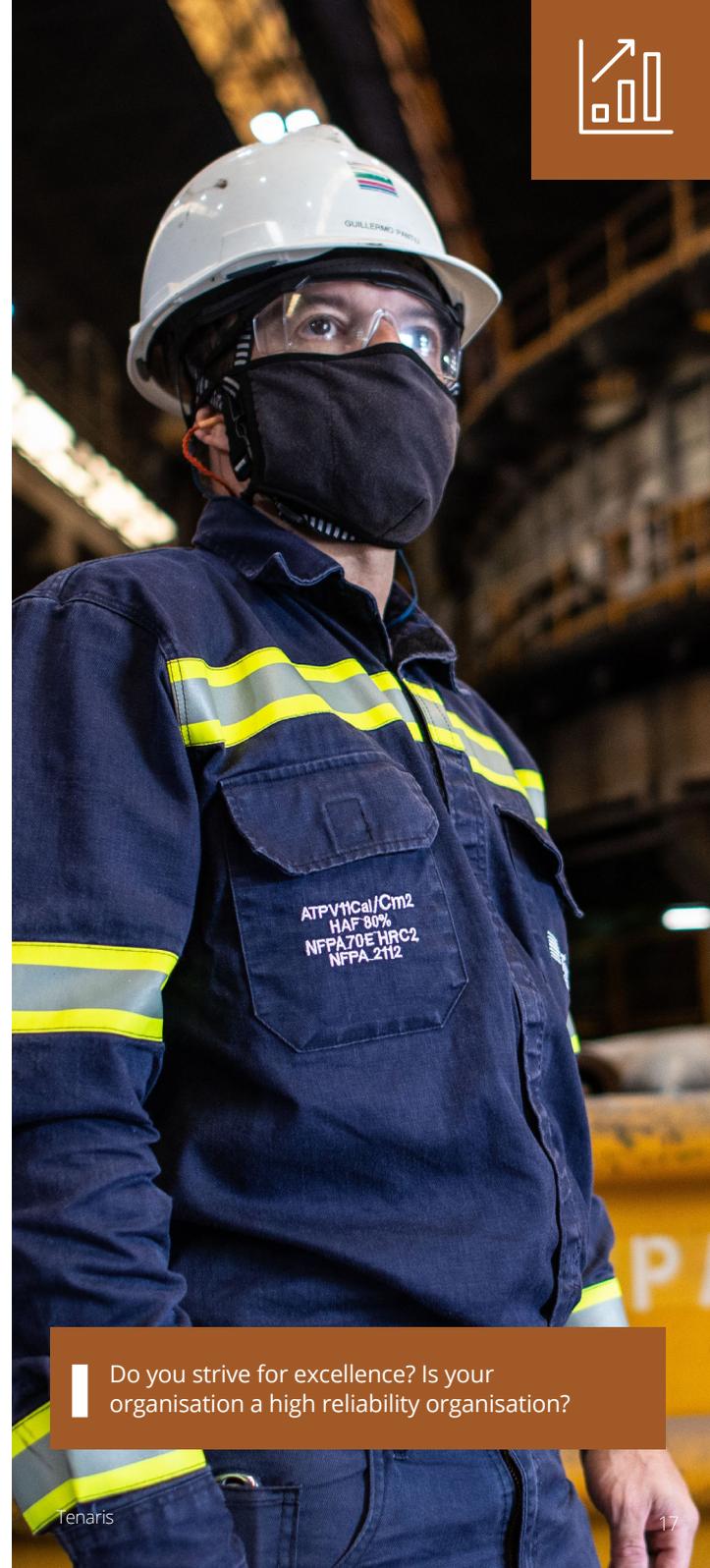
Harm events can include:

- Harm to people
- The environment
- The company assets
- The company reputation
- The company business objectives

To invest in safety and health is to improve productivity and performance.

Excellence in occupational safety and health and process safety contributes to the zero-harm objective and prevents catastrophes that can lead to business disruptions.

Excellent safety systems form part of excellent management systems.



Do you strive for excellence? Is your organisation a high reliability organisation?

## Safety and health is integrated into all business management processes.

Safety and health should be included in all new and existing business processes, for example, managing assets, production, projects and administration. Risk should be reassessed before any changes are applied.

When safety and health are consistently brought to the forefront of business decisions and processes, people develop an appreciation for the importance of the topic. People understand what is expected of them and have the knowledge to work safely.

Bring safety and health to the forefront of all your business decisions and processes.

Before decisions are made, make an assessment of the safety and health implications. Involve different levels of people to ensure a thorough appraisal.





Clear definitions and calculation methods ensure the industry is applying common standards and metrics.

### Employees and contractors

#### Company employee (employee)

A person who is on the payroll of the member company, e.g. has an employee number that identifies that person as a company employee. Employees are directly supervised by a company representative. Temporary or agency workers hired directly by the company are to be considered as employees if the company has primary responsibility for supervising their activities.

#### Contract employee (contractor)

An individual supplied by an external company (contractor, sub-contractor, consultant, or vendor) on a full or part-time basis and who is providing a service (production, maintenance, or administrative support) to the member. The contractor's safety, health and well-being are primarily supervised by the external contractor's supervisor or manager. He is paid by the external company directly. The external company presents an invoice for the contract for service to the member company

#### Visitor

Anyone on the company premises other than a company employee or contractor. Injuries to a visitor will be included as a company employee since the company has the duty of care and direct safety supervision. If hours visited can be added to the calculation for frequency purposes, then please include them.

### Types of incidents

#### Fatality (F)

Death from a work-related injury, certified by a medical professional. Fatality Frequency Rate (FFR) is calculated on the number of fatalities per million man hours.

#### Lost Time Injury (LTI)

Any work-related injury resulting in the employee or contractor not being able to return to work for their next scheduled work period. Returning to work with work restrictions does not constitute a lost time injury status, no matter how minimal or severe the restrictions, provided it is at the employee's next scheduled shift. However, if an injury deteriorates and time is later lost, an LTI should be recorded. Lost Time Injury Frequency Rate (LTIFR) is calculated as number of Lost Time Injuries per million man hours.

#### Restricted Work Case (RWC)

Any work-related injury other than a fatality or a Lost Time Injury where the injured person cannot fulfil his normal work the day following the injury but is able to undertake a temporary job, work at his normal job but not full-time, or work at a permanently assigned job but unable to perform all duties normally assigned to it. If the injury has led to lower productivity or slower work from the worker, but the worker is still capable of undertaking all of their routine tasks, then this would not be classified as restricted work.

#### Medical Treatment Injury (MTI)

Any work-related injury other than a fatality, a Lost Time Injury, or a restricted work case, that resulted in a certain level of treatment (not first aid treatment) given by a physician or other medical personnel under standing orders of a physician (e.g. medical treatments: using prescription medications, or use of a non-prescription drug at prescription strength, Using wound closing devices such as surgical glue, sutures, and staples, Using any devices with rigid stays or other systems designed to immobilise parts of the body, Administration of oxygen to treat injury or illness).

### Minor Injury (MI)

Any work-related injury other than a fatality, a Lost Time Injury, a restricted work case, or a Medical Treatment Injury which is treated by first aid or minor manipulation to provide relief for a strain or bruise. A minor injury does not require treatment by a professionally trained paramedic or physician and does not incur loss of work time other than time of the shift on which it occurred. The injured person continues with his normal scheduled work ( e.g. using a non-prescription medication at non-prescription strength, administering tetanus immunisations, cleaning, flushing or soaking wounds on the surface of the skin, using wound coverings such as bandages, Band-Aids™, gauze pads, etc.; or using butterfly bandages or Steri-Strips™, using hot or cold therapy, drilling of a fingernail or toenail, using eye patches).

### Near miss incident

An incident that physically occurred but there was no personal injury to the employee, contractor or visitor but which could have resulted in a serious injury and needs to be followed up in the same way as a Lost Time Injury but recorded as a near miss.

Example: Operator finds a heavy bolt on the floor next to his operating station, likely coming from an overhead crane or roof structure.

### Unsafe act, unsafe situations (they can be called Precursors)

- Any action that may endanger a person or people working around him/her.

Examples: When working at heights (on a roof for instance) without using a safety harness or not clipped on; not wearing a seatbelt when driving a vehicle.

- Or any situation judged as being such that, sooner or later, it may lead to a risk of an incident inflicting harm to one or more persons.

Example: Missing or broken handrail leading to risk of falling from height.

### Potential Serious Injury or Fatality (PSIF)

Any incident regardless of actual severity that has the potential to lead to a life-threatening, life-altering, or fatal injury.

Serious Injuries generally refers to long term or permanent incapacity and fatalities.

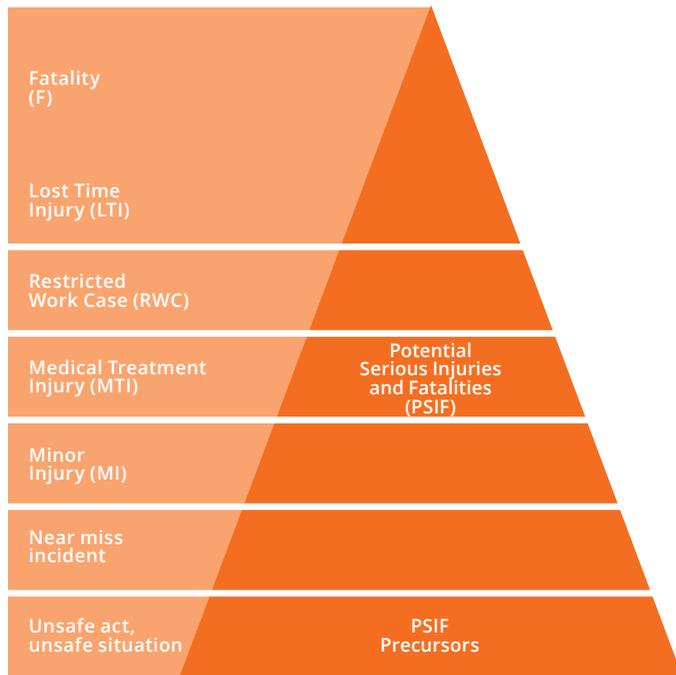
A PSIF precursor is any unmitigated high-risk situation that will result in serious injuries if not controlled because management controls are absent, ineffective, or not complied with.

PSIF events can be identified using predetermined criteria based on the hazards and risk related to steelmaking operations e.g. molten metal contact, confined spaces, electrical hazards, fire hazards, etc.

An event can also be considered as having high potential for serious injury or fatality if it ranks high for severity in a risk matrix. This is the reason why some steel companies describe these events as 'Severity 4 (S4), Potential 4 (P4).'



## Occupational pyramid including PSIF concept:



Typically, precursors of fatalities and serious injuries account for approximately 20% of the total events in each level of the occupational pyramid. Expressed by increasing consequence pyramid levels are: PSIF Precursors, near misses, minor injuries, medical treatment, restricted work cases and lost time injuries with the potential to cause fatality and serious injuries.

## Causes of incidents

### Fall from height

Depending on the country, companies may define a height level where a fall prevention or restraint must be worn and used. The level is usually anywhere there is a risk of falling off 1.8 metres or 6 feet, but proper preventive fall practices should also be used as the fall from a lower distance can lead to serious injuries.

Examples: Fall from a ladder, fall from a platform, fall from a roof, fall into a shaft, a pit or a hole in the ground.

### Falling object

Object falling on a person for any reason, also objects that can be released sideways or upwards are considered.

Examples: Tool falling from a scaffold, load falling from a crane, product falling due to the collapse of a pile of products, something stored vertically falling or sliding down, building components broken during a storm, or broken by snow, ice, or even hail, snow or ice blocks.

### Moving machinery

Incident caused by any component of machinery or equipment that is able to move by any energy source (electrical, steam, hydraulic, pneumatic, heat, wind, product such as strip being pulled by other equipment), by remote control or by gravity.

Examples: Crushed by the movement of a shaft rotated by an operator in a remote cabin, unexpected start of an unisolated motor or engine, unexpected start of a conveyor, trapped between the belt and the roll of a conveyor, crushed by the movement of a cover or table of a machine operated by hydraulic or pneumatic cylinders.

### Overhead crane

Any incident whose main cause is the operation or condition of an overhead crane or its product holding component such as C hook or coil grab, chains or slings.

Examples: Collision between two overhead cranes running on the same tracks or overlapping track; people injured due to the swing of the load lifted by an overhead crane, components dropping from a crane, loss of load.

### **Forklift**

Any incident resulting from the use of or contact with a forklift truck, a powered industrial truck used to lift and move materials. Incidents with forklifts can occur due to the load handled, the environment in which the forklift is moving, the state of the vehicle or the skills of the driver.

Examples: Collision between a forklift and any other vehicle, person hurt by a forklift, reversal of the forklift, forklifts tend to swing around in a large radius and can run over pedestrians.

### **Rail**

Incident with any rail vehicle inside the site or while handling railcars.

Examples: Collision by anything with a train, pedestrians crushed between the bumpers of railcars while hooking up railcars, person falling from or struck by a locomotive or railway cars.

### **On-site road / vehicle**

Incident with a vehicle inside the site including private cars and industrial vehicles except forklifts.

Examples: A pedestrian hurt by a truck, collision between a car and a truck.

### **Off-site Road / Vehicle**

Incident on the public road with any type of vehicle or on foot to and from the workplace. Includes business travel.

Examples: Sales or marketing people injured on the road during working time, employees driving to an externally organised training session.

### **Other mobile equipment**

Incidents whose main cause is the use of equipment other than moving machinery, overhead crane, vehicle and train.

Examples: Hurt by a stepladder on wheels pushed by an operator, hurt while using an aerial work platform (cherry picker, boom lift, man lift, basket crane).

### **Explosion**

A release of energy that causes a pressure discontinuity or blast wave (e.g., detonations, deflagrations, and rapid releases of high pressure caused by rupture of equipment or piping).

Examples: Water in liquid steel, leak of oxygen, generation and leak of hydrogen or leak of CO or blast furnace gas can drive to an explosion picker, boom lift, man lift, basket crane).

### **Fire**

Any incident resulting from the combustion of materials and propagation of the flames causing damage to people, installation and the environment.

### **Gassing / Asphyxiation**

Incident in any area where gas can accumulate or be trapped, and the air does not sustain or support life.

- 'gassing' when the breathing air contents a toxic gas;

Example: gassing due to a rate of carbon monoxide (CO) in the breathing air above the threshold limit depending on the duration of the exposition to the CO.

- 'asphyxiation' occurs when the oxygen rate in the breathing air decreases below 19.5%;

Example: asphyxiation due to the presence of carbon dioxide (CO<sub>2</sub>), nitrogen (N<sub>2</sub>), argon (Ar) or any other gas taking the place of the oxygen in the breathing air.

### **Exposure to chemicals**

Incident caused by contact or exposure to hazardous chemical substance. If the injury is caused by breathing toxic gas, the injury is categorized into cause gassing / asphyxiation.

Examples: Acid burn, chemical spill, allergic reaction.

### **Hot metal**

Incidents caused by hot or liquid metal. Main risks are heat radiation, splashing, scalding from hot metal.

Examples: Projection of hot metal on a person; burn by radiation of hot metal.

### **Hot substances**

Incident caused by exposure to any type of hot material, equipment, surface, steam or water. If the injury is caused by hot metal, the injury is categorized into that cause.

Example: Burns caused by hot equipment in contact with skin.

## Electrical

Incident caused by exposure to electrical energy directly or indirectly.

Examples: Part of the body of a person in direct contact with bare wires, live busbars providing energy to an overhead crane, part of the body of a person in indirect contact with electrical energy by touching the switch gear or high voltage cabling or wires.

## Product handling / Storage

Incident involving the handling, movement and storage of products, machinery or equipment. Steel products can be sharp-edged or move when cooling or being stored by crane.

Examples: Operator hurt by a product being handled, hands crushed between a sling and the product when the crane driver begin to lift the product, hand cut by sharp edges of a product.

## Product loading

Any incident resulting from the process of loading and unloading products, semi-products, raw materials or any equipment to or from a truck trailer, a rail trailer or a ship.

Example: An operator standing on the trailer is hurt by the product during the loading of this product on the trailer, squeezed between the load and the wall of the trailer while retaining the load.

## Manual tasks and tools

Incident caused when performing tasks manually or using hand tools or power tools. If the injury is caused by e.g., sharp edges of steel while handling the product, the injury is categorized into cause product handling / storage.

Example: Carrying or lifting heavy objects, using a screwdriver as a chisel causing the tip of the screwdriver to break and fly.

## Slip, trip, fall same level

Incident caused by falling on the same level, not from elevation. Slips happen when there is too little friction or traction between the footwear and the walking surface. A trip is the result of a foot striking or colliding with an object, which causes a loss in balance.

Examples: Winter slipperiness fall, twisted ankle while walking, stumbling on uneven surface.

## Structural failure

Any incident resulting from a failure of the structure of a building, machinery or equipment.

Examples: Deficient scaffolding, roof or wall panels or structural frames, weather conditions or lack of maintenance may deteriorate surface, constructive defect of machinery.

## Object in the eye

Incident caused by something that enters the eye from outside the body.

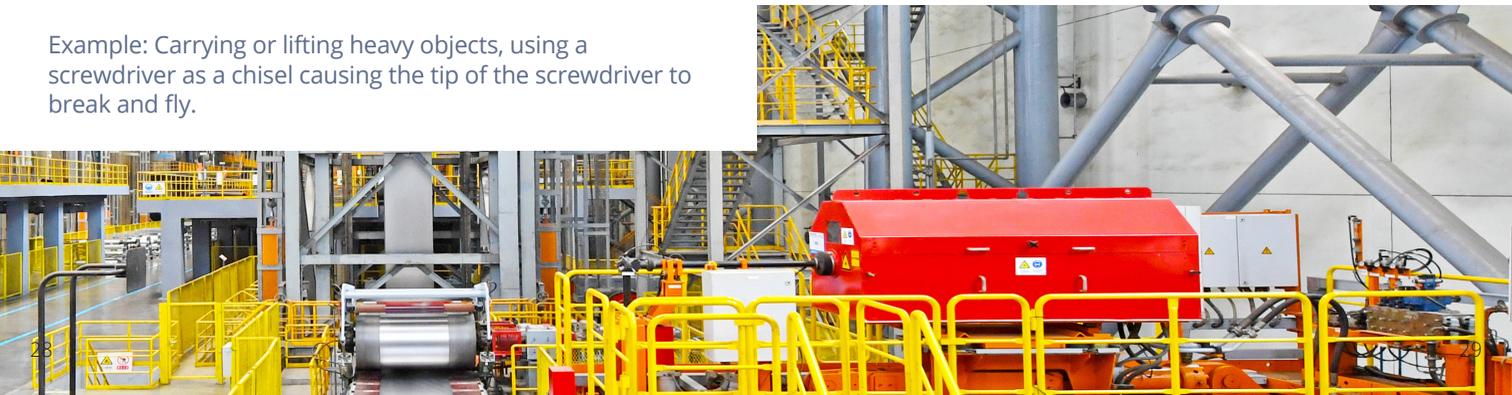
Examples: Steel sliver in the eye, dust in the eye

## Other

Incident is caused by a reason which is not listed. In case there are several reasons behind the incident, the most suitable is chosen.

## Unknown

The cause of the incident is not known by the reporter at that time. Note: root causes of every fatality or lost-time injury must always be investigated and the true cause found and reported.



## Preventive actions

Preventive actions are activities planned with the intention of preventing the occurrence of safety incidents. They include:

- Health and safety audits
- Walks
- Safety inspections
- Reviews
- Innovations
- Positive safety observations

## Calculation of frequency rates

### Hours worked

For company employees, the total number of hours worked including overtime and training during the period. For contractor employees, the total number of hours worked for the company during the period.

## Work-related and non-work-related injuries

### Work-related injury

A workplace injury is the direct result of 'work-related' activities for which management controls are, or should have been in place, or those occurring during business travel.

Examples:

Work-related injuries:

- Exposure (contact with, contacted by, falls, etc.) to workplace conditions that directly result in injury, i.e., slippery floors, falling objects, protruding objects, molten metal, dust, gases
- Strains and sprains while performing work-related activities such as strenuous lifting and pulling. In summary, those injuries in which corrective action(s) can be identified and can be taken to improve upon the work being done at the time of the injury (This point is the key determining factor.)

- 'Work-related' includes attending company-sponsored courses, conferences, business travel, or any other activity where presence is expected by the company. For contractor personnel, 'work-related' normally includes only the time spent on company premises
- Injuries occurring in member company car parking lots, walkways, or any other portion of company property

Non-work-related injuries:

- Symptoms arising on member company property or business travel that are the result of other factors, i.e., cold or flu, heart attack
- Voluntary participation in wellness programmes/sports
- Personal grooming, self-medication, self-infliction
- Vehicle incidents/on foot travel to and from work, other than during business travel

## Commuting accident

Any accident on the public road during trip from home to the workplace or from the workplace back home with any type of vehicle or on foot. Accidents inside the site or during business travel are excluded as they are considered workplace accidents.

worldsteel recognises that not all companies record commuting accidents because of local legislation and also that not all commuting accidents are the result of measures the company has or has not taken.

## Sickness absence

### Sickness absence

Absence from work on the grounds of incapacity to work due to any sickness, work-related or not, and which could qualify for 'disability income'. All other cases of absence such as pregnancy, childbirth, leave, training and seminars are not included in the definition of sickness absence.

### Sickness absence rate

Sickness absence rate is calculated as total number of hours of sickness.

Absence per scheduled hours. Sickness absence is calculated for a year, and for a defined perimeter (department, plant, country, region...).

## Calculation methods of frequency rates

### Lost Time Injury Frequency Rate:

Number of (F + LTI) \* 1,000,000 / hours worked

### Total Recorded Injury Frequency Rate:

Number of (F + LTI + RWC + MTI) \* 1,000,000 / hours worked

### All Injury Frequency Rate:

Number of (F + LTI + RWC + MIT + MI) \* 1,000,000 / hours worked

### Fatality Frequency Rate:

Number of F \* 1,000,000 / hours worked

### Preventive Actions Frequency Rate:

Number of individual preventive actions \* 1,000,000 / hours worked

### Percentage of Potential Serious Injuries and Fatalities:

Number of PSIF events / Number of total events \* 100

The World Steel Association (worldsteel) is one of the largest and most dynamic industry associations in the world, with members in every major steel-producing country. worldsteel represents steel producers, national and regional steel industry associations, and steel research institutes. Members represent around 85% of global steel production.

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