

# Workplace Safety and Health Guidelines

Event Management



WSHCOUNCIL

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# 1. Introduction

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The dynamic and vibrant Meetings, Incentives, Conferences, and Events (MICE) industry has propelled Singapore into one of the top global convention destinations, and is a significant contributor to the hospitality industry and Singapore's economy.

Events range widely in scale and complexity, from one-day corporate seminars to public exhibitions and trade fairs that span several days. Events could be held in purpose-built multi-functional halls (see Figure 1), or open spaces outdoors (see Figure 2). To handle variations more efficiently, event management companies hire contractors to execute different aspects of an event.

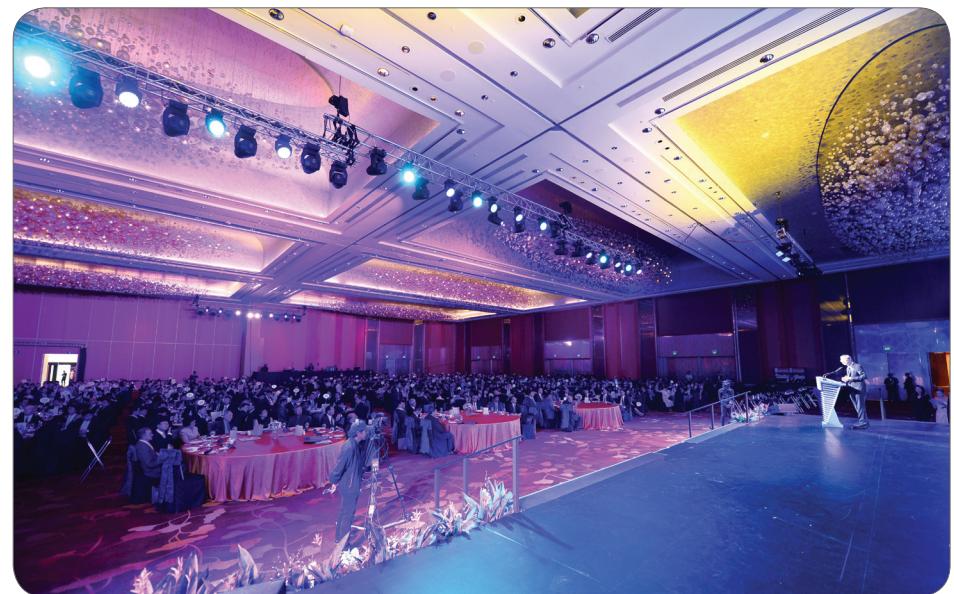


Figure 1: An indoor event.



Figure 2: An outdoor event.

This publication helps event organisers and contractors identify work hazards present in various work activities, and suggests preventive measures to manage the associated risks. Employers should always look out for the safety, health and well-being of their employees. Through better safety and health management, companies can strive towards a goal of zero harm.

## 2. Roles and Responsibilities

To organise large-scale events, many companies come together in a complex network of working relationships. Each company may hold multiple roles of occupier, principal and contractor in one project. Figure 3 is a simplified representation of this network.

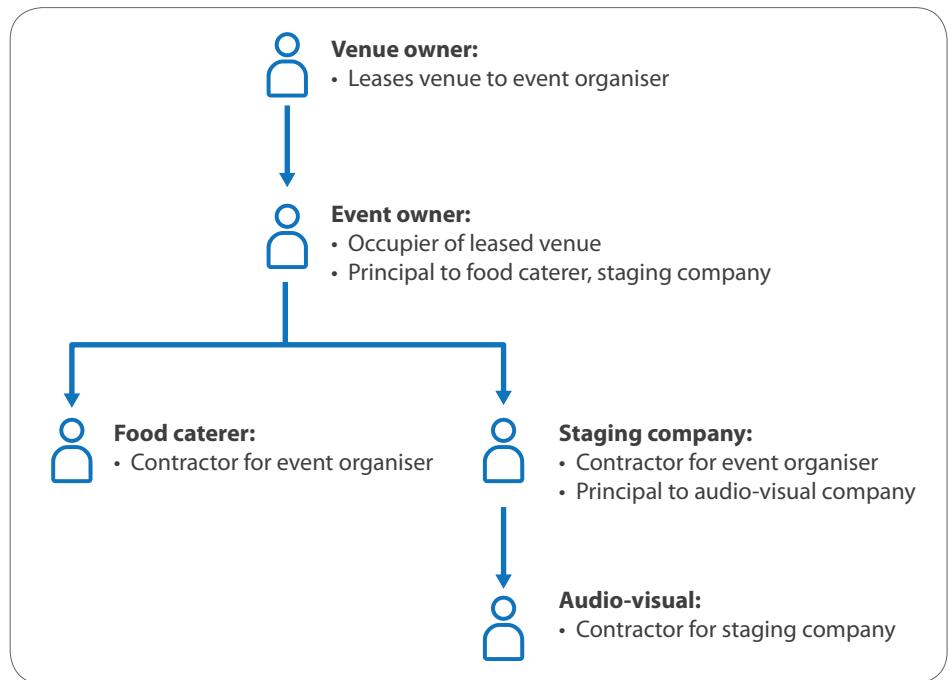


Figure 3: Illustration of principal-contractor relation.

### Occupier

The occupier is the party that has control of the premises, regardless of whether they own it. This can be either the venue owner or company (e.g., event organiser) that is granted temporary lease of the venue for the duration of the event.

The occupier must ensure that the following are safe for everyone within the premises, even if the person is not an employee (i.e., employees, contractors and the public):

- Workplace (e.g., factory, workshop, kitchen, event space);
- All access and egress pathways to and from the workplace; and
- Machines (e.g., electric generators and motors), equipment (e.g., lighting, sound, and lifting gears), and substances (e.g., fog machine fluid, polishing agent, paint).

### **Principal**

A principal engages another person or company to supply labour or perform work under a contract for service. The main event organiser is the principal to all its contractors. Following the same logic, each contractor is a principal to any sub-contractor that they individually engage.

When the principal instructs a contractor or their workers on how the work is to be carried out (as an employer would), the principal takes on responsibilities of an employer.

Responsibilities of a principal include:

- Engage contractors who are competent in carrying out work safely.
- Allocate adequate time (agreed on by principal and contractor) to complete projects safely.
- Ensure that all machines, equipment, plant, article or processes are safe.

### **Employer**

Every employer, organiser and contractors alike, must protect the safety and health of their employees or workers working under them, as well as other people who may be affected by the work being carried out.

Responsibilities of an employer:

- Provide a safe working environment for employees and visitors.
- Conduct risk assessments (RA) to identify hazards.
- Implement adequate safety measures for any machine, equipment, plant, article or process used at the workplace.
- Develop and implement systems for responding to emergencies.
- Provide workers with sufficient instruction, training and supervision so that they can work safely.
- Report incidents to the Ministry of Manpower (MOM) according to the WSH (Incident Reporting) Regulations.

### **Employees**

Employees should follow all safety rules and regulations conveyed from their employers. They are equally accountable for their own safety, and should utilise safety devices, personal protective equipment (PPE) appropriately. Employees also play an important role in reporting hazards or giving feedback to their employers.

Responsibilities of employees:

- Follow safe work procedures (SWPs) or safety rules implemented at the workplace.
- Refrain from unsafe or negligent acts that will endanger oneself or others.
- Use PPE provided properly and not tamper with or misuse the equipment.

### 3. Hazards in Events Management

Hazards that employees face vary between contractors and scope of their work. There are hazards specific to the nature of the work and work environment, while some hazards are common across all industries.

See Figure 4 for a general overview of aspects of event management, and types of common work activities (non-exhaustive).

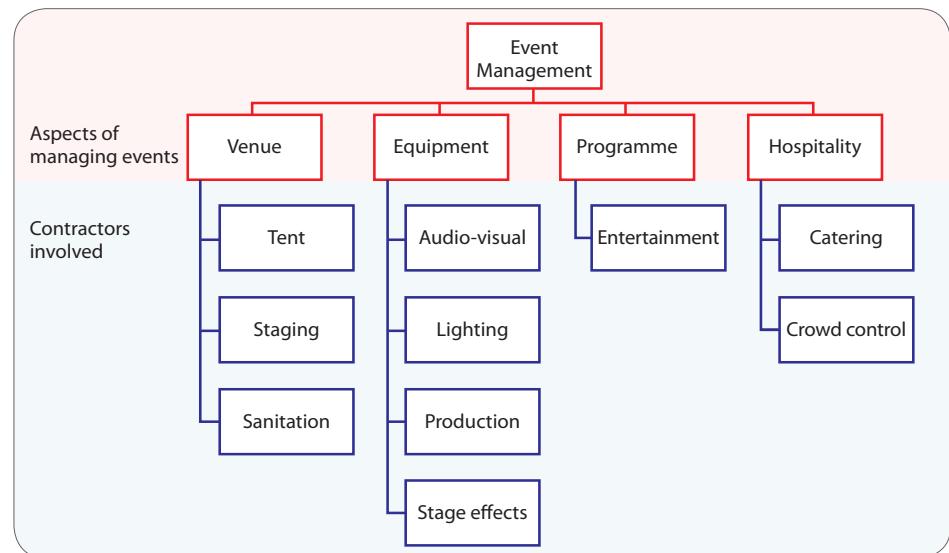


Figure 4: **Aspects of event management and types of contractors involved.**

The process of running an event can be roughly divided into three phases: pre-event, during the event and post-event. See Table 1 for work activities that take place during various phases.

Phase	Contractors	Key Activities (non-exhaustive)
Pre- and post-event	Staging	Supplies constructing materials to set up the stage (e.g., truss frames, and portable seating galleries).
	Manufacturing	Provides wood and metalworking services to construct stage backdrop and ornaments for event space.
	Tent rental	Supplies and sets up temporary infrastructure (e.g., tent, gazebo) to house outdoor events.
	Sanitation	Supplies portable toilets, and provides cleaning and refuse collection services.
Pre-, during and post-event	Audio-visual	Supplies and operates visual and sound equipment; LCD screens, speakers, microphones, and so on.
	Lighting	Provides and operates specialised lighting equipment; flood lights, Fresnel lights, moving lights, and so on.
	Production	Supplies video and sound recording equipment and provides media production services.
	Stage effects	Provides and operates equipment for effects; fog machine, confetti cannon, stage pyrotechnics, and so on.
During event	Entertainment	Provides talents; masters of ceremonies, performers, musicians, animal handlers, and so on.
	Catering	Supplies food and beverages, and provides waiting services.
	Crowd control	Provides general security, traffic marshals and ushers.

Table 1: **Contractors and type of services they provide during different phases of organising an event.**

## Pre-event

This phase involves transforming event space according to client's request or event designer's specification and setting up facilities. This includes putting up stages, tents (for outdoor events), exhibits, and direction signage for event attendees. Audio-visual and lighting equipment are installed and tested in this phase.

## During the event

Another set of contractors will be hired to execute the event's programme, and provide hospitality services to attendees. Audio-visual and lighting engineers will work on-site to operate the equipment.

## Post-event

The same contractors engaged in the constructing of event space will dismantle the set-up and restore the venue to its original configuration.

Tables 2 to 4 offer a quick look at the different causes of injuries that are relevant to work activities during various phases of an event.

Constructing (pre-event) and dismantling (post-event) event space					
Causes of injuries	Work activities	Tent set-up	Stage set-up	Props and backdrop	Sanitation
Slips, trips and falls	✓	✓			
Struck by falling object	✓	✓			
Struck by vehicle or machine	✓	✓			
Caught in between objects					
Cut and stabs				✓	
Extreme temperatures	✓			✓	
Exposure to chemicals					✓
Exposure to noise				✓	
Electrical hazards					
Poor ergonomics	✓	✓		✓	✓
Fatigue		✓			
Fire hazards					✓
Work at heights	✓	✓		✓	
Weather elements*					
Contact with animals					
Drowning*					
Asphyxiation					
Harassment and abuse*					

\*General causes of injuries that apply to all work activities, when relevant to work environment.

Table 2: **Work activities and relevant causes of injuries during constructing and dismantling.**

**Installing (pre-event), operating (during), and dismantling (post-event) equipment**

Causes of injuries \ Work activities	Audio-visual	Lighting	Production	Stage effects	Pyrotechnic
Slips, trips and falls	✓	✓	✓	✓	
Struck by falling object	✓	✓			
Struck by vehicle or machine					
Caught in between objects					
Cut and stabs					
Extreme temperatures	✓	✓		✓	✓
Exposure to chemicals				✓	
Exposure to noise	✓				
Electrical hazards	✓	✓			
Poor ergonomics			✓		
Fatigue			✓		
Fire hazards		✓		✓	✓
Work at heights	✓	✓		✓	
Weather elements*					
Contact with animals					
Drowning*				✓	
Asphyxiation					
Harassment and abuse*					

\*General causes of injuries that apply to all work activities, when relevant to work environment.

Table 3: **Work activities and relevant causes of injuries for equipment installation, operation and dismantling.**

**Services provided during event**

Causes of injuries \ Work activities	Performing	Animal handling	Catering	Security and ushering	Traffic marshalling
Slips, trips and falls	✓		✓		
Struck by falling object					
Struck by vehicle or machine					✓
Caught in between objects					✓
Cut and stabs			✓		
Extreme temperatures			✓		
Exposure to chemicals					
Exposure to noise	✓				
Electrical hazards					
Poor ergonomics			✓	✓	✓
Fatigue			✓	✓	✓
Fire hazards			✓		
Work at heights					
Weather elements*					
Contact with animals		✓			
Drowning*					
Asphyxiation					
Harassment and abuse*				✓	✓

\*General causes of injuries that apply to all work activities, when relevant to work environment.

Table 4: **Services provided and relevant causes of injuries during the event.**

## 3.1 Slips, trips and falls

Slips, trips and falls is the leading cause for injuries, and the hazard can be present in all workplaces and work activities. The resulting injury may range from minor (e.g., bruises that do not need medical attention) to fatal (e.g., when a worker sustains a head injury during a fall).

### Slips

A person can slip when friction between the floor surface and footwear is too low. For instance, carpenters can slip on sawdust or on nails and screws on the floor. Slips also often occur in kitchens, when the kitchen floor is oily or wet.

Common causes of slips:

- wet spills (e.g., water, oil);
- dry spills (e.g., powder, saw dust);
- loose object between shoe and floor (e.g., piece of plywood or screws and nails);
- inadequate traction (e.g., footwear with worn-out soles); and
- condensation (e.g., in cold working environment).



Figure 5: Warning signs for wet floor.

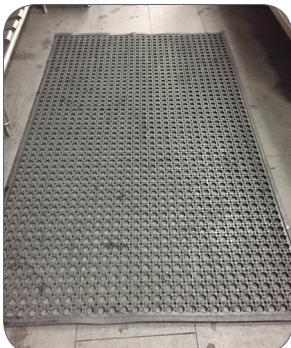


Figure 6: Anti-slip tiles and mat.

Suggested countermeasures to prevent slips:

- Implement a housekeeping system to keep floor free of spills.
- Place warning signs where floor is slippery or cordon off the area (see Figure 5).
- Use anti-slip floor coating or mats, especially in areas with high foot traffic (see Figure 6).
- Ensure that employees wear anti-slip boots.

### Trips

A person trips when his or her foot is blocked by an obstruction while walking. Rigging chains and construction materials on the floor can easily cause tripping. Electrical cables that run around the stage area are also common tripping hazards for stage crew and performers.

Low light conditions also increases chances of tripping. During a show, the backstage area needs to be kept dark; this can be dangerous for stage crew if tripping hazards are not addressed.

Common causes of trips:

- obstructions on the floor (e.g., electrical cables, truss members);
- uneven walking surface (e.g., curbs, steps, cracked flooring); and
- inadequate lighting (e.g., indoors or during night shifts).



Figure 7: Cable trench covering electrical cables.



Figure 8: Warning strips on steps.

Suggested countermeasures to prevent trips:

- Implement a housekeeping system to keep walking space free of obstructions (see Figure 7) and fix damages on floor surface.
- Ensure adequate natural or artificial lighting.
- Install guardrails or handrails at elevated platforms and stairs.
- Provide visual warning [e.g., warning signs (see Figure 8), bright coloured, luminous or reflective tape].

For more information on housekeeping, refer to:

- *WSH Guide on Workplace Housekeeping*.

## 3.2 Struck by falling object

### Working on elevated work platforms

Equipment or materials can drop from or get knocked off while working at heights (e.g., on a ladder, scaffold or mobile elevated working platform). For instance, when installing an LED display on a truss structure, or installing a ceiling fan to a tent structure.

Recommended measures:

- Use tie-downs to secure tools to a utility belt or anchor points on work platform.
- Install toe-boards to prevent tools from being kicked off accidentally.
- Set up a barricade and restrict unnecessary traffic into work zone.

### Transporting and lifting

Activities such as setting up tents and constructing truss frames (see Figure 9), and installing lighting, audio and visual equipment involve lifting processes that present a risk of falling objects. Anyone within a lifting zone can get hit if a truss member fall or an equipment fail.



Figure 9: Lorry crane lifting tent frame members.



Figure 10: A safe working load label.



Figure 11: A tag with safe working load, inspection date and expiry information.

Control measures that employers should take during lifting and transporting are:

- Barricade the lifting zone and restrict access into zone.
- Use appropriate lifting or transporting equipment for its intended purpose.
- Lift within safe working load of equipment (see Figures 10 and 11).
- Ensure that only competent persons carry out rigging and operate machine.
- Ensure that cargo is well-secured and loaded in a stable manner.
- Do not work directly under a suspended load.
- Ensure routine maintenance of equipment.
- Ensure that all workers put on an appropriate set of PPE (e.g., helmet and steel-capped boots). Reflective safety vests should also be worn to increase visibility.

More information can be found in the following:

- WSH (Scaffolds) Regulations 2011;
- WSH (Operation of Cranes) Regulations 2011;
- *Code of Practice for Safe Lifting Operations in the Workplaces*; and
- *WSH Guidelines on Safeguarding against Falling Objects*.

## 3.3 Struck by vehicle or machine

Vehicles and machines are frequently used for transporting or lifting heavy loads (e.g., trucks, lorry cranes, forklifts, etc.). Collisions can occur when vehicles and machines share the same travelling and operating space, and the resulting injuries are usually major or fatal.

Employees setting up tents alongside a lorry crane, and traffic marshals directing traffic on public roads are examples of how employees work in close proximity to a vehicle or machine. Implementing a sound traffic safety management system can reduce chances of employees getting struck during work.

Common causes of collisions:

- Driver or operator is distracted, fatigued or not paying attention.
- Driver's or operator's field of vision is obstructed.
- Reversing or driving around a blind corner or intersection.
- Poor visibility (e.g., haze or heavy rain) or low light conditions at night or indoors.
- Elongated cargo that sticks out of vehicle or lifting machine can strike a person when the vehicle or machine is making a turn.



Figure 12: Work zone cordoned off.

Suggested countermeasures to prevent employees from getting struck by vehicle or machine:

- Separate vehicle and pedestrian traffic where feasible.
- Barricade worksites and restrict access (see Figure 12).
- Ensure that worksite has adequate lighting.
- Integrate a fleet and driver monitoring system into vehicles.
- Assign a banksman to guide drivers.
- Ensure that work is always carried out under proper supervision.
- Train and retrain drivers in defensive driving.
- Ensure that employees and visitors put on bright reflective vests at the worksite.

For more information, refer to:

- *WSH Guidelines on Workplace Traffic Safety Management*.

## 3.4 Caught in between objects

Crush injuries can happen when a body part or an entire person is caught in between immovable structures, or between parts of a machine (e.g., caught between a wall and reversing vehicle).

When an entire person or limb gets caught, severe fractures can occur and broken bones may cut and puncture organs, leading to internal bleeding. Minor injuries can be a broken finger or toe, but it would put an employee out of work until enough strength and mobility have been recovered to resume work.



Figure 13: Food blender with guard in (left) and out (right) of position.



Figure 14: Buffing machine with guard.

Similar to the hazard, "Struck by Moving Objects", a traffic safety management system can address risks of getting caught between a structure and a vehicle.

Additional control measures that should be considered include:

- Ensure that employees are aware of pinch points in a worksite.
- Install guarding coupled with a fail-safe mechanism for machines (see Figures 13 and 14).
- Use a tool instead of hands to grip objects located in pinch points (e.g., using pliers to hold a nail in place when hammering).

## 3.5 Cuts and stabs

Sharp tools or cutting equipment are frequently used by carpentry, metalworking and food preparation services, and employees face higher risks of cuts and stabs. For example, employees buffing sharp edges of freshly cut metal sheets could get cuts when handling the materials manually.

Common causes of cuts and stabs:

- Using the wrong tool for the work.
- Using a blunt tool and over-exerting.
- Machine guarding not provided or removed intentionally.
- Crowded and/or untidy workstation.
- Working while distracted or fatigued.
- Lack of safety awareness when using sharp tools or equipment.

Suggested measures to prevent cuts and stabs:

- Train and retrain employees to select correct tools and use them properly.
- Install and lock guarding on machines (see Figure 15).
- Install interlocks on machines.
- Inspect and maintain tools according to supplier's specifications and intensity of use.
- Plan workstations to ensure adequate space for manoeuvring.
- Store and maintain sharp tools separately from other tools.
- Wear cut-resistant gloves during work (see Figure 16).

For more information, refer to:

- *WSH Guidelines on Safe Use of Machinery*; and
- *WSH Guidelines for Hospitality and Entertainment Industries*.



Figure 15: Machine with guard.



Figure 16: Cut-resistant gloves.

## 3.6 Extreme temperatures

### Hot environment

Employers need to be mindful of heat injuries when workers are working outdoors (e.g., setting up tents outdoors) because of Singapore's hot and humid climate. Foreign employees who are not used to heat and humidity are prone to heat injuries. With time, they will gradually adjust to the new working environment.

Where possible, employers should provide equipment to regulate the ambient temperature or improve ventilation. Other means of guarding against heat injuries are:

- Acclimatise foreign employees by gradually increasing their workload over time.
- Provide employees with loose-fitting cotton uniforms or ensure that they wear clothes made of light breathable materials.
- Provide equipment to alleviate heat and humidity (e.g., fan, air-conditioner).
- Provide adequate breaks during shifts.
- Provide a cool, shaded rest area (see Figure 17).
- Provide adequate drinking water.
- Avoid scheduling intensive work during midday hours.
- Teach employees to recognise early symptoms of heat injuries.

For more information, refer to:

- *WSH Guidelines on Managing Heat Stress in the Workplace*.



Figure 17: Shaded rest area with ventilation (left) and air-conditioned indoor rest area.

### Cold environment

Some events need to be held in a cold environment (e.g., ice sculpture exhibitions) or the event may require cold storage facilities (see Figure 18). Employees who need to work in a cold environment should be protected from hypothermia, and in severe cases, frostbites. Preventive measures for slips should also be implemented because the humid conditions in Singapore will lead to condensation on the floor.

Precautions to take when working in a cold environment include:

- Ensure that employees wear anti-slip footwear.
- Ensure that employees wear thermal protective clothing.
- Provide adequate breaks during shifts.
- Provide a rest area at room temperature.
- Provide drinking water.

### Handling hot and cold objects

Besides environmental temperatures, employees also need to work with hot or cold objects that could cause injuries when not properly handled.

A number of work activities involve hot work, for example, metalworking may involve using a blow torch, audio-visual and lighting equipment that get heated up after hours of use, and food caterers handling hot food. Engineers operating machines to create stage effects may have to handle cold objects; confetti cannons that run on compressed air, food handlers working with frozen products, and so on.

Employers can implement the following to protect their employees:

- Insulate or barricade heat sources.
- Display prominent warning signs on hot or cold surfaces (see Figure 19).
- Keep hot liquid level low in containers to avoid accidental spills, especially when transporting or transferring liquids.
- Where feasible, use a tool to handle hot or cold objects.
- Provide thermal gloves to handle hot or cold objects.



Figure 18: Cold storage room.



Figure 19: Warning labels for hot object or surface.

### 3.7 Exposure to chemicals

Prolonged contact with chemicals leads to skin irritation and inhaling the vapours leads to breathing problems. When manufacturing displays and props, employees need to use adhesives, paint and polishes, and sanitation contractors use harsh chemicals for cleaning. Where possible, employers should avoid the use of these chemicals, or switch to less harmful alternatives.

Safety Data Sheets (SDS) provided by the supplier contains information about chemicals and instructions on proper handling. Employers need to ensure that employees strictly follow instructions on the SDS to reduce their exposure to said chemicals.

Chemicals can enter the human body in three ways:

1. Inhalation: Chemicals that evaporate readily (e.g., paint remover, adhesive) can be inhaled.
2. Absorption: Chemicals can be absorbed through contact with skin and eyes.
3. Ingestion: Chemicals can be accidentally swallowed when employees do not wash their hands after work and before touching their food.



Figure 20: Spill kit (left) and shower and eye wash.

### Safe handling of chemicals

- Ensure that worksite has adequate ventilation or an exhaust system.
- Wear respirators when working in a confined space or area with poor ventilation.
- Wear safety goggles and face shield.
- Wear chemical resistant gloves.
- Rotate schedules to limit each employee's exposure.
- Eat and drink only at designated areas at the worksite.
- Ensure that employees handling the chemical are trained and competent.
- Ensure that employees practice good personal hygiene.
- Train employees to handle emergency spills and contact (spill kit and shower, if available; see Figure 20).

### Safe storage of chemicals

- Store and lock up chemicals to prevent unauthorised access (see Figure 21).
- Place chemical containers in trays to contain leaks or spills.
- Store chemicals below eye level.
- Store chemicals away from heat sources.
- Store chemicals according to compatibility.
- Do not store chemicals without proper labels.
- Do not store in incompatible containers that may react with the chemical.



Figure 21: Storage cabinet with label and lock.

### Safe disposal of chemicals

- Follow disposal instructions on the SDS.
- Do not mix chemical waste with general waste or pour it into the drain.
- Do not mix incompatible chemical wastes.
- Engage licensed Toxic Industrial Waste collectors to dispose chemicals safely.
- Store chemical waste safely and securely until it is picked up by collectors.

For more information, refer to:

- Chapter 3 of WSH Guidelines on Laboratories Handling Chemicals.

See Annex C for more information on classification and labelling of chemicals.

## 3.8 Exposure to noise

Frequent and prolonged exposure to loud noises can lead to permanent loss of hearing sensitivity, known as noise-induced deafness (NID). It will severely reduce the quality of life and create an inherent safety risk for the afflicted.

Various occupations involved in events are frequently exposed to loud noises, and employers should address this hazard. Performers and stage crew work near speakers placed on and around the stage, while carpentry and metalworking are by nature also loud and noisy.

Employers can engage acoustic consultants to assess noise levels and educate and train their employees to manage this risk. Noise can be reduced in two ways, by decreasing the volume or duration of exposure at three locations (see Figure 22).

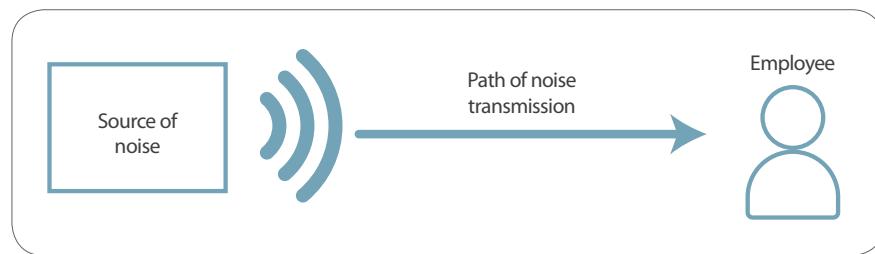


Figure 22: Diagram of noise transmission.

### 1. At the source

Eliminating or reducing noise at source is the most effective measure. Employers should seek out alternative equipment or quieter work processes. For example, using screws instead of nails to hold materials together will eliminate the need to hammer.

### 2. Along the path of transmission

Noise levels can be reduced by putting up noise barriers or dampening machine parts that vibrate and generate noise. For example, use rubber lining to reduce knocking in machines. Sound absorptive materials can also be used to prevent noise transmission.



Figure 23: Ear muff and plugs.

### 3. On the employee

- Limit the amount of time spent in noisy environments or on noisy work.
- Provide quiet rest areas.
- Ensure that employees put on ear muffs and ear plugs during work (see Figure 23).
- Mark out noisy work zones to remind employees to put on hearing protection.
- For crew and performers who work in close proximity to speakers, their exposure to loud sounds cannot be feasibly reduced. Noise-cancelling in-ear microphones can be considered, as it does not impede communications while providing protection.

Employers should also provide audiometric examinations for employees exposed to loud noises so that NID can be detected earlier and measures can be taken to protect their hearing. Any diagnosed cases of NID should be reported to the Ministry of Manpower via iReport.

For more information, refer to:

- *WSH Guidelines on Hearing Conservation Programme*; and
- *Safety Handbook for Working in Noisy Environment*.

See Annex D for permissible noise levels extracted from the WSH (Noise) Regulations.

## 3.9 Electrical hazards

Electrical accidents can start fires and cause injuries ranging from minor burns to death. Temporary electrical installations should not be of lower quality than permanent installations. For outdoor events, installations are exposed to weather elements, and will require robust measures to prevent mishaps.

Audio-visual and lighting engineers are constantly working around high wattage equipment, thus they face higher risks of electrical shocks. Employers need to pay attention to three aspects of this hazard in order to prevent accidents.

### 1. Environment

- Implement a housekeeping system:
  - Plan layout to minimise need for long cables to be laid out; and
  - Keep event space clean and dry.
- Protect outdoor installations with adequate shelter from wet weather.
- Position electrical equipment a safe distance from water bodies.



Figure 24: Generator cage.



Figure 25: Distribution box.

## 2. Equipment

- Engage a licensed electrical worker for installations, inspections and repairs.
- Cage up generators and lock up electrical installations (e.g., distribution board, socket-outlet assembly and residual current circuit breaker) to prevent unauthorised access (see Figure 24).
- Always connect electrical equipment to a distribution board instead of the generator or main power line (see Figure 25).
- Do not overload power sockets.
- Use cable trenches to cover cables that are trailing on the floor to shield them from damage (it also reduces the chance of people tripping over the cables).
- Replace damaged equipment or cables with exposed wiring.

## 3. Employees

- Train employees to be competent on the proper use of equipment.
- Provide electrically insulating PPE (e.g., gloves, boots).

For more information, refer to:

- CP 88 Code of practice for temporary electrical installations (Part 2); and*
- Electricity (Electrical Installations) Regulations.*

## 3.10 Poor ergonomics

The nature and duration of many work activities tend to be physically demanding, and frequently involves manually handling heavy equipment or materials. Overlooking workplace ergonomics can lead to musculoskeletal disorders (MSDs). Some symptoms of MSDs are discomfort, motion impairment, or persistent pains.

See Table 5 for common risk factors of MSD and recommendations to prevent them in employees. Employers should put control measures in place to keep employees in optimal physical condition and at the same time improve work productivity.

Illustration	Risk factor	Recommendations
	<b>Repetitive movement</b> Repeating the same movement for extended periods of time (e.g., food packing, cleaning).	<ul style="list-style-type: none"> <li>Provide adequate breaks.</li> <li>Rotate shifts or job scope periodically.</li> <li>Teach employees stretching exercises.</li> </ul>
	<b>Forceful exertion</b> Manually lifting or pushing heavy loads (e.g., carrying speakers or stage props).	<ul style="list-style-type: none"> <li>Reduce weight of load if possible.</li> <li>Use mechanical aids for lifting, or moving.</li> <li>Get help from a co-worker.</li> <li>Apply correct lifting technique.</li> </ul>
	<b>Awkward posture</b> Body, arms and legs are not in natural relaxed position (e.g., overreaching or twisting).	<ul style="list-style-type: none"> <li>Plan layout to keep equipment within reach.</li> <li>Provide adjustable work surfaces.</li> <li>Store heavy or bulky items near waist level.</li> </ul>
	<b>Static posture</b> Standing or sitting in the same position and location for long hours (e.g., traffic marshalling or ushering).	<ul style="list-style-type: none"> <li>Provide adequate breaks</li> <li>Provide anti-fatigue mats.</li> <li>Teach employees stretching exercises.</li> <li>Rotate shifts or job scope periodically.</li> </ul>
	<b>Vibration</b> Prolonged exposure damages nerves and vessels in the hands and tire out back muscles (e.g., saws, drills, and heavy machine).	<ul style="list-style-type: none"> <li>Use alternative tool or less impactful work process to reduce source of vibration.</li> <li>Use dampeners on machine or work surface to reduce transmission of vibration.</li> <li>Provide anti-vibration gloves or safety shoes.</li> </ul>

Table 5: Risk factors that lead to MSD and recommendations to prevent them.

For more information, refer to:

- WSH Guidelines on Improving Ergonomics in the Workplace.*

### 3.11 Fatigue

Despite efforts and intentions to set aside adequate time, delays or changes in the plan can disrupt progress. Therefore extended working hours and night shifts are at times unavoidable.

Long and irregular working hours, along with a number of other factors contribute to fatigue. When fatigued, a person's alertness, motor skills, reflex, judgement and decision-making are compromised, and they are more likely to cause or get into an accident. Some common factors and suggestions on mitigating the effects of fatigue are listed in Table 6.

Contributing factors	Recommendations
<b>Organisational</b> <ul style="list-style-type: none"><li>• Work duration</li><li>• Nature of work</li><li>• Timing of shifts</li><li>• Frequency of odd-hour shifts</li><li>• Demand of work (mental, physical)</li></ul>	<ul style="list-style-type: none"><li>• Minimise night shifts.</li><li>• Distribute night shifts evenly.</li><li>• Provide adequate breaks during a shift.</li><li>• Plan adequate recovery time in between shifts.</li></ul>
<b>Environmental</b> <ul style="list-style-type: none"><li>• Climate (e.g., hot, humid, cold)</li><li>• Lighting (e.g., glaring sun, low light)</li></ul>	<ul style="list-style-type: none"><li>• Provide adequate ventilation.</li><li>• Provide sheltered rest areas when working outdoors.</li></ul>
<b>Individual</b> <ul style="list-style-type: none"><li>• Age</li><li>• Diet</li><li>• Drinking and smoking habits</li><li>• Pre-existing medical conditions</li><li>• Overall physical health</li><li>• Sleeping habits</li></ul>	<ul style="list-style-type: none"><li>• Build a company culture that encourages healthy lifestyles.</li><li>• Customise job scope according to individual factors.</li></ul>

Table 6: **Types of factors that contribute to fatigue and corresponding recommendations.**

For more information on fatigue management, refer to:

- *WSH Guidelines on Fatigue Management*; and
- *Guide to Total Workplace Safety and Health*.

### 3.12 Fire hazards

The fast-paced and transient nature of the events sector can pose a challenge to managing fire safety. Poor housekeeping that leads to accumulation of sawdust in woodworking factories or refuse after an event are fire hazards. Faulty electrical installations can also overheat and start a fire. Employers should prepare their employees on emergency response and also take preventive measures to ensure fire safety.

#### Emergency preparedness

- Plan layout to facilitate fast evacuation.
- Identify emergency exits and keep them unobstructed.
- Plan and execute emergency responses and evacuation.
- Provide a warning system at outdoor spaces.
- Train employees on emergency response.
- Provide fire-fighting equipment on-site or identify their locations in buildings.

#### Fire prevention

- Implement housekeeping to prevent accumulation of flammable or combustible materials.
- Label flammable materials clearly and store them safely away from ignition or heat sources.
- Store pressurised gas cylinders safely away from ignition or heat sources.
- Power off portable generators and give them time to cool off before refuelling.
- Use fire-retardant materials for stage decorations, effects and costumes where possible\*.
- Label and isolate equipment that heats up to high temperatures (e.g., lighting).

#### \*Case

An explosion occurred during the Colour Play Asia party at Formosa Fun Coast, Taiwan, in June 2015. The draw of the event was coloured powder that was deployed in large quantities for effects, blanketing the attendees and the vicinity in a thick cloud. During the event, the powder was ignited and created a large fireball, severely burning over 500 of the event attendees, of which 15 have died, months after the accident.

"Colour Play Asia fire claims another life, after five months". Taipei Times. 30 November 2015. Retrieved 15 January 2016.

#### Fire Safety Act

Organisers are required to comply with the Fire Safety Act [Singapore Civil Defence Force (SCDF)] which covers fire safety aspects of setting up temporary structures to keep the public attending the event safe. Any intention to temporarily change the use of part of buildings for holding an indoor event will need a Temporary Permit from SCDF.

Apply for Temporary Change of Use at <https://licence1.business.gov.sg/web/frontier/home>

## Dangerous Fireworks Act

Fireworks and pyrotechnic stage displays are regulated by the Dangerous Fireworks Act (Singapore Police Force). Only companies that are exempted under the Dangerous Fireworks (Exemption) Notification are authorised to execute these displays (see Figure 26).

Employers should ensure that their employees are aware of the use of pyrotechnics at an event, and strictly follow safety precautions advised by their pyrotechnic contractor. After loading pyrotechnics at the event venue, cage and lock up the pyrotechnics to prevent unauthorised access and tampering.

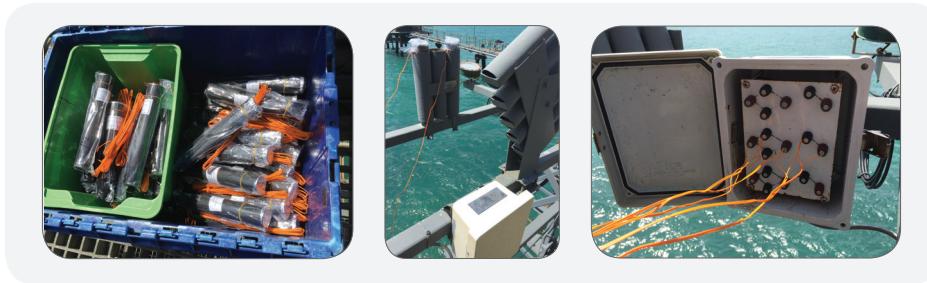


Figure 26: (from left to right) Fireworks, housing and ignition system.

For more information on fire hazards, refer to:

- *WSH Guidelines on Flammable Materials.*

## 3.13 Work at heights

Throughout various stages of an event, there will be work carried out at elevated heights. Setting up and dismantling tents, installing equipment on truss frames, and climbing ladders to hang banners are examples of working at heights. Without adequate protective measures, employees can fall during work and the injuries can be fatal.

Recommendations for constructing, dismantling and installation works at heights:

- Carry out as much work as possible at ground level before using a proper lifting equipment to raise installation to required height.
- Provide a stable work platform (e.g., MEWP, scaffold).
- Implement fall prevention or fall arrest systems where appropriate.
- Install edge protection at all open sides.
- Ensure that employees use the PPE provided.

Recommendations for performers and stage crew when working at heights:

- Have a competent person inspect and maintain equipment used.
- Familiarise performers on safety precautions implemented.
- Install edge protection or handholds on stage props that performers will be performing on.
- Install handrails on stairs.
- Assign a spotter to keep an eye on suspended performers if stage lighting is low.

The use of ladders is very common for they are portable and convenient. Yet, it is not as stable and safe as other height access equipment. Employers should make sure that their employees use ladders safely. Recommendations on safe use of ladders:

- Choose appropriate ladder for the task: Consider its height and type (e.g., step-ladder, A-frame ladder, anti-slip coat on the ladder steps).
- Safe use of ladder: Always maintain 3-point contact, avoid standing on the top rung (see Figure 27).
- Other safety considerations: Carry tools in a utility belt so that hands are free for climbing the ladder, check that the ladder is free from defects before use.

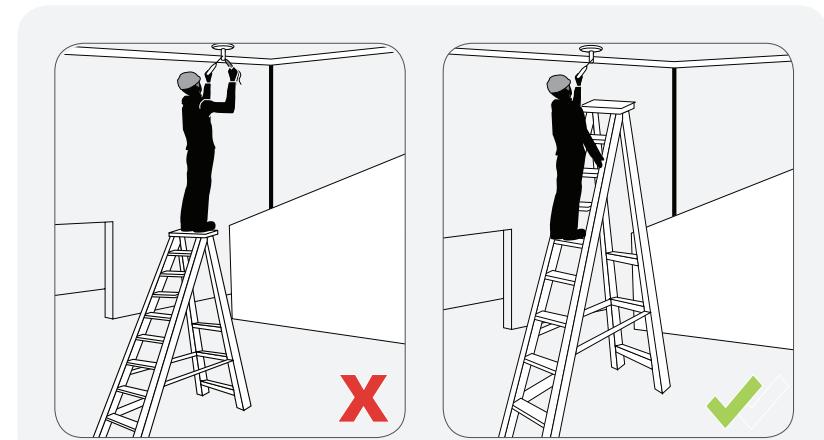


Figure 27: Safe use of ladders.

For more information, refer to:

- *WSH (Work at Heights) Regulations 2013;*
- *WSH (Scaffolds) Regulations 2011;*
- *Code of Practice for Working Safely at Heights;*
- *WSH Guidelines on Personal Protective Equipment for Work at Heights; and*
- *Safe Use of Ladders Checklist and Ladder Safety Pack.*

## 3.14 Weather elements

Events held outdoors are subjected to weather conditions and employees are exposed to a number of dangers.

### Tropical climate

Singapore's hot and humid climate can easily induce heat injuries in those with poor constitution, or those who are not used to it. See chapter on "Extreme Temperatures".

## Haze

During drier months of the year, the Pollutant Standards Index (PSI) can reach hazardous levels. Hence outdoor work should be kept to a minimum, if not stopped completely. Employers can help reduce health and safety impact of exposure to hazy conditions with the following recommendations.

- Limit duration of working outdoors.
- Reassign employees with respiratory or heart conditions to work indoors.
- Provide appropriate face masks (e.g., N95 mask) with a proper fit for employees working outdoors.
- Reinforce traffic safety due to reduced visibility.
  - Encourage workers to wear bright-coloured clothing.
  - Reduce driving speed.

## Adverse weather conditions

During rainy seasons, always hold events indoors with a lightning protection system if possible. When working outdoors, employers need to take precautions to protect their employees.

Some precautions employers can take:

- Provide anti-slip shoes to reduce chances of slipping.
- Provide blower fans at areas with high foot traffic to help the floor to dry faster (see Figure 28).
- Cease all outdoor work when lightning is detected or announced by National Environment Agency (NEA).
- Reinforce traffic safety due to reduced visibility and slippery road conditions.

Refer to NEA for live updates on PSI levels and lightning alerts and the Ministry of Health for information on face masks.



Figure 28: Blower fan

## 3.15 Contact with animals

### Wild animals

Events may include animal exhibits as part of the attraction, and event organisers should take precautions to protect both their employees and the public. The animal handlers are in the best position to provide safety advice specific to the species of animals. The event manager should communicate safety instructions to contractors and employees who will be working near the wild animals.

Employers should note the following when an event requires animal exhibits:

- Safety measures to take when in close proximity to animals.
- The emergency response if an animal escapes.
- Check vaccination and medical history of animals.
- Ensure that all equipment used for handling or containing animals are in good working condition.

### Harmful animals

When setting up an event space outdoors, employees may come into contact with animals or insects that bite or sting. Vibration and noises from constructing activities could disturb or agitate insects, prompting an attack. The result of some bites and stings can range from mild itching to major allergic reactions that can be fatal. Some common insects and animals found in Singapore are bees, hornets, centipedes, snakes, and spiders.

Employers should note the following when an event is held outdoors, and there is a risk of employees getting bitten or stung.

- Avoid areas with where insects are seen in large swarms because a nest could be nearby.
- Engage pest control services to remove or neutralise nests before starting work.
- Wear long-sleeved clothing with gloves.
- Tuck trouser legs into socks and boots.
- Train employees on first-aid and prepare a first-aid kit on-site.
- Emergency response during a bee or hornet attack:
  - Prone down and protect head and neck with hands.
  - Wait for the attack to stop.
  - Seek medical help immediately after attack.
- Emergency response after a spider, snake or centipede bite:
  - Seek medical treatment immediately in a hospital.
  - If possible, provide a detailed description or photograph of the animal to the doctor. This will help the doctor to identify the species and determine the treatment method.

## 3.16 Drowning

Events may be held in locations near or at water bodies, for example, the floating platform at Marina Bay, or next to a pool. Employers should take into consideration the risks of employees falling into water and provide the necessary protection.

Employers should first look at the amount of work required to be carried out near water, and how the amount of time spent working near water can be reduced. Edge protection, SWPs and PPE should not be the only safety measures. Other measures that employers can put in place:

- Do as much work as possible away from the water body before setting up installation at designated location.
- Barricade the edge and put up warning signs along the edge.

- Provide life vests and ensure that employees wear them while working (see Figure 29).
- Provide rescue devices (e.g., pole and hook, ring buoy) near the worksite (see Figure 30).
- Avoid assigning work near water to employees who cannot swim.



Figure 29: Life vests issued to employees.



Figure 30: Edge protection and buoy.

## 3.17 Asphyxiation

Fog machines are used to create atmospheric effects during a performance (see Figure 31). The machines may use propellants or heat-produced fog from a mix of water and glycol or glycerol (fog fluid). Excessive fogging can displace oxygen in a room, and the fog can be drying or irritating. Hence, care should be taken so that employees would not be overcome by the fumes and develop breathing difficulties.

Common propellants that fog machines use:

- dry ice;
- compressed carbon dioxide or nitrogen; and
- liquid nitrogen.

Safety precautions to take:

- Provide adequate mechanical ventilation when using fog machine indoors.
- Ensure that employees are in good health, and do not have existing respiratory problems (e.g., asthma).
- Ensure that machine operators are competent and aware of dangers of the machine.
- Have the machine routinely maintained by a competent person.
- Clearly label pressurised or liquefied propellants that are used with the machine.
- Limit fogging to minimum amount required for desired effects.



Figure 31: Fog machine, liquid nitrogen.

## 3.18 Harassment and abuse

In some events, the atmosphere can be highly charged (e.g., sporting events and music concerts) or event goers may be intoxicated, and staff could be subject to abuse should any conflict arise. Employees deployed to manage crowds (e.g., general security, and crowd and traffic control) are likely to face these situations. Within organisations, harassment can also occur between colleagues.

Abuse spans over a wide scope and can have any of the following attributes:

- Physical, verbal, psychological, and/or sexual.
- One-off incident or more systematic patterns of behaviour.
- Amongst co-workers, between superiors and subordinates, or it may come from third parties such as clients, customers, public, and so on.
- Range from minor cases of disrespect to more serious acts that include criminal offences, which require intervention from public authorities (i.e., police).

Employer should implement appropriate measures to prevent and manage violence in the workplace and employees play an equally important role in identifying and reporting incidents.

Measures employers can take to protect employees from harassment and abuse.

- Adopt a policy against workplace violence and communicate this to all staff.
- Define and list unacceptable behaviours.
- Deploy employees in pairs or small groups when handling potentially rowdy crowds.
- Where possible, station employees within the field of view of closed-circuit televisions (CCTV).

Employees faced with a possible hostile situation should:

- Never handle hostile situation alone.
- Avoid retaliating verbally or physically as it may escalate the situation.
- Keep a safe distance from the aggressor.
- Record and report all incidents (if possible, gather witnesses or make video recordings with mobile phones).

There are times when it would be better to tackle situations informally. Some people may not realise that their behaviour is inappropriate and it can be easily resolved in a casual setting. Regardless, careful judgements should be made on the best approach for the situation.

For more information on how to prevent harassment and abuse, refer to:

- Tripartite Advisory on Managing Workplace Harassment at [www.wshc.sg](http://www.wshc.sg)*

# 4. Risk Management

Under the WSH (Risk Management) Regulations, organisations are required to conduct Risk Assessment (RA) before starting work, to identify, evaluate and control risks in the work activities and environment. The objective is to reduce workplace accidents and improve the safety, health and well-being of all in the workplace (see Figure 32).

Employers should strive to have their RA be as extensive and inclusive as possible, covering all aspects of safety, health and well-being of their employees. On this note, for instance, employers should consider putting measures in place to mitigate risks for vulnerable employees, such as pregnant or lactating mothers, and minors. If the risks cannot be adequately addressed, alternatives should be arranged for these employees.

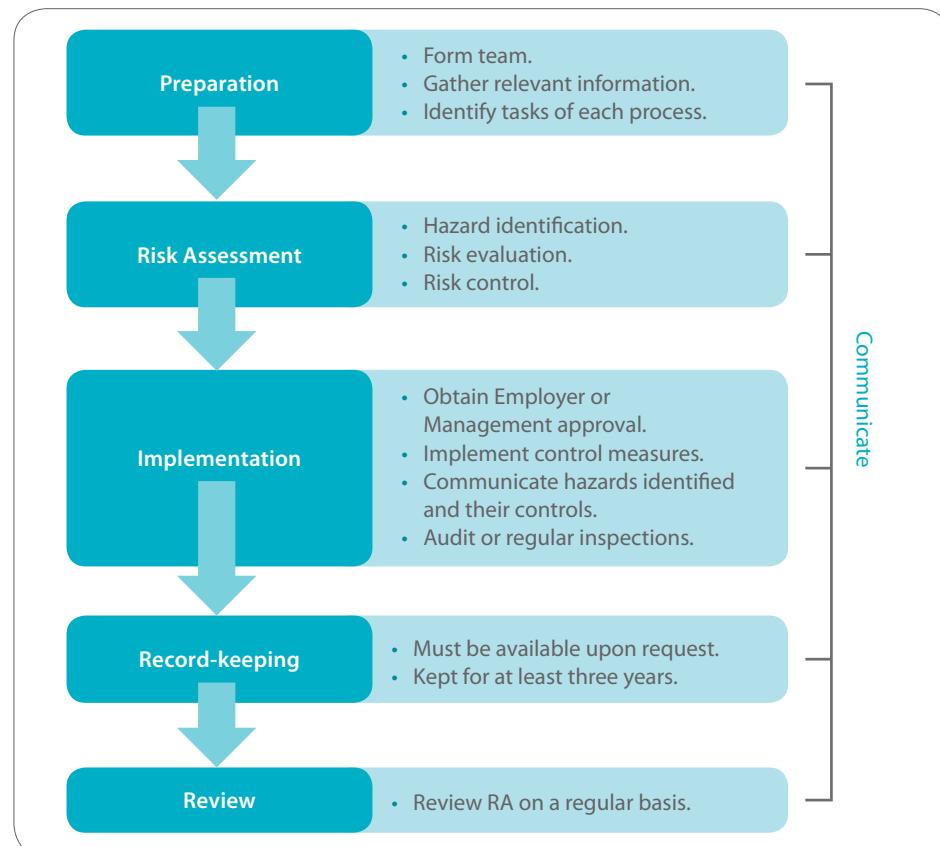


Figure 32: Risk management process.

## 4.1 Preparation

A multi-disciplinary RA team, consisting of personnel from various departments, personnel familiar with potential hazards and risks of work activities such as WSH officers, healthcare professionals and human resource representatives, should be formed. Relevant information pertaining to the work and operations, such as a list of work activities, should also be compiled beforehand to facilitate better understanding by the team.

## 4.2 Risk Assessment

RA is a three-step process that comes after forming a RA team and defining the scope. Priority should be given to controlling hazards at the upstream processes as this will reduce the amount of exposure from those hazards. After mitigation, hazards are reduced to more acceptable and manageable levels, and termed residual risks.

A sample of a RA Form can be found at Annex A. Extracts are taken from Annex A to describe three steps of RA below.

### Step 1: Hazard identification

When identifying hazards, three aspects should be considered and evaluated side by side. These aspects are the physical work environment and processes, work organisation and individual health factors (see Table 7 for an example). Identify as many hazards associated with each activity covered in the scope of the work as possible. Potential accidents or ill-health that could result from these hazards should be listed out. Person(s) at risk as a result of exposure to those hazards are also identified at this step.

Hazard identification		
Sub-activity	Hazard	Injury or Ill-health
Installing stage backdrop	Fall from ladder during installation.	Sprained ankle, broken leg or head injury.
	Getting cut by mechanised saw while cutting wood for backdrop.	Cut to hand or finger.

Table 7: Example of hazard identification in a Risk Assessment Form.

### Step 2: Risk evaluation

For each hazard identified, estimate the severity and likelihood of occurrence by giving it a numerical value from one to five. Multiply the two values to get the Risk Prioritisation Number (RPN). Refer to the 5x5 risk matrix using the RPN to determine if the risk is at an acceptable level. Hazards with higher RPN should be given priority when implementing control measures (see Table 8 for an example).

Hazard identification		Risk evaluation		
Hazard	Existing risk controls	Severity (S)	Likelihood (L)	Risk prioritisation number (RPN)
Fall from ladder during installation	<ul style="list-style-type: none"> <li>Maintain three-point contact at all times.</li> <li>Use utility belt to hold tools.</li> </ul>	5	2	10
Cut by machine	<ul style="list-style-type: none"> <li>Install and lock machine guard.</li> <li>Follow lockout/ tag-out procedure.</li> </ul>	3	2	6

Table 8: Example of risk evaluation in a Risk Assessment Form.

### Step 3: Risk control

Based on the determined RPN, risk controls should be selected to reduce the risk to an acceptable level. Table 9 suggests the acceptability of risk for different risk levels and their recommended actions. The most effective way to reduce risk is to tackle it at its source. This can be achieved by eliminating the risk, followed by substitution, and implementation of engineering controls, according to the Hierarchy of Control.

Risk level	Risk acceptability	Recommended actions
Low	Acceptable	<ul style="list-style-type: none"> <li>No additional risk control measures may be needed.</li> <li>Frequent review and monitoring of hazards are required to ensure that the risk level assigned is accurate and does not increase over time.</li> </ul>
Medium	Tolerable	<ul style="list-style-type: none"> <li>A careful evaluation of hazards should be carried out to ensure that the risk level is reduced to as low as reasonably practicable within a defined time period.</li> <li>Interim risk control measures, such as administrative controls or PPE, may be implemented while longer term measures are being established.</li> <li>Management attention is required.</li> </ul>
High	Not acceptable	<ul style="list-style-type: none"> <li>High risk level must be reduced to at least medium risk before starting work.</li> <li>There should not be any interim risk control measures. Risk control measures should not be overly dependent on PPE.</li> <li>If practicable, the hazard should be eliminated before starting work.</li> <li>Management review is required before starting work.</li> </ul>

Table 9: Recommended action for risk levels.

## Hierarchy of Control

When selecting control measures, the Hierarchy of Control can be used as a guide (see Figure 33). The control measures need not be mutually exclusive and can be used in tandem with other measures to improve effectiveness.

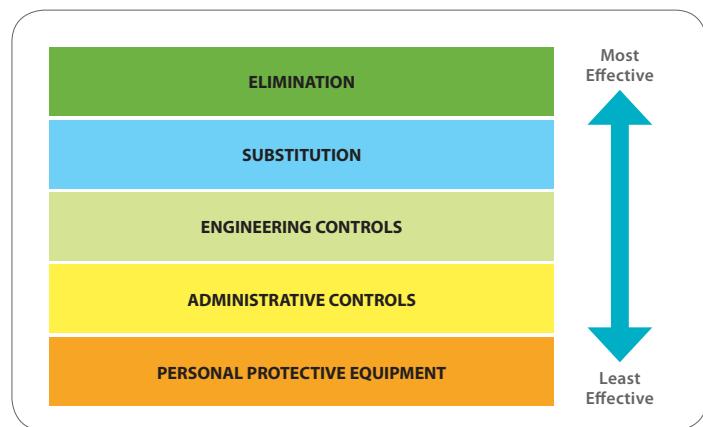


Figure 33: [The Hierarchy of Control](#).

### Elimination

Elimination is the most effective form of control measure as it completely removes the hazard from the work process, and also all risks associated with that hazard.

### Substitution

Substitution involves replacing an element in a work process with a less harmful alternative so that the hazard presents a lower risk.

### Engineering controls

These are structures or equipment that physically reduces the impact of the hazard by changing the work environment or work process, by putting a barrier between the hazard and employee.

### Administrative controls

This reduces or eliminates exposure to hazards via strict adherence to specific work procedures or job instructions. Documentation should emphasise all steps in the work processes and controls needed for work activities to be carried out safely.

### Personal protective equipment

The proper use of PPE can further mitigate risks. Hence, employers should ensure that all employees put on PPE issued to them during work. PPE can also be considered for short-term contingencies such as emergencies, infrequent maintenance or repair work, but it should always be used in conjunction with other control measures. To be effective, PPE should fit the employee well, and will need proper maintenance and storage to keep it in good working condition.

## 4.3 Implementation and Review

Risk control measures once approved by the management should be implemented immediately. For risk management (RM) to be effective, hazards and their control measures must be communicated to employees performing the work. Managers and supervisors who oversee the work area or work activity that bears risks should ensure that all persons who will be exposed are duly informed about the risks and their associated mitigating measures.

Regular inspections or audits can be carried out to verify the effectiveness of the control measures put in place. This will ensure that the measures are current and effective to manage risks at the workplace.

RA must be reviewed or revised under the following conditions:

- At least once every three years;
- After an accident, near-miss or occupational disease is diagnosed; and
- A change implemented in the work processes.

## 4.4 Record-keeping

All WSH RAs and related documents should be kept for at least three years and must be made available upon request by the Commissioner for WSH.

For more information on Risk Management, refer to:

- *Code of Practice on Workplace Safety Health (WSH) Risk Management*.

# 5. Workplace Safety and Health Management System

Employers are encouraged to develop and implement a comprehensive WSH management system to establish a safe and healthy work environment, and prevent accidents and work-related illnesses. The system is comprised of many elements, some of which can be implemented readily. Doing so is a display of commitment to safety and health, and various extents of implementation can qualify organisations for bizSAFE and cultureSAFE certification.

For more information on bizSAFE and cultureSAFE, refer to the WSH Council website at [www.wshc.sg](http://www.wshc.sg)

## 5.1 WSH policy

The management's commitment is essential to create a robust safety-first culture in the organisation. This can be embodied in a company's written policy that spells out its philosophy and attitude towards safety and health. It should be properly documented, implemented and communicated to all staff. It should also be reviewed periodically to ensure relevance to the company's operations.

## 5.2 In-house WSH rules and regulations

A set of written WSH rules and regulations should be laid down for staff and contractor(s). Any key legal requirements that are in line with the WSH Act need to be incorporated as well. These can also serve as reminders of safety and health responsibilities for all staff. Individual departments may also develop their customised set of rules and regulations.

## 5.3 Risk Management

See chapter on Risk Management.

## 5.4 Safe Work Procedures

Employers are encouraged to establish SWPs for all work activities carried out. These should be communicated effectively to all staff; during new staff orientation, and at regular refresher trainings for existing staff.

Whenever new equipment or processes are introduced or when there are changes made to operating procedures, SWPs should be reviewed and updated as well.

## 5.5 Safety training

Safety training is important to provide employees with the knowledge and skills to work in a safe manner. Safety training can be incorporated into the operational training of employees and carried out on-the-job by trained supervisors or commissioned external trainers. Records of

such training should be documented and updated routinely. Training should also be reviewed when there are changes to the company's operations.

### What should the safety training cover?

- All possible risks associated with the job;
- Company's WSH policy;
- Safety measures;
- SWPs; and
- Proper use of equipment and PPE.

### When should safety training be conducted?

- During orientation for new staff;
- Periodically for all existing staff;
- When new equipment or processes are introduced; and
- When there is a transfer of staff between departments.

Training audience		
Operational staff	Supervisory staff	Managerial staff
Follow SWPs and risk control procedures.	Interpret WSH policies, procedures and programmes.	Identify responsibilities under the WSH Act.
Follow workplace emergency response procedures.	Educate employees on WSH policies, procedures and programmes.	Establish and maintain WSH framework.
Participate in WSH management activities.	Implement and control WSH management programmes.	Establish and evaluate WSH system, policies, procedures and programmes.
–	Implement workplace risk management programmes.	Establish workplace risk management procedures.
–	Maintain workplace risk control measures.	Come up with risk control measures.

Table 10: Examples of safety training topics for different trainees.

For more information on WSH training, visit the Singapore Workforce Skills Qualification (WSQ) website at [www.ssg.gov.sg/wsq.html](http://www.ssg.gov.sg/wsq.html)

## 5.6 Communication

Establish communication channels for conveying WSH information and messages to internal staff and external contractors. A clear procedure for receiving, documenting and responding on these channels should be maintained. For instance, daily toolbox meetings is a convenient platform for bilateral communication and records of each meeting should be kept.

## 5.7 Employee participation

Workplaces with 50 or more employees should form WSH committees with members from both the management and employees. Employers should also encourage their staff to form WSH Innovation Teams. This will serve as a platform which ideas and solutions to improve safety and productivity can be contributed. Management can encourage active staff engagement and contribution by giving clear recognition to those efforts.

Details on setting up a WSH committee and its functions can be found in the *WSH (Workplace Safety and Health Committees) Regulation*.

## 5.8 Incident investigation

Employers need to report accidents or dangerous incidents within 10 days of occurrence and occupational diseases within 10 days of receiving the diagnosis to the Ministry of Manpower (MOM). The reports can be submitted via an online reporting platform, iReport, on [www.mom.gov.sg](http://www.mom.gov.sg) and employers need to maintain these records for at least three years from the time of reporting.

Every incident is a valuable lesson, and should be shared with all relevant staff and contractors. Accident statistics should be collected and analysed, and management can use the information to identify problematic areas and pick out trends. When statistics is shared, management will have the materials for reviewing and exacting improvements.

For more information on Incident Investigation, refer to:

- *Guidelines on Investigating Workplace Incidents for SMEs* from the WSH Council website at [www.wschc.sg](http://www.wschc.sg)

## 5.9 Maintenance programme

An effective maintenance programme for all equipment should be set up and strictly adhered to. This is to prevent accidents resulting from equipment failure. The programme should contain an inventory list of all equipment and machines in the work premise, and the inspection and maintenance schedules and records. There should also be a channel for staff to report defective or damaged equipment discovered during work.

## 5.10 Occupational health programmes

Occupational health programmes targeted at addressing specific hazards should be established. Each programme should clearly define its objectives, details on the person-in-charge, component activities and frequency of execution. Table 11 shows some examples of such programmes.

Hazard	Programme
Excessive exposure to loud noise	Hearing conservation programme
Exposure to chemicals, radioactive materials, bio-hazardous materials	Management of hazardous substances programme
Awkward work postures, repetitive work, manual handling	Ergonomics programme

Table 11: **Health programmes for managing corresponding hazards.**

## 5.11 Emergency preparedness

An emergency response plan is imperative in saving lives and mitigating loss when the situation arises. An emergency team should be formed, with each member's roles and responsibilities clearly defined. Management should take care to ensure that every staff is familiar with the emergency procedures, and this can be reinforced through regular drills and exercises. The performance in each drill should be evaluated to learn how the company can improve its emergency response plan.

**Emergency response plans should minimally include the following:**

- procedures for raising an alarm;
- procedures for evacuation and rescue;
- means to rescue and administer first aid; and
- communication channels with relevant government authorities and response agencies.

Examples of emergencies include:

- fire;
- structural failure or collapse; and
- gas leakage.

## 5.12 Documentation and review

There should be a system in place for documenting and regular reviewing of the WSH system. This is to facilitate retrieval of relevant documents and ensure that the programme remain relevant and effective. All revisions to the safety and health manual should be dated and endorsed by authorised personnel. Recommendations coming from such reviews should be duly considered and implemented wherever possible.

## 5.13 Safety promotion

Employers can also organise promotional programmes to generate more WSH awareness, and cultivate a stronger safety culture at work. Examples of such promotional activities include:

- participation in WSH talks, seminars and exhibitions;
- participation in National WSH campaigns;
- participation in National WSH competitions (e.g., Safety Starts with Me, WSH Innovation Awards);
- subscribe to WSH Bulletin on the WSH Council website at [www.wshc.sg](http://www.wshc.sg);
- dedicate a column to WSH in town council newsletters; and
- in-house competitions, exhibitions, and awards.

## 5.14 Contractor management

Multiple contractors may be engaged to work on different aspects of an event. Event companies should establish a system to evaluate, select, and control contractors to assess these contractors before awarding any work to them. Event companies should be cautious when selecting and managing their contractors to ensure that the latter do not pose additional and unnecessary risks for themselves or others. Event companies should meet their contractors regularly to monitor their WSH performance during the term of the contract, as well as a final review after the completion of said contract.

For more information on contractor management, refer to:

- *Guidelines on Contractor Management* from the WSH Council website at [www.wshc.sg](http://www.wshc.sg)

## 5.15 Safety inspection

Event companies should establish an effective programme to carry out periodic inspections to identify potential hazards, unsafe acts and conditions in the workplace, and monitor any changes in the work processes. Both management and employees should be involved in this programme. An inspection checklist can be used when conducting regular safety inspections. It is important to be comprehensive and go over every aspect of the workplace. The findings from each inspection should be recorded and analysed. Following that, recommendations and follow-up actions should also be properly documented for future reference.

For more information, refer to:

- *SS 506: Part 1: 2009 Occupational safety and health (OSH) management systems*.

## 6. References

### A. Ministry of Manpower, Occupational Safety and Health Division

Legislations available at MOM website at [www.mom.gov.sg](http://www.mom.gov.sg)

- The Workplace Safety and Health Act (Chapter 354A)
- WSH (Operation of Cranes) Regulations 2011
- WSH (Scaffolds) Regulations 2011

Guides to managing workplace hazard available at MOM website at [www.mom.gov.sg](http://www.mom.gov.sg)

- *Safety Circular on Safe Work Procedures* (2000)
- *Safety Circular on Electrical Safety*
- *Safety Circular on Lock-out Procedures* (2000)
- *Guidelines on Risk Assessment for Occupational Exposure to Harmful Chemicals* (2002)
- *Guidelines for Noise and Vibration Control* (2003)
- *Guidelines on Prevention and Control of Chemical Hazard* (2002)
- *Guidelines on Solvent Management in Dry Cleaning* (2000)
- *Factsheets on Successful Noise Control Case Studies* (2001)

### B. Workplace Safety and Health Council

The following guides are available on the WSH Council website at [www.wshc.sg](http://www.wshc.sg)

- *Code of Practice for Safe Lifting Operations in the Workplaces* (2014)
- *Code of Practice on Workplace Safety and Health (WSH) Risk Management* (2012)
- *Code of Practice on Working Safely at Heights* (2013)
- *Guide to Total Workplace Safety and Health* (2014)
- *Guidelines on Fatigue Management* (2010)
- *Guidelines on Hearing Conservation Programme* (2014)
- *Guidelines for Hospitality and Entertainment Industries* (2013)
- *Guidelines on Safeguarding Against Falling Objects* (2011)

### C. Singapore Standards

The following standards can be obtained from SPRING Singapore.

- *Approved Code of Practice SS 549: 2009 Code of Practice for Selection, use, care and maintenance of hearing protectors*
- *Approved Code of Practice SS 569: 2009 Code of Practice for Manual handling*
- *Approved Code of Practice SS 506: Occupational safety and health (OSH) management system Part 1: Requirements*
- *Approved Code of Practice SS 506: Occupational safety and health (OSH) management system Part 2: Guidelines for the implementation of SS 506: Part 1: 2009*

### D. Singapore Workforce Skills Qualifications

For more information, visit the Singapore Workforce Skills Qualification (WSQ) website at [www.ssg.gov.sg/wsqa.html](http://www.ssg.gov.sg/wsqa.html)

### Contact

For enquiries, please email Workplace Safety Health Council at [contact@wshc.sg](mailto:contact@wshc.sg)

To report accidents, dangerous occurrences and occupational diseases, go to [www.mom.gov.sg/report](http://www.mom.gov.sg/report)

## 7. Acknowledgements

Supporting Organisations	Contributors
Sentosa Development Corporation	Mr Freddie Ngiam
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Workplace Safety and Health Council	Mr Perry Hung

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- Resorts World Sentosa; and
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## 8. Annex

### Annex A: Sample Risk Assessment Form

Risk Assessment Form															
Department:	Staging and carpentry	RA Leader:	Roy Lim												
Work activity:	Building stage, backdrop and bleachers	RA Member 1:	Hong Qi Shun												
Event Location:	New year countdown celebrations at Padang field	RA Member 2:	Han King Sui												
Assessment Date:	16 Dec 2014	RA Member 3:	Eddie Lo												
Last Review Date:	17 Dec 2013	RA Member 4:	Priakash Muthu												
Next Review Date:	15 Dec 2015	RA Member 5:	-												
				Risk Evaluation						Risk Control					
Ref	Sub-activity	Hazard	Possible Injury/ Ill-health	Existing Risk Controls	S	L	RPN	Additional Controls	S	L	RPN	Implementer	Due Date	Remarks	
	Trip over truss members that are piled up on the ground.	Bodily injuries, twisted ankle, bruised knee, and so on.	Plan layout of work site before starting work to reduce number of people walking around area where truss members are kept.	3	3	9		Implement and sustain housekeeping practices to reduce tripping hazards at worksite.	3	1	3	Eddie Lo	20 Dec 2014		
1	Installing truss structure	Head injury.	Mark out a clearance zone around MEWP to keep other employees away.	4	4	16		Wear hard hat or safety helmet during work. Secure tools to a utility belt.	4	2	8	Hong Qi Shun	20 Dec 2014		
	Toppling of lorry crane while lifting trusses.	Potentially fatal injuries.	Work within safe working load of the crane. Ensure that outriggers are always fully extended.	5	2	10		Ensure that lorry crane is immobilised before deploying. Use handbrakes and wheel chocks.	5	1	5	Roy Lim	20 Dec 2014		

Hazard Identification				Risk Evaluation						Risk Control								
Ref	Sub-activity	Hazard	Possible Injury/ Ill-health	Existing Risk Controls			S	L	RPN	Additional Controls			S	L	RPN	Implementer	Due Date	Remarks
	Constant bending and overreaching when setting up bleacher components.	Bad posture leading to back and joint aches.	Educate employees on proper posture; bending knees; instead of bending back.	3	4	12				Schedule shifts to reduce the amount of time an employee spends on the same work activity.	3	2	6	Han King Siew	20 Dec 2014			
2	Setting up bleachers	Bodily injuries; broken arm or leg or even potentially fatal head injuries.	Use MEWP to install guardrails at height.	5	3	15				Use travel restraints on employees working at heights on the bleacher.	3	3	9	Eddie Lo	20 Dec 2014			
	Hand or finger getting caught between joints.	Hand or finger injuries.	Teach employees to be aware of and avoid identified pinch points during toolbox briefing.	3	3	9				Provide proper fitted work gloves.	3	3	9	Roy Lim	20 Dec 2014			
	Sustaining cuts when using cutting tools such as saws.	Finger amputation and cuts.	Wear cut-resistant gloves when handling materials and tools.	4	3	12				Keep machine guards for powered saws locked in place.	4	2	8	Han King Siew	20 Dec 2014			
	Getting electrocuted when using powered tools.	Electrocution.	Use waterproof industrial plugs. Daily inspection for wear and tear on wiring insulation.	5	2	10				Wear insulating rubber gloves and safety boots.	5	1	5	Priakash Muthu	20 Dec 2014			
3	Inhaling saw dust produced while cutting.	Breathing problems and irritation to eyes.	Wear N95 masks and goggles.	3	4	12				Locate woodcutting activities away from other work activities.	3	1	3	Priakash Muthu	20 Dec 2014			
	Hands getting pricked by splinters.	Minor pricks.	Provide cut-resistant gloves for employees handling materials.	2	3	6					-	-	-	-	-			
	Cutting plywood to create backdrop for the stage	Placing plywood on the floor to level out the carrying and placement.	Bad posture leading to back and joint aches.	3	4	12				Schedule shifts to reduce the amount of time an employee spends on the same work activity.	3	2	6	Han King Siew	20 Dec 2014			
4	Setting up the stage	Improper rigging causes backdrop to drop while lifting.	Bodily injuries.	Ensure that only competent persons carry out rigging and propping up of the backdrop.	3	3	6			Communicate clearly during lifting to coordinate the process.	3	2	6	Priakash Muthu	20 Dec 2014			
5	Lifting backdrop onto the stage	Struck by hammer while securing support to backdrop.	Hand or finger struck by hammer.	Use screws instead of nails.	3	2	6			When using screws is not feasible, use a pair of pliers to hold onto to nails, instead of using one's bare hands.	3	1	3	Eddie Lo	20 Dec 2014			

### Assessment of Likelihood

Level	Likelihood	Description
5	Almost Certain	Continual or repeating experience.
4	Frequent	Common occurrence.
3	Occasional	Possible or known to occur.
2	Remote	Not likely to occur under normal circumstances.
1	Rare	Not expected to occur but still possible.

### 5x5 Risk Matrix with Risk Prioritisation Number (RPN)

Severity \ Likelihood	Rare (1)	Remote (2)	Occasional (3)	Frequent (4)	Almost Certain (5)
Severity	Catastrophic (5)	Major (4)	Moderate (3)	Minor (2)	Negligible (1)
Catastrophic (5)	5	10	15	20	25
Major (4)	4	8	12	16	20
Moderate (3)	3	6	9	12	15
Minor (2)	2	4	6	8	10
Negligible (1)	1	2	3	4	5

### Assessment of Severity

Level	Ranking	Description
5	Catastrophic	Fatality, fatal diseases or multiple major injuries
4	Major	Serious injuries or life-threatening occupational disease (including amputations, major fractures, multiple injuries, occupational cancer, and acute poisoning).
3	Moderate	Injury requiring medical treatment or ill-health leading to disability (includes lacerations, burns, sprains, minor fractures, dermatitis, deafness, and work-related upper limb disorders).
2	Minor	Injury or ill-health requiring first-aid only (includes minor cuts and bruises, irritation, and ill-health with temporary discomfort).
1	Negligible	Not likely to cause injury or ill-health.

## Annex B: Globally Harmonised System of Classification and Labelling of Chemicals (GHS)

GHS Pictogram	Hazard class	Examples
	• Corrosive	<ul style="list-style-type: none"> <li>• Acids (sulphuric acid in batteries)</li> <li>• Bases (hydroxide for industrial cleaning)</li> </ul>
	<ul style="list-style-type: none"> <li>• Flammables</li> <li>• Aerosols</li> <li>• Self-reactive</li> <li>• Pyrophoric</li> <li>• Self-heating</li> <li>• Emits flammable gas</li> </ul>	<ul style="list-style-type: none"> <li>• Gases (hydrogen, acetylene)</li> <li>• Liquids (gasoline, thinner, alcohol)</li> </ul>
	• Acute toxicity (severe)	<ul style="list-style-type: none"> <li>• Cyanide</li> </ul>
	<ul style="list-style-type: none"> <li>• Irritant</li> <li>• Skin sensitiser</li> <li>• Acute toxicity</li> <li>• Narcotic effects</li> <li>• Respiratory tract irritation</li> <li>• Hazardous to ozone layer</li> </ul>	<ul style="list-style-type: none"> <li>• Solvents (paint remover)</li> <li>• Lubricants</li> <li>• Coolants</li> </ul>

	<ul style="list-style-type: none"> <li>• Carcinogen</li> <li>• Respiratory sensitisier</li> <li>• Reproductive toxicity</li> <li>• Target organ toxicity</li> <li>• Mutagenicity</li> <li>• Aspiration toxicity</li> </ul>	<ul style="list-style-type: none"> <li>• Benzene</li> <li>• Asbestos (used in roof insulation)</li> </ul>
	• Oxidiser	<ul style="list-style-type: none"> <li>• Peroxide (for bleaching, sanitising)</li> </ul>
	<ul style="list-style-type: none"> <li>• Explosive</li> <li>• Self-reactive</li> <li>• Organic peroxide</li> </ul>	<ul style="list-style-type: none"> <li>• Cellulose nitrate (fireworks)</li> </ul>
	• Gases under pressure	<ul style="list-style-type: none"> <li>• Helium (for filling balloons)</li> <li>• Nitrogen (as a propellant gas)</li> <li>• Propane (for cooking)</li> </ul>
	• Environmental toxicity	<ul style="list-style-type: none"> <li>• Halon destroys the ozone layer (used in fire extinguishers)</li> </ul>

## Annex C: Permissible Exposure Limits for Noise

Example of noise level	Decibel dB(A)	Maximum exposure limit	
Normal conversation	60	-	Ear plugs required.
Vacuum cleaner	75	-	
Heavy city traffic	85	8 hr	
Food blender	88	4 hr	
Heavy truck traffic	91	2 hr	
Passing train	94	1 hr	
Hand drill	97	30 min	
Motorcycle riding	100	15 min	
Airplane taking off	103	7.5 min	
Table saw	106	4 min	
Jackhammer	109	2 min	
Chainsaw	111	1 min	
Thunderclap	120	9 sec	-

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