

LPA Guidelines

Safety Guidelines for the Live Entertainment and Events Industries

Working at Height Hazard Guide

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Disclaimer

In legislative terms, the requirements of the *Work Health and Safety Act 2011* (the WHS Act) and Work Health and Safety Regulations (the WHS Regulations) are mandatory. In contrast, a guide is designed to assist obligation holders to comply with the requirements of an act or regulation. The information contained in the LPA guides is not mandatory, has no legal status and may not apply in all work situations.

Obligation holders still have a duty to assess the risks in each work situation and take all reasonable steps to eliminate or minimise the risks that are specific to each work activity.

Working at Height Hazard Guide

1. Overview

This guide provides information to assist in managing risks associated with **working at height** in live entertainment and events. Information in this guide is based on the Work Health and Safety Act 2011 (WHS Act) and Work Health and Safety Regulations 2011 (WHS Regulations), which are operational in all states except Victoria and WA, where adoption of the legislation is not yet enacted (as at Jan 2018).

It is recommended that this information is referenced during the planning and delivery of events to assist in identifying hazards, assessing risks and determining appropriate control measures to eliminate and or minimise these risks, so far as reasonably practicable.

This guide does not replace the need to implement risk management strategies, undertake research or seek specialist advice.

Each worker and person conducting a business or undertaking (PCBU) has a responsibility to understand their obligations under WHS legislation. Codes of practice and Australian and international standards provide approved guidance on how to meet work health and safety obligations.

Working at height refers to any work where a person could fall from one level to another. There are two main risks associated specifically with working at height:

- Injuries or death due to persons falling from height
- Injuries or death due to persons being hit by an object falling from height

The risk of serious injury or death increases significantly for falls from 2 metres or more. Falls can also occur at ground level as a result of falling into a pit or below stage.

This guide provides practical information and suggested control measures for:

- General working at height
- Catwalks/grids
- Elevated Work Platforms (EWP)
- Ladders
- Orchestra pit
- PPE (personal protective equipment)
- Rescue plan
- Scaffolding
- Stage traps and pits
- Temporary access
- Theatrical performance exemption
- Unprotected edges

Additional information can be found in the Rigging Safety Guide and Stage Machinery and Plant Safety Guide.

Part 1 Safety Guidelines for Live Entertainment and Events provides general information on duties, obligations and risk management.

2. Key Considerations – Working at Height

Consider the following questions during event design, planning and delivery	Yes	No	Comment/Action
2.1 All work at height			
<i>Will there be other PCBUs and workers involved or affected by this activity?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Have arrangements been made to consult with and cooperate and coordinate activities with other PCBUs before and during undertaking this activity?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Has the scope of work been defined – duration, equipment required, scheduling, location?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Are there site-specific safety requirements or procedures that need to be considered?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Has an appropriate and viable rescue plan been developed?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Can all or some of this task be done at ground level?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Have the heights at which work will be undertaken been determined?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Are there specific obligations in your state/territory if a person could fall more than 2 metres?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Are workers who are required to work at height trained and competent?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Have these workers been consulted about hazards and risk controls?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Have the means of access, design and layout of elevated work areas been determined?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Are additional specific controls required to manage risks during non-performance mode?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Will the work be undertaken outdoors?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Will the work be undertaken indoors?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Will there be lighting levels, noise, weather conditions or other environmental factors that might introduce new hazards?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Does the number, proximity and movement of all people in the work area pose additional risks?</i>	<input type="checkbox"/>	<input type="checkbox"/>	

Consider the following questions during event design, planning and delivery	Yes	No	Comment/Action
<i>Have exclusion zones been determined?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Has the method of maintaining the exclusion zones been determined?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Are plant and equipment appropriately maintained and checked?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Does the task require any specific PPE, footwear or clothing?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Are workers competent in the use of PPE?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Are procedures in place for potential emergency situations, including self-rescue or site rescue?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Are relevant workers competent to undertake self-rescue or site rescue?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
2.2. Ladders – NOTE ladders are the last option that should be considered when required to work at height.			
<i>Has the height of the area to be accessed been determined?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Could the use of a ladder be substituted by using a work platform as a safer option?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Will the work to be undertaken from a ladder involve any electrical equipment or be close to electrical equipment?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Is the work indoors?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Is the work outdoors?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Are strong winds/gusts present or forecast?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Is the ladder suitable for the task?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Is the ground surface level, non-slippery and strong enough to support the ladder?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Is the ladder rated to industrial grade – individual rung strength of $\geq 120\text{kg}$?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>If a straight ladder is to be used – has the method of securing the top been determined?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>If a straight ladder is to be used – can the correct</i>	<input type="checkbox"/>	<input type="checkbox"/>	

Consider the following questions during event design, planning and delivery	Yes	No	Comment/Action
<i>angle 1:4 be achieved?</i>			
<i>If a very long/high straight ladder is to be used – has the worker’s competency in emergency procedures been determined?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Will any tools or equipment be required to be used by the worker on the ladder?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Has the method of securing these tools been determined?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Are these tools designed for single hand use?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Can the tasks be performed without reaching, ensuring the torso stays within ladder stiles?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
2.3. Elevated work platforms (EWP)			
<i>Is the EWP of suitable power, height and capacity for the task?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Is the work platform capable of reaching the work and supporting the load of the required people and equipment?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Can an EWP gain access to the venue or work site?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Is the ground surface level and capable of supporting the weight of the EWP?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Do the workers hold the appropriate competencies or licence to operate the EWP?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Does the work platform conform to all other site regulations (exhaust, noise, etc.)?</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Is the platform capable of reaching heights greater than 11m? If so, High Risk Licence is required.</i>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Has a rescue plan been determined in case of emergency situations?</i>	<input type="checkbox"/>	<input type="checkbox"/>	

3. General Guide – Working at Height

3.1 Responsibilities

PCBUs have specific obligations under the Model WHS Regulation 78 to manage the risk of falls in the workplace. The regulations require that work be carried out on the ground or on a solid construction where practicable. Where this is not possible, fall prevention devices, work positioning systems and fall arrest systems must be provided.

Designers in particular have an important role in eliminating or minimising the risk of falls in the design and use of sets and structures. This includes lighting and sound designers. PCBUs must ask designers for the risk assessment on the design and designers are required to supply one.

Workers must also take reasonable care of their own safety and the safety of others.

3.2 Training and competence

All persons undertaking work at height must be trained and competent in the specific activity. It is recommended that personnel required to work at height undertake training in the accredited unit of competency RIIOHS204D Work Safely at Heights or equivalent. Additional training and induction to site-specific and job-specific safe work methods may be required.

Licences are required for activities deemed as high risk work. See relevant WHS legislation for details.

3.3 Consultation, co-operation and co-ordination

The Model WHS Act makes consultation with workers a legal requirement. Consultation, cooperation and coordination between PCBUs is a requirement where they share a duty for the safety of a worker or for work to be done.

PCBUs should use the information in this guide to consult with workers including event staff to determine the working at height hazards and risks associated with an event and how to best eliminate or minimise these risks using the hierarchy of controls.

Consultation should start as early as possible, before decisions are made, and continue through the duration of the event.

Consider the other parties who will need to be involved in the consultation process when planning the event and determine what information needs to be shared and discussed. During an event, PCBUs are required to consult, co-operate and co-ordinate with other PCBUs such as the venue or site management, unions, production companies, designers, event organisers or promoters, catering providers, security, subject matter experts such as structural engineers or safety officers, local authorities or governments, rigging companies, performers, suppliers of plant or equipment etc.

If employees are represented by health and safety representatives, the consultation must involve those representatives.

Areas to address during consultation may include induction, schedules, floor plans, set, lighting and sound designs, site specific requirements, risk assessments, SWMS, hazards and control measures, legislative requirements, licences, plant movement, traffic management, exclusion zones, key contacts, emergency procedures, permits to work.

Opportunities for consultation include toolbox talks, event briefings, site inspections, stakeholder meetings, post event reviews, working groups or forums.

3.4 Design and planning

In the early stages of design and planning for an event, the following criteria should be addressed when planning work at height:

- Legislative requirements
- An appropriate and viable rescue plan
- Consultation with relevant PCBUs and workers
- Selection of the means of working at height
- Selection of the plant and equipment required to complete the task
- Appropriate scheduling and allocation of resources to minimise impact on others
- Development of risk assessments and SWMS including controls agreed to during consultation
- Access to site and logistics
- Maintenance programs
- Emergency procedures
- Communication methods

3.5 Event delivery

In the delivery stages of an event (bump-in, rehearsal, show, bump-out) the following criteria should be addressed when undertaking work at height:

- Consultation with relevant PCBUs and workers
- Site specific inductions
- Equipment inspections and/or maintenance
- Work permits or engineering certificate requirements
- Implementation and monitoring of controls identified in risk assessments or SWMS
- The rescue methods, persons and equipment required for that rescue
- Compliance to legislative requirements
- Review, consultation and adjustment of control measures as required on site
- Incident reporting and management
- Sign-off and handover procedures

3.6 Review

After an event, the following criteria should be reviewed in consultation with relevant parties:

- Incident reports and outcomes including near-misses.
- Effectiveness of the risk control measures
- Scheduling
- Areas for improvement

- Incidents of non-compliance
- Any new hazards or risks identified

3.7 Documentation and records

The following documents and records should be created, maintained and kept on site when undertaking work at height during an event:

- Risk assessments and SWMS
- Training records, certificates of competency and licences
- Induction records
- Toolbox talk topics and attendance
- Evidence of consultation
- Incident reports, including near-misses
- Plant design specifications and maintenance records
- Engineering certification, work permits and sign-off records

Any of the above documents could be requested to be sighted by other PCBUs for verification or clarification and should be available at all times.

Various WHS documents and records need to be retained for differing periods of time – see relevant WHS legislation for details.

4. Suggested Control Measures

4.1 Managing the risks of falling from height

Identify all locations and tasks that could cause injury due to a fall. Specific control measures to manage the risks of falls must be implemented, where it is reasonably practicable to do so.

The WHS Regulations require that the following hierarchy of risk control measures be applied, in order, to eliminate or minimise the risk:

1. Eliminate the risk of fall by working at ground level
2. Prevent the fall by working on a solid construction (with fixed guard rails etc.)
3. Minimise the risk of fall by providing a safe system of work. The most effective control measure must be selected first unless it is not practicable to do so. In order of effectiveness, they are:
 - fall prevention
 - work positioning systems
 - fall arrest system

It may be necessary to use a combination of controls.

NOTE: The requirement to implement this control hierarchy does not necessarily apply in relation to the performance of stunt work, acrobatics or a theatrical performance. However, it is required that it be implemented for these activities if practicable.

4.1.1 Fall prevention

Assess whether it is practicable to apply passive fall prevention devices such as a working platform (scaffold, EWP) or a secure fence, edge protection, guardrails. Prevent the cross risk of barriers falling off the stage and injuring people working underneath by applying barriers along the downstage end not less than 2 metres from the stage edge.

4.1.2 Work positioning system

If passive fall prevention is not practicable, apply a work positioning system, such as a fall restraint technique. This is a PPE option and therefore lower in the hierarchy of controls. A fall restraint system prevents the person reaching a location from which there is a risk of fall. A person is connected to a suitable anchor point or 'life line' system that can withstand not less than 15kN force. This system design requires the person to wear a full-body industrial harness fitted correctly and connected by a lanyard to a line or bolt. The lanyard is of appropriate length to prevent the worker falling off an unprotected edge.

Industrial rope access systems can only be used by licensed operators.

4.1.3 Fall arrest system

Where other control measures are not practicable or not fully effective, a fall arrest system may be considered. An individual fall arrest system comprises a full-body industrial harness fitted

correctly, shock-absorbing lanyard of appropriate length, safety rope with fall-capturing device. A fall arrest system must be designed so the worker is never exposed to a force > 6kN. Workers must be trained in the correct use of the equipment including inspection for defects.

Workers must inspect their equipment before and after work and apply a 'buddy' system where workers cross-check their equipment settings before progressing to working at height. Working at height rated helmets must be worn. Pendulum effects and the forces exerted to the body in case of a fall must be calculated and considered. Workers moving along metal structures shall always have 1 point of attachment e.g. use a Twin Tail shock absorbing lanyard, one end of which must be connected to an appropriate anchor point or life-line at all times, only to be released when the other lanyard has been connected to the next available connection point. Secondary devices may also be required.

Assumptions must not be made about the load capacities of any structure when considering its use for access or as an anchor for fall restraint or arrest. Obtain advice from the venue operator and/or a structural engineer.

Where a fall arrest system is deployed, the risk of suspension trauma is considerable. A rescue plan must be in place and understood by competent trained personnel. A rescue plan must be available for medical or other incidents that may prevent a worker from descending safely from height unaided. See **Rescue Plans** below.

4.1.4 Administrative control measures

Administrative control measures may also be used to support higher level controls. These include Safe Work Method Statements (SWMS), work permits, isolating 'no go' areas, and planning work so that people are not required to work below.

If in any doubt about obtaining safe access to a location at height, consult a height safety professional. Do not attempt to gain access by ad-hoc methods.

It is important to ensure adequate numbers of suitably trained and competent personnel are on hand to implement and monitor risk control measures when working at height.

4.2 Managing the risks of falling objects

The principles that apply to preventing falls also apply to falling objects. In managing their duty to eliminate or minimise the risk so far as is reasonably practicable, PCBUs are required to maintain a safe system of work. This means ensuring fall prevention or if not reasonably practicable, then providing a system to arrest falling objects. Tools and equipment are common falling object hazards and should be secured with lanyards or in a closed tool-belt or pouch. Large props and scenery must be secured during bump-in/bump-out. Items to be rigged or flown pose a particular risk when securing and releasing the load. See Rigging Safety Guide for more information.

Control measures should be considered including the use of exclusion zones, PPE, tether lines, equipment trays and pouches; appropriate warning signs and administrative controls including training and toolbox talks.

4.3 Catwalks and grids

Catwalks, grids and other ways to access high areas must conform to the requirements of AS 1657: 2013 – Fixed Platforms, walkways, stairways and ladders – Design, construction and installation.

Controls to manage risk of falling or falling objects include:

- Empty pockets of all objects before accessing catwalk/ grid areas
- Pay attention to general housekeeping to ensure items are properly stowed
- Ensure all tools and equipment are properly tethered to the person or structure
- Use tool and equipment trays
- Ensure adequate personnel to hold items in place while items are being secured or released
- Never stand on handrails
- Never lean out over handrails
- Raise and lower equipment in a controlled manner
- Control access to the area and the area beneath it at all times
- Install adequate barriers and signs and ensure administrative procedures are in place and understood by all personnel
- Ensure procedures are in place to evacuate persons requiring medical defibrillation from metal structures such as catwalks and grids
- Where ladders are required to be used on fixed walkways, ensure the height of the potential fall is calculated and controls are put in place that are commensurate with the risk

4.4 Elevated work platforms (EWP)

EWPs (boom lift, scissor lift, vertical lift) provide a working platform and must be appropriate for the task.

Ensure the surface on which the EWP is being used is structurally capable of supporting the load of the EWP. Consult the venue operator or a structural engineer.

Workers must be trained and deemed competent to operate the particular brand and type of equipment, and in fall arrest and emergency rescue procedures.

Workers require a High Risk Work Licence when operating EWPs able to reach a height of >11m or with a boom length of 11 metres or more.

Elevating Work Platform Association of Australia (EWPA) provide certification (Yellow Card) for the safe operation of various types of EWPs with a boom length or reach of less than 11 metres. It is recommended that Yellow Card certification be adopted at all work sites as the minimum standard for safe operation of EWPs with a boom length or reach of less than 11 metres.

All workers need to meet safe work requirements set out in AS 2550 *Cranes, hoists and winches – Safe use – Mobile elevating work platforms*.

4.5 Ladders

Each year, many serious injuries result from falls from ladders. Overreaching, trying to carry out heavy tasks or simply not setting the ladder up securely are among some of the common causes of falls. It may be more efficient and safer to use an elevated work platform or scaffolding, or to substitute a ladder with a step platform with all guardrails in place. Ladders are the last option that should be considered when working at height. They are a tool of last resort.

The choice of ladder must be appropriate for the task, positioned correctly and used in a safe way. Guidance on the selection, safe use and care of portable ladders is set out in AS/NZS 1892 *Portable ladders* series. The manufacturer's recommendations on safe use should also be followed.

Ladders must be used as prescribed in the national Code of Practice – Managing the Risk of Falls at Workplaces (Section 7. Ladders) as follows:

Extension or single ladders should generally only be used as a means of access to or egress from a work area. They should only be used as a working platform for light work of short duration that can be carried out safely on the ladder.

SELECTING LADDERS

If ladders are used they must be selected to suit the task to be undertaken. In doing this, you should consider the duration of the task, the physical surroundings of where the task is to be undertaken and the prevailing weather conditions.

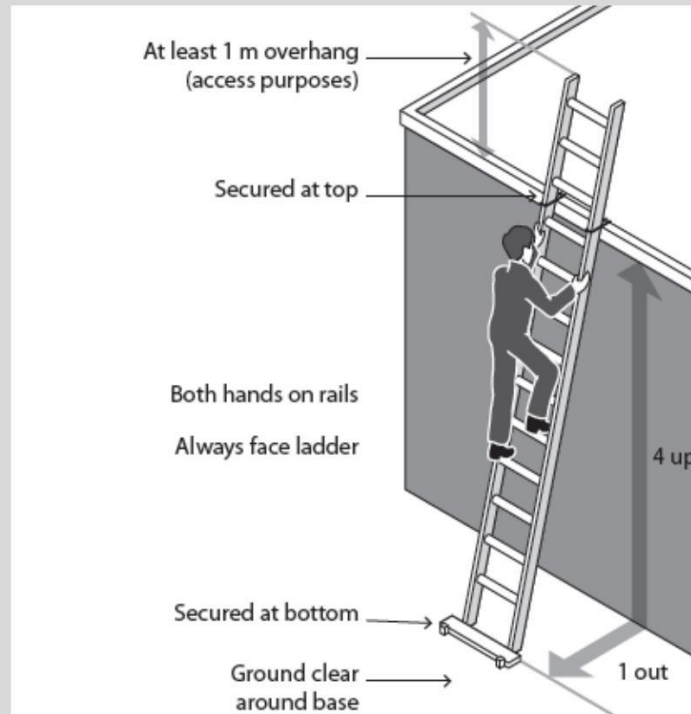
Ladders should have a load rating of at least 120 kg and be manufactured for industrial use.

POSITIONING LADDERS

Any ladder used at a workplace must be set up on a solid and stable surface, and set up so as to prevent the ladder from slipping. Single and extension ladders can be prevented from slipping by:

- Placing ladders at a slope of 4:1
- Petting up stepladders in the fully opened position
- Securing ladders at the top or bottom, or if necessary, at both ends

Example of acceptable ladder use:



ACCESS OR EGRESS

Where fixed or extension ladders are used for access or egress, you should check that:

- There is a firm, stable work platform, free from obstructions, to step onto from the ladder
- The ladder extends at least one metre above the stepping-off point on the working platform
- Tall protection is provided at the stepping-off point where people access the working platform

SAFE USE OF LADDERS

When a ladder is used, you should check that:

- The ladder is in good condition – the ladder should be inspected for faults, such as broken rungs, stiles and footing before it is used
- Damaged ladders are removed from service
- The ladder is set up on firm, stable and level ground
- The ladder is the correct height for the task to avoid reaching or stretching
- The ladder is not too close or too far from the support structure—the distance between the ladder base and the supporting structure should be about one metre for every four metres of working ladder height (4:1 ratio)

- The ladder is secured against displacement (i.e. Slipping or sliding) and/or there is another person holding the base of the ladder
- The ladder is not placed so that the weight of the ladder and any person using the ladder is supported by the rungs
- All the locking devices on the ladder are secure
- Materials or tools are not hand carried while climbing the ladder—use a tool belt or side pouch
- Only light duty work is undertaken while on the ladder, where three points of contact can be maintained and tools can be operated safely with one hand
- Slip resistant base, rungs or steps are provided
- Slip resistant shoes are worn

- Ladders are not used without additional appropriate precautions:
 - in access areas or doorways—if necessary, erect a barrier or lock the door shut
 - on scaffolding or an elevating work platform to get extra height
 - next to power lines unless the worker is trained and authorised and the appropriate ladder is being used
 - in very wet or windy conditions
 - next to traffic areas, unless the working area is barricaded

When using ladders, it is not safe to:

- Use metal or metal reinforced ladders when working on live electrical installations
- Carry out work such as arc welding or oxy cutting
- Work over other people
- Allow anyone else to be on the ladder at the same time

Except where additional and appropriate fall protection equipment is used in conjunction with the ladder, it is not safe to:

- Use a stepladder near the edge of an open floor, penetration or beside any railing
- Over-reach (the centre of the torso should be within the ladder stiles throughout the work)
- Use any power or hand tool requiring two hands to operate, such as concrete cutting saws and circular saws
- Use tools that require a high degree of leverage force which, if released, may cause the user to over-balance or fall from the ladder, such as pinch bars
- Face away from the ladder when going up or down, or when working from it.
- Stand on a rung closer than 900 mm to the top of a single or extension ladder
- Stand higher than the second tread below the top plate of any stepladder (with the exception of three-rung step ladders)

Source: Managing the Risk of Falls at Work Places Code of Practice 2015

4.6 Orchestra pit

An orchestra pit increases the height of a potential fall from the stage apron and additional controls to those described in Unprotected Edges (4.13) are recommended. These include:

- Control access to the area at all times
- Install adequate barriers and signs and ensure administrative procedures are in place and understood by all personnel
- Install a safety net to catch objects
- Use pit covers

Pit covers

The management of a venue that has an orchestra pit is responsible for providing a pit safety cover to prevent accidental falls into the pit, and to catch material which, when accidentally dropped from the stage, could cause injury.

The pit cover should be an acoustically transparent flameproof net or grid that extends across the entire width of the pit and a sufficient distance over the orchestra pit from the lip of the stage to prevent accidental falls. The net should be of a size and strength appropriate for the impact it may sustain during the production. A flameproof theatrical gauze or scrim may be stretched over the orchestra pit cover to prevent smaller lightweight objects from falling into the pit. Care should be taken to allow proper ventilation of the orchestra pit if a gauze is used.

When the pit is occupied, the pit safety cover should be in place. At all other times the pit cover should be in place or a warning barrier should be placed at waist level, sufficiently upstage of the pit to prevent people from falling in.

An orchestra pit safety cover should:

- Be able to support the weight of a human body falling from the stage or any raised performance area
- Be flameproof
- Not interfere with the proper ventilation of the orchestra pit
- Allow adequate line of sight between conductor and musicians and between the conductor and performers
- Conform to the shape of the pit opening

As the size and shape of each orchestra pit is different, a safety pit cover requires custom fabrication and installation. If a given production uses scenic elements that extend into the pit area, the pit cover may need to be re-configured or replaced.

The shape and size of the opening in the pit cover for the conductor should allow the conductor to conduct without impediment while not unduly compromising the safety of the musicians.

Source – Safety Guideline for the Live Performance Industry in Ontario – Orchestra Pits

4.7 Personal protective equipment (PPE)

The use of PPE is often required to mitigate the risk of falls. PPE is required to be stored and maintained in good order as required by AS 1891.4:

- Harnesses for fall arrest must be of the full body type and comply with AS 1891 *Fall Arrest Harnesses*.
- Harnesses must be fitted correctly.
- Connection to the harness must be via the fall arrest attachment points, which are labelled on all harnesses. The dorsal ring is the preferred attachment. Care must be taken if connecting to the front fall arrest attachment points.
- Lanyards must be properly connected to adequate anchor points.
- Anchor points must be certified to withstand 15kN force for one person and 22kN for two people. They are required to be tested and re-certified annually. As a rule of thumb, anchor points should be able to support 1500 kg mass, e.g. a large family car.
- Temporary horizontal lifelines can be installed to provide an attachment for fall arrest. Always follow manufacturer's recommendations when selecting suitable anchor points and assessing minimum clearance distances. One manufacturer recommends a minimum rating of 22kN at each anchor point. A more permanent system should be installed where regular and routine access is required.
- Vertical life-lines (or drop lines) provide fall protection from fixed or vertical ladders.
- A 'Shepherd's Hook and extension pole' is a useful tool to connect lifelines or similar to anchor points while the worker remains at ground level.
- Harnesses, lanyards, life-lines and other fall protection equipment must be inspected by the operator according to manufacturer's recommendations before every use. They must be inspected and the results recorded by a certified technician every 6 months or before each hire in the case of hire equipment.
- Shock absorbing lanyards are used for fall arrest to limit the force on the body to < 6kN. Fall clearance calculations must be carried out to include the length of shock absorber extension. Shock absorbing lanyards can be used as part of a fall restraint system as they will not deploy under less than 2kN force. Shock absorbing lanyards must not be used in conjunction with retracting lanyards or inertia reel devices, which contain their own shock absorption.
- Retracting lanyards and inertia reel fall arrest devices must be tested and re-certified annually by a certified technician. They must be withdrawn from service if they fail an inspection or following a shock load. Most models are fitted with a fall indicator, located at the swivel point of the snap-hook, to show they have been deployed in a fall. If this indicator is visible, the unit must be returned to the manufacturer for repair and re-certification or be retired from service.
- Attachment hardware must be at least double action or double locking. These connections require two deliberate actions to open, reducing the risk of roll-out and accidental opening.

- Fall arrest PPE, webbing and rope products must be withdrawn from service after maximum 10 years' service or following a shock load or failing and inspection.
- Fall protection equipment must be correctly stored according to manufacturer's recommendations. Equipment can be damaged by:
 - Direct sunlight for extended periods (ultra violet degradation)
 - Acid and alkaline chemicals such as battery acid, solvents, petrol, caustic products, adhesives and paints can damage webbing. Harnesses and lanyards can suffer chemical reactions causing damage from being stored on concrete floors.
 - Heat/ flame over 170 degrees C. Special care must be taken to avoid contact with welding spatter and grinding sparks.
 - Damp conditions can result in mould and mildew damage and corrosion to metal parts.
 - Crushing, foot traffic, moving plant, scenic elements etc.
- Harnesses and webbing products should be kept clean, following manufacturers recommended cleaning methods.
- Harnesses, webbing and rope products should be stored hanging, ideally from timber pegs, away from contaminants and direct sunlight.

4.8 Rescue plan

To minimise the potential for orthostatic shock – suspension trauma – the person responsible for the work must ensure that site rescue capabilities and plan are available to assist a worker suspended in a harness within 3 to 5 minutes. A rescue plan must be available on site and working at height rescue personnel designated with appropriate equipment available for vertical or horizontal rescue.

Specialised slings, which the suspended worker can use to raise himself/herself and relief tension of the harness, can reduce the risk of suspension trauma. Self-rescue is not possible for an unconscious or incapacitated worker. A plan for assisted rescue is also required. A number of proprietary systems are available from height safety retailers.

The rescue plan must address downward evacuation of a worker as the quickest and most practical approach. If downward evacuation is not available – site rescue personnel must be competent and have the equipment to enact upwards/sideways evacuation of the casualty. A rescue action for fallen and suspended workers must be enacted immediately to prevent suspension trauma. Research indicates that in approximately 8 minutes (or 3 minutes for some people) suspended workers may become unconscious, which significantly complicates the rescue.

Rescue plans must be available for medical or other incidents that may prevent a worker from descending safely from height unaided.

Rescue plans are not restricted to harness work – workers on a catwalk may need to be rescued in a short time frame, down ladders and along narrow access.

All rescue procedures must be tested and communicated so that they are effective.

4.9 Scaffolding

The use of scaffolding for accessing work at height is often a good way to provide safe access to areas at height.

Scaffolding is designed to be built in certain ways for the construction industry however entertainment applications are vastly different and may include levels that are not fully planked. Scaffold towers may be used for PA systems, FOH towers and for stage bases.

Workers must be competent and provided with relevant training, information and supervision when building, dismantling or maintaining scaffolds. Where the work satisfies the definition of construction work, personnel must hold a general construction induction-training card (White Card) and receive training specific to the scaffold, scaffolding work and the workplace.

If a person or object could fall more than 4 metres from the scaffold, the person erecting or dismantling scaffolding must hold the relevant High Risk Work Licence. This means if the standing platform is 2 metres or higher from the ground, then with a full arms reach, there is the risk of an object falling from 4 metres and the previous requirements apply.

Lightweight mobile scaffold towers must be erected by a competent person in line with manufacturer's recommendations.

Further information: Safe Work Australia *Scaffolds and Scaffolding Work Draft Code of Practice*

4.10 Stage traps and pits

Holes are sometimes cut into stages to provide access from below. These may include lifting equipment to raise or lower performers, props or scenery. Risks posed by the use of this machinery are discussed in the Stage Machinery and Automation Systems Hazard Guide. The risks include falling from height, being hit by falling objects, pinch and crush injuries. Controls include:

- Install a fence or other kind of removable barrier that is sturdy and in place at all times except when in performance mode; ensure that the barrier cannot fall into the hole causing injury below
- Ensure that all personnel are aware of the hazard and advise all personnel each time the pit is open
- Do not open traps or have them open in complete lighting blackout
- Ensure that blocking of action on stage doesn't require people to go too close to an open trap, especially in low-light situations
- Avoid placing drapes or other scenery items that could mask the presence of an open pit or trap
- Control access to the areas around and beneath the trap at all times
- Install adequate barriers and signs and ensure administrative procedures are in place and understood by all personnel

4.11 Temporary access

Where access to height is by temporary means, the risk of falls must be controlled. Controls include:

- Engineer the design of temporary access ways to ensure they are stable and can withstand forces which they will reasonably be subjected – obtain advice for a certified structural engineer

- Ensure temporary access ways are constructed and installed by competent and where required, licensed persons
- Use fall restraint and/or arrest systems – anchor points must withstand 15KN force
- Personnel must be trained in Work Safely at Heights or hold a High Risk Work Licence appropriate to the task
- Ensure correct use of portable ladders, scaffolding and EWPs
- Employ the services of Industrial Rope Access Trade Association (IRATA) qualified rope access specialists
- Control access to the area and the area beneath it at all times
- Install adequate barriers and signs and ensure administrative procedures are in place and understood by all personnel

4.12 Theatrical performance alternatives

Regulation 79 of the WHS Regulations makes provision for alternative risk controls to be established in the case of ***theatrical performance***. This would generally only apply during a performance mode, including rehearsal where full application of Regulation 78 is not practicable.

It is critical that PCBUs and workers clearly understand that the duty to prevent or minimise the risk of falls applies in all circumstances. However, during performance mode appropriate alternate controls may be established such as, but not limited to:

- Use of inset lighting on sets and staging elements to indicate unprotected edges
- Installation of tactile ground surface indicators so the change of texture indicates unprotected edges
- Blocking and rehearsal of movements on stage

At all other times, the alternatives would not apply and falls must be managed in line with the provisions set out in WHS Regulation 78. Temporary railings and crash-mats can be installed to control the risk of fall during non-performance activity.

4.13 Unprotected edges

Raised stages present a risk of fall that must be controlled. Common controls include:

- Install a fence or other kind of removable barrier that is in place at all times except when in performance mode (performance, rehearsals, plotting of lighting states and other activities that require an unencumbered view of the stage)
- Install illuminated, luminescent and/or reflective indicators on the edges
- Install tactile indicators on the edges
- Mark an exclusion zone by placing a line of tape a safe distance from the stage edge and inform performers
- Control access to the area at all times
- Install adequate barriers and signs and ensure administrative procedures are in place and understood by all personnel

Raised platforms may be a part of a set or for the installation of sound, lighting or video equipment. It is essential that potential risks are considered at the design phase and that fall protection is included in the construction design of platforms.

To minimise risk, raised performance areas must be designed where practicable to conform to the requirements of AS 1657 – *Fixed Platforms, walkways, stairways and ladders – Design, construction and installation*.

Where not practicable, alternative effective controls must be applied. Controls include:

- Implement controls described above for raised stages, orchestra pit and stage traps and pits
- Install guard rails designed to withstand forces to which they will reasonably be subjected – consult a structural engineer
- Install toe boards
- Install ‘catch platforms’ 2 metres wide and no more than 1 metre below to reduce the potential fall height
- Install correct crash mats for the nature of the possible fall, train performers and staff in how to land safely on them
- Use PPE such as harnesses and lanyards to the specifications outlined in this document
- connected properly to adequate anchor points. Anchor points must be certified to withstand 15KN force. They are required to be tested and re-certified annually
- Harnesses, lanyards and other components must be inspected before every use by the operator. They must be inspected by a certified technician every 6 months or before each hire in the case of hire equipment.
- Inertia reel fall arrest devices must be tested and re-certified annually by a certified technician.
- Fall arrest PPE must be withdrawn from service after maximum 10 years’ service
- Implement administrative controls such as rehearsal under full light before performing in show lighting states
- Control access to the platform and the area beneath it at all times
- Install adequate barriers and signs and ensure administrative procedures are in place and understood by all personnel

5. Legislation, Standards and Guidance

Safe Work Australia 2015 [Managing the risk of falls at workplaces Code of Practice 2011](http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/managing-risk-falls-cop)
<http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/managing-risk-falls-cop>

Safe Work Australia 2012 [Falling Objects Fact Sheet](https://www.safeworkaustralia.gov.au/system/files/documents/1702/falling_objects_fact_sheet.pdf) provides general guidance on managing risks posed by falling objects
https://www.safeworkaustralia.gov.au/system/files/documents/1702/falling_objects_fact_sheet.pdf

Australian and New Zealand Standards

AS 1418.13 *Cranes (including Hoists and Winches) – Building Maintenance Units*

AS/NZS 1576 *Scaffolding series*

AS/NZS 1657 *Fixed platforms, walkways, stairways and ladders—Design, construction and installation*

AS/NZS 1891.1 *Industrial fall-arrest systems and devices—Harnesses and ancillary equipment*

AS/NZS 1891.2 sup:1-2001 *Industrial fall-arrest systems and devices—Horizontal lifeline and rail systems—Prescribed configurations for horizontal lifelines (Supplement to AS/NZS 1891.2)*

AS/NZS 1891.3 *Industrial fall-arrest systems and devices—Fall-arrest devices*

AS/NZS 1891.4 *Industrial fall-arrest systems and devices—Selection, use and maintenance*

AS/NZS 1892 *Portable ladders series*

AS/NZS 4142.3 *Fibre ropes—Man-made fibre rope for static life rescue lines*

AS/NZS 4389 *Safety mesh*

AS/NZS 4488 *Industrial rope access systems series*

AS/NZS 4488.2 *Industrial rope access systems—Selection, use and maintenance*

AS/NZS 4576 *Guidelines for scaffolding*

AS 2550.16 *Cranes—Safe Use—Mast climbing work platforms*

AS/NZS 4994 *Temporary edge protection series*

British Standards

BSEN 1263-1 *Safety nets: Safety requirements, test methods*

BSEN 1263-2 *Safety nets: Safety requirements for the positioning limits*

Sources:

Safe Work Australia 2015 *Managing the Risk of Falls at Workplaces Code of Practice 2011*.

Safe Work Australia 2012 *Falling Objects Fact Sheet*

Safety Guideline for the Live Performance Industry in Ontario – Orchestra Pits

https://www.labour.gov.on.ca/english/hs/pubs/liveperformance/gl_live_pits.php