



# Temporary Structures Hazard Guide

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## Disclaimer

In legislative terms, the requirements of *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.

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## 1. Overview

This guide provides information to assist in managing risks associated with **temporary structures** used 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.

### 1.1 Definition

#### 1.1.1 Temporary structures

For the purposes of this guide a temporary structure is any structure that is not permanent and has a defined life, typically less than 28 days but up to one year, and most likely is designed to be demountable. Temporary structures are often custom designed for events, are generally erected manually and made from lightweight materials that are used repeatedly in multiple configurations.

The main risks associated specifically with temporary structures are collapse or structural failure due to:

- Poor design and inadequate engineering
- Overloading or poor supervision
- High winds or other adverse weather conditions
- Unsuitable ground conditions
- Crowd movement or behaviour
- Unintended use

This Temporary Structures Safety Guide provides practical information and suggested control measures for:



- Sets and scenery
- Temporary seating, grandstands
- Ground support structures
- Exhibition stands
- Marquees and inflatables
- Outdoor rigging
- Stages and risers
- Fire safety

#### **1.1.2 Further information for reference**

##### ***Working at Height Safety Guide***

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

##### ***UK Guide- Temporary demountable structures – Guidance on procurement, design and use.***

3<sup>rd</sup> Edition by the Institution of Structural Engineers.

<https://www.civilax.com/temporary-demountable-structures/>

##### ***Australian Building Code Board – Temporary Structures***

<http://www.abcb.gov.au/Resources/Publications/Education-Training/Temporary-Structures>



## 2. Key Considerations – Temporary Structures

The following questions must be considered during event design, planning and delivery. Use them to identify hazards and plan how risks will be managed.	Yes	No		Comment/Action
<b>2.1 Design and planning</b>				
<i>Which other PCBUs (employers and contractors) and workers will be involved or affected by this activity?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Has the design been signed off by an engineer?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Have arrangements been made to consult, cooperate and coordinate activities with other PCBUs (employers and contractors) before and during undertaking this activity?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>What is the duration the structure will be erected?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Are there any maintenance requirements for the operational period the structure is erected?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Are competent or licensed persons required to erect structure?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Is there any high risk plant required for erection?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Is there sufficient emergency egress?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Is there an emergency evacuation plan for the structure?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>What is the weight and/or audience capacity of the structure?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>What type of activity will be carried out on or around the structure?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Does the floor loading of the structure meet the intended use?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>What is the ground loading capability of the site where the structure will be erected?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>What weather conditions will the structure endure?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>What are the location and environmental conditions the structure will be erected in?</i>	<input type="checkbox"/>	<input type="checkbox"/>		



<b>The following questions must be considered during event design, planning and delivery. Use them to identify hazards and plan how risks will be managed.</b>	<b>Yes</b>	<b>No</b>		<b>Comment/Action</b>
<i>Does the structure require any fire suppression or fire retarding?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Will the structure prevent or obstruct fire systems?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Are exclusion zones required during the erection, operational or dismantle periods?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Are there any restrictions on access or capacity required during operational period?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Does the structure require any temporary lighting or fire systems?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Does the temporary lighting system need to be backed up by an emergency lighting system?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Are there any venue or local jurisdiction permissions, approvals or restrictions that apply to the erection of the structure?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Does the design of temporary structure require building certification or other approval?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Are any services such as water, electricity required to be installed?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Are there any moving or mechanical parts to the structure?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Will there be any potential overcrowding periods or peak audience volume?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Has the demographic of the audience been specifically considered in the design of the structure?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>What type of audience will be occupying the structure, i.e. ticketed, free, ambulant, moving or static?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Who is monitoring the structure and how?</i>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>What is the evacuation or emergency management plan and who has the power to enact it</i>	<input type="checkbox"/>	<input type="checkbox"/>		



## 3. General Guide – Temporary Structures

### 3.1 Responsibilities

Extract from Safe Work Australia – Safe Design of Structures Code of Practice

[https://www.safeworkaustralia.gov.au/system/files/documents/1702/safe\\_design\\_of\\_structures2.pdf](https://www.safeworkaustralia.gov.au/system/files/documents/1702/safe_design_of_structures2.pdf)

#### ***From Section 2.5 – Information Transfer***

Key information about identified hazards and action taken or required to control risks should be recorded and transferred from the design phase to those involved in later stages of the lifecycle. Communicating this information to other duty holders will make them aware of any residual risks and minimise the likelihood of safety features incorporated into the design being altered or removed by those engaged in subsequent work on or around the building or structure.

#### ***From Section 22***

Designers must give adequate information to each person who is provided with the design in order to give effect to it concerning:

- The purpose for which the structure was designed
- The results of any calculations, testing, analysis or examination
- Any conditions necessary to ensure that the structure is without risks when used for a purpose for which it was designed or when carrying out any activity related to the structure such as construction, maintenance and demolition.

The designer must also, so far as is reasonably practicable, provide this information to any person who carries out activities in relation to the structure if requested.

The safety report applies to designs of structures that have unusual or atypical features which present hazards and risks during the construction phase that are unique to the particular design.

The safety report should include information about:

- Any hazardous materials or structural features and the designer's assessment of the risk of injury or illness to construction workers arising from those hazards
- The action the designer has taken to control those risks, for example changes to the design. The information requirements under the WHS Act may be incorporated into the safety report prepared under the WHS Regulations.

**The client must provide a copy of the safety report to the principal contractor.**



### **Work health and safety file**

The development of a work health and safety (WHS) file for a structure could assist the designer meet the duty to provide information to others. It could include copies of all relevant health and safety information the designer prepared and used in the design process, such as the safety report, risk register, safety data sheets, manuals and procedures for safe maintenance, dismantling or eventual demolition.

#### **3.1.1 Training and competence**

PCBUs and contractors must assess the risks and ensure all staff have the required skills and training to minimise the risks and meet legislative requirements. All staff competencies such as experience, training and licenses should be recorded in the files or information shared with interested parties,

Additional training and induction to site-specific and job-specific safe work methods may be required.

Licenses are required for activities deemed as high risk work – see relevant WHS legislation for details and ensure that all staff undertaking tasks requiring licenses, are indeed holding the appropriate training documentation.

Additional regulations may be imposed by the local authorities and/or the event insurer, such as being required to use a registered builder of temporary structures. The City of Sydney and the City of Melbourne requirements at the following web site are a good example of what *may* be required

<http://www.cityofsydney.nsw.gov.au/development/building-and-construction-approvals/temporary-structures>

<http://www.melbourne.vic.gov.au/building-and-development/planning-and-building-services/building-safety-amenity/pages/temporary-siting-approvals.aspx>

#### **3.2 Consultation, cooperation and coordination**

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 hazards and risks specific to temporary structures planned for your 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 through both the dismantling of the structure and any rehabilitation of the site.

Consider the other parties who will need to be involved in the consultation process in the early planning stages of the event and determine what information needs to be shared and discussed and who need to be consulted in the development of the risk assessment and SWMS.

During an event, PCBUs are required to consult, cooperate and coordinate with other PCBUs such as the venue or site management, production companies, 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, designers, workers, unions etc. Evidence of this consultation may be required in the event of an incident or investigation so records do need to be kept.

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

Areas to address during consultation may include items such as inductions, schedules, floor plans, set 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 may include toolbox talks, event briefings, site inspections, stakeholder meetings, post event reviews, working groups or forums.

Scheduling safety as both the first and last items on a meeting agenda ensures the best coverage of issues. Items from previous discussions are covered first and any new items raised at the meeting are then discussed at the end.

### 3.3 Design and planning

Early stages of planning should address the following issues:

- Consultation with relevant PCBUs and workers
- The site where the proposed temporary structures will be erected
- The specific requirements for the temporary structure/s
- Selection of the plant and equipment required to complete the task
- Appropriate scheduling and allocation of resources to minimise impact on others, including the public and other users of the site



- Risk assessments and SWMS including controls agreed to during consultation
- Access to site and logistics for the erection of structure/s
- Maintenance programs during the erected life of the structure/s
- Emergency procedures

There are 2 stages to the design and installation of a temporary structure, both of which require specific sign offs.

At the **design stage**, all the aspects of the design need to be brought together and all the parties need to be in agreement as to both the engineering and operational aspects of the design. The risk assessments on the use of the design as well as the engineering aspects of the materials used and the actual physical design will need to be signed off as suitable by all parties ensuring no surprises at the time of installation and use.

**Installation** of the structure will need certification each time the structure is erected. This might be a one-off event but may also require certifications for each town on a tour (i.e. circus set ups) from relevant engineers and/or local authorities.

### 3.3.3 Engineering

The structural adequacy of every temporary structure needs to be considered. This could be assessing the manufacturer's specifications or engaging an engineer to assess the structural adequacy of a custom temporary structure.

Designers of structures are often not engineers, but designers, contractors and PCBUs should determine during the design phase when an engineer and/or appropriate expert should be engaged.

Engineering certification for temporary structures will define the duration the structure will be erected for. Engineering for a 1 week structure in summer will certainly be different for a structure designed for 12 months of use through all 4 seasons.

Adverse weather, especially wind, plays a large part in the design capability and structural adequacy of a temporary structure. A full range of procedures and policies will need to be in place to cope with the structure's ability to cope with various weather conditions. These need to be in place should a freak weather event threaten the structure with conditions that exceed the designed parameters.

Any temporary structure that covers more than 50m<sup>2</sup> ground area and any stage, tent or marquee that has an unsupported span greater than 8m should be regarded as a large structure and it is best practice to have this structure's design engineered. Structures that are hired or have already been built previously should have an engineering certificate available when it is



supplied and any new design should be engineered from concept through design to construction. It is best practice to have the design and completed temporary structure engineered where:

- There is legislation requiring design certification
- The structure is likely to be used for other than for its intended purpose
- The structure will be supporting the weight of person including members of the public
- The structure will be erected in an environment that could affect the structural adequacy such as a wind tunnel, potentially soggy ground etc.

### 3.4 Event delivery

In the delivery stages of an event (bump-in, rehearsal, show, bump-out) the following criteria should be addressed when erecting, occupying or dismantling temporary structures:

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

### 3.5 Review

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

- Incident reports and outcomes
- Effectiveness of the control measures
- Scheduling
- Areas for improvement
- Incidents of non-compliance
- Any new hazards or risks identified
- Cost benefit risk analysis – what could have been done more efficiently/efficiently?



### 3.6 Documentation and records

The following documents and records should be created, maintained and kept on site when utilising temporary structures during an event:

- Permits granted by local authorities
- Structure design specifications, build diagrams and plans
- Engineering certification, work permits and sign off records
- Risk assessments and SWMS
- Training records, certificates of competency and licences
- Induction records
- Toolbox talk topics and attendance
- Evidence of consultation
- Incident reports

Any of the above documents could be requested to be sighted by another PCBU for verification or clarification and should be available at all times. Site safety folders are recommended with originals in a secondary location.

Some WHS documents and records need to be retained for a specific period of time – see relevant WHS legislation for details.

## 4. Suggested Control Measures

### 4.1 Sets and scenery

Stage sets and scenery elements can be large props, freestanding flats, flown scenic cloths and solid scenery items, drapes and items such as automated staging. The effect of installation, operation and dismantling of these elements must be assessed as part of the structural analysis of the temporary structure.

Where adverse weather or other environmental elements potentially require the full or partial dismantling of the structure, the effect of additional scenic elements on the dismantling must be considered. While the overall structure may have been assessed at the design stage, the internal structure must also be included in the risk assessment. This is especially relevant where the internal structure is designed/operated by a secondary PCBU or contractor from the external structure supplier; both must work together to ensure all risks are eliminated or reduced to a practicable minimum.

### 4.2 Temporary stages/ mobile stage/ temporary seating and spectator stands

A temporary stage can be as simple as indoor rostra for speeches, a platform for a display or performance, an outdoor stage. As a general rule any stage or platform designed for general,



unspecified use should have a 7.5kPa capacity (approximately 750kg/m<sup>2</sup>). This is generally used for rental and venue owned multi-purpose units where the actual usage is not specified from project to project. This figure is used by the majority of the European manufacturers of temporary/portable stage units where specific standards exist for these items. A temporary stage designed and built for a specific purpose will be subject to a design risk assessment to ensure it is adequate for the event and truly 'fit for purpose'.

A mobile stage is a stage that is attached to or is moved by a vehicle or truck. Often the stage is detached from the vehicle once in place. Mobile stages can also be a 'float' or form part of a street parade. A mobile stage will often have a fixed roof, which is erected once the stage is in place. A mobile stage should be erected following manufacturers design specification and signed off by a competent person **each** time it is erected.

Temporary seating needs to comply with National Construction Code/BCA regulations for Open Spectator stands (grandstands), which requires a minimum carrying capacity. Temporary seating is often erected on uneven and unstable ground that is subject to movement during the installation of the seating. A competent person should assess the ground loading capability and the whole structure needs to be engineered around what support is available. This may require a geo-tech assessment as to the suitability of the terrain.

#### 4.3 Ground support structures/scaffolding – a high risk work license activity

According to Safe Work Australia:

*'The model Work Health and Safety (WHS) Regulations list the work that requires a high risk work licence. High risk work includes scaffolding, dogging and rigging work. It also involves using cranes, forklifts, reach stackers, boilers and boom-type elevating work platforms. In most instances if you carry out high risk work you will need a licence to undertake that type of work.'*

This covers what we normally refer to as ground support structures, which ranges from items such as spectator stands, stage platforms, LED screen and speaker and lighting supports through to grand stages with associated roof and internal theatrical rigging.

All the many variations and additions to a design need to be carefully considered as they will affect the manufacturer's design specification. If these elements were not allowed for in the initial design, new engineering calculations will need to be made.

Scaffolding built in accordance with AS/NZS 1576 does not necessarily need to be engineered if signed off by the scaffolding company, however scaffolding used for events is widely used for many purposes outside of manufacturer's design specification and these modifications, no matter how small, should be engineered.



Outdoor staging and temporary structures are often built using a combination of different manufacturers propriety products, the custom nature of the structure needs to be assessed.

As a general rule any ground support structure or scaffolding where the risk of fall is over 4m in height and/or covers a floor area of more than 50m<sup>2</sup> should be engineered. It is also important to note that the Code of Practice for Managing the Risk of Falls at the Workplace states that: *'the scaffold and its supporting structure is inspected by a competent person before use, after any incident that could affect its stability (such as a severe storm), after any repairs, and at least every 30 days'*

#### 4.4 Exhibition stands/concession stands/'popups'/smaller structures

In most cases the venue will have specific restrictions to height and size of exhibition stands. This is nominally due the fact that these temporary structures are sold on a per square metre basis and are therefore strongly regulated.

The PCBU, contractors and floor setup staff must ensure the layout of exhibition stands remains consistent with the planned layout and that access and egress are maintained at all times, especially at setup and take down time were the venue can be very busy.

Special consideration needs to be taken when planning a stand that has any type of overhead cover as it will catch heat from below and block fire services from above. Access and egress to a stand and positioning of emergency equipment needs to be considered at the planning stage to ensure compliance with local regulations.

#### 4.5 Marquees/inflatables

Generally marquees or tents over 100m<sup>2</sup> and seating stands for more than 20 persons are recognised as temporary structures and may require building certification for each erection. Local legislation must be investigated and complied with.

All inflatables require engineering certification that specifies ballast requirements, weather monitoring, evacuation requirements and 'firestop' certification.

**NOTE – Inflatable jumping castles, rides or similar amusement structures** are regulated under State Work Health and Safety Acts and are to comply with the Australian Standard AS 3533 *Amusement rides and devices Part Two – Operation and Maintenance*.

#### 4.6 Rigging at outdoor events

Rigging at outdoor events should only be undertaken by persons experienced in the planning, installation, monitoring and emergency management planning of such events. These events present different risks and challenges to indoor events and experience in outdoor rigging is required to adequately assess and address all the risks specific to the outdoor environment.



Contingency plans should be developed for weather considerations and rescheduling or cancellation as required. This may include rapid dismantling techniques, emergency evacuation plans, site lockout requirements and emergency services access.

The senior production manager and rigger on such an event must both have the authority and the resolve to halt works, evacuate structures and ensure design parameters are strictly adhered to. Communications between the senior rigger, the production manager and the safety team must ensure the above requirements are met and are able to be enacted.

#### 4.7 Fire safety

Temporary structures have a range of potential issues with fire that need to be addressed as part of the risk assessment. Construction of the structure, materials used for both construction and scenery, access to firefighting tools including permanently installed features such as sprinkler heads and fire hoses that are blocked by a structure, are all items that should be flagged and the risks eliminated. Other items such as egress, exit widths, distance to exits are all covered in the Construction code and need to be included from the early design stage.

## 5. Legislation and Further Guidance

Identification of safety good practice in the construction and deconstruction of temporary demountable structures

<http://www.hse.gov.uk/event-safety/tds-report.htm>

The Purple Guide to Health, Safety and Welfare at Music and Other Events has been drawn up by the Events Industry Forum in consultation with the UK events industry, including representatives from regional and national Government.

<http://www.thepurpleguide.co.uk/>

For more UK based information visit the following website:

<http://www.hse.gov.uk/event-safety/temporary-demountable-structures.htm>

AS/NZS 1170 Set: 2007 Structural design actions

National Construction Code incorporating Building Code of Australia

<http://www.abcb.gov.au/Resources/Publications/Education-Training/Temporary-Structures>

Vic H102.2 Temporary tiered seating, concourses and embankments

AS/NZS 1576:2010 Scaffolding

AS/NZS 4576-1995 Guidelines for scaffolding

Institution of Structural Engineers. Temporary demountable structures. Guidance on design, procurement and use (3rd edition). UK, 2007



Safe Work Australia Safe Design of Structures Code of Practice. July 2012

ANSI E1.21-2013

Entertainment Technology – Temporary Structures Used for Technical Production of Outdoor Entertainment Events – E1.21 establishes a minimum level of design and performance parameters for the design, manufacturing, use and maintenance of temporary ground supported structures used in the production of outdoor entertainment events. The purpose of this guidance is to ensure the structural reliability and safety of these structures and does not address fire safety and safe egress issues

<http://webstore.ansi.org/RecordDetail.aspx?sku=ANSI+E1.21-2013>