Australian Capital Territory

Work Health and Safety (Formwork Code of Practice) Approval 2024

Notifiable instrument NI 2024-56

made under the

***Work Health and Safety Act 2011*, section 274 (Approved Codes of Practice)**

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1 Name of instrument

This instrument is the *Work Health and Safety (Formwork Code of Practice) Approval 2024.*

2 Commencement

This instrument commences 90 days after the date of notification.

3 Code of Practice Approval

Under section 274 of the *Work Health and Safety Act 2011* (the Act) and being satisfied that this code of practice was developed in accordance with the process described in s274 (2) of the Act, I approve the attached Formwork Code of Practice.

4 Revocation

This instrument revokes *Work Health and Safety (Formwork) Code of Practice 2011* [NI 2011-770].

Mick Gentleman
Minister for Industrial Relations and Workplace Safety

5/2/2024

ACT Government

Formwork

Code of Practice

January 2024

Disclaimer

This code is based on a national model material developed by Safe Work Australia under the national harmonisation of work health and safety legislation and material developed by SafeWork NSW including the Formwork Code of Practice and WorkSafe QLD Formwork Code of Practice 2016, and has been approved under section 274 of the *Work Health and Safety Act 2011* (ACT), following the legislated consultation.

This code of practice commenced in the Australian Capital Territory on the date it was published on the ACT Legislation Register.

Safe Work Australia is an Australian Government statutory agency established in 2009. Safe Work Australia includes Members from the Commonwealth, and each state and territory, Members representing the interests of workers and Members representing the interests of employers.

Safe Work Australia works with the Commonwealth, state and territory governments to improve work health and safety and workers' compensation arrangements. Safe Work Australia is a national policy body, not a regulator of work health and safety. The Commonwealth, states and territories have responsibility for regulating and enforcing work health and safety laws in their jurisdiction.

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Copyright information

Foreword

This code of practice (Code) provides guidance to workers and businesses on how to manage the risks associated with formwork and is an approved Code under section 274 of the *Work Health and Safety Act 2011* (WHS Act).

An approved Code provides practical guidance on how to achieve the standards of work health and safety (WHS) required under the WHS Act and the *Work Health and Safety Regulation 2011* (WHS Regulation) and outlines effective ways to identify and manage risks.

A Code can assist anyone who has a duty of care in the circumstances described in the Code to achieve compliance with the health and safety duties in the WHS Act and WHS Regulation, in relation to the subject matter of the Code. Like regulations, Codes deal with particular issues and may not cover all hazards or risks in the workplace. The health and safety duties require duty holders to consider all risks associated with work, not only those for which regulations and Codes exist.

Codes are admissible in court proceedings under the WHS Act and WHS Regulation. Courts may regard a Code as evidence of what is known about a hazard, risk, risk assessment or risk control and may rely on the Code in determining what is reasonably practicable in the circumstances to which the Code relates. For further information see the Safe Work Australia (SWA) Interpretive Guideline: *The meaning of 'reasonably practicable'*.

Compliance with the WHS Act and WHS Regulation may be achieved by following another method if it provides an equivalent or higher standard of WHS than the Code.

An inspector may refer to an approved Code when issuing an improvement or prohibition notice.

In circumstances where equipment, or methods, for managing WHS risks are used in the workplace, it is recommended that current Australian standards or recognised international standards are applied, where available.

These include:

- AS 1337 *Eye protectors for Industrial Applications*
- AS/NZS 1338.2:1992 *Filters for protection against ultraviolet radiation*
- AS/NZS 1576 *Scaffolding*
- AS 1657 *Fixed Platforms, Walkways, Stairways and Ladders*
- AS 1891 *Industrial Safety Belts and Harnesses*
- AS 2626 *Industrial Safety Belts and Harnesses Selection, Use and Maintenance*
- AS 3610 *Formwork for Concrete*
- AS/NZS 4576 *Guidelines for Scaffolding*
- BS EN 1263-1:2002 *Safety nets. Safety Requirements, test methods*
- AS/NZ 3000 *Australian/New Zealand Standard for Wiring Rules*
- AS/NZ 2272: 2006 *Plywood - Marine*
- AS/NZS 2269.0:2012 *Plywood – Structural Specifications*
- AS/NZ3012 *Electrical installations—Construction and demolition sites*; and
- AS/NZ3760 *In-Service Safety Inspection and Testing of Electrical Equipment.*

Scope and application

This Code is intended to be used by a range of duty holders to assist them in complying with the WHS Act and WHS Regulation. Duty holders include persons conducting a business or undertaking (PCBUs), workers and their health and safety representatives (HSRs), manufacturers, importers and suppliers.

It is recommended to use this Code if you design, construct, erect, alter, maintain, use, dismantle, or remove formwork.

Formwork carries a range of risks beyond those covered in this Code. Other relevant Codes that apply in the ACT to help manage these risks include, but are not limited to:

- Managing the work environment and facilities
- Construction work
- Hazardous manual tasks
- Demolition work
- Excavation work
- Managing electrical risks in the workplace
- Safe design of structures
- Managing the Risk of Falls at Workplaces
- Managing the Risk of Falls in Housing Construction
- Managing noise and preventing hearing loss at work
- Managing the risks of plant in the workplace
- Managing the risks of airborne crystalline silica (silica dust);
- Managing the risks of psychosocial hazards; and
- Managing risks of hazardous chemicals.

How to use this code of practice

This Code includes references to legal requirements under the model WHS Act and WHS Regulation. These are included for convenience only and should not be relied upon in place of the full text of the WHS Act or WHS Regulation. The words ‘must’, ‘requires’ or ‘mandatory’ indicate a legal requirement exists that must be complied with.

The word ‘should’ is used in this Code to indicate a recommended course of action, while ‘may’ is used to indicate an optional course of action.

1. Introduction

This Code defines what formwork is, the types of formwork and what is involved in managing the associated risks. This Code outlines who has duties under the WHS laws in the Territory and explains the hierarchy of controls and how to apply it in managing risks arising from or in connection to formwork and related activities.

1.1 What is Formwork?

'Formwork' means the surface of the form and framing used to contain and shape wet concrete until it is self-supporting. It is a temporary structure that supports part or the whole of a permanent structure until it is self-supporting.

Formwork includes the forms on or within which concrete is poured, and the frames and bracing which provide stability during the assembly, pour and curing stages. Although commonly referred to as part of the formwork assembly, the joists, bearers, bracing, foundations, frames and footings are technically referred to as falsework.

Falsework means the temporary structure used to support a permanent structure, material, plant, equipment and people until the construction of the permanent structure has advanced to the stage where it is self-supporting.

Formwork construction may involve high risk activities like operating powered mobile plant like cranes, working at height and excavating foundations.

Section 3 of this Code provides more information about different types of formwork including:

- traditional or conventional formwork systems
- slip, jump and travelling forms
- modular formwork systems; and
- falsework.

1.2 Who has health and safety duties in relation to formwork?

Duty holders who have a role in managing the risks of formwork include:

- PCBUs
- officers and principal contractors
- designers, manufacturers, importers, suppliers of plant, substances, and structures
- workers; and
- other persons in the workplace, such as visitors.

A person can have more than one duty and more than one person can have the same duty at the same time. Each PCBU in the supply or contractual chain must ensure, so far as is reasonably practicable, the health and safety of all workers that they engage, cause to engage, influence or direct; and must consult all workers that carry out work for them on health and safety issues.

CONTRACTUAL CHAIN

SWA provides additional information for PCBUs who are working as part of a contractual chain – WHS duties in a contractual chain: Factsheet. This information may assist duty holders understand how individual contractors, including principal contractors, formwork contractors, and self-employed persons may have the same duty at the same time, or may be both a PCBU and a worker.

Contracting is when a business engages another business to carry out work under a contract agreement. A contractual chain refers to the situation where, in relation to the same project or work matter, there are multiple contractors and subcontractors. There can be several levels in a contractual chain. For example, in commissioning a project a person may engage a head contractor (for example a principle contractor for construction projects, or a contractor with overarching responsibilities and management of the work) to deliver a construction project. The head contractor may engage contractors to undertake parts of the project, and these contractors may engage subcontractors to carry out activities that the contractor is to deliver.

Note: the WHS Act defines a major construction project as a project involving construction work with a contract price that is more than $5,000,000.

Where multiple contractors are on site over a period of time, working together on a project, they will each have duties under the WHS Act to the extent of their control. Their duties are not limited because someone else has the same or overlapping duties. Each person with a duty must ensure that they have complied with the law and should consult with other duty holders to ensure that action is being taken.

An example of contractual chain is shown below:

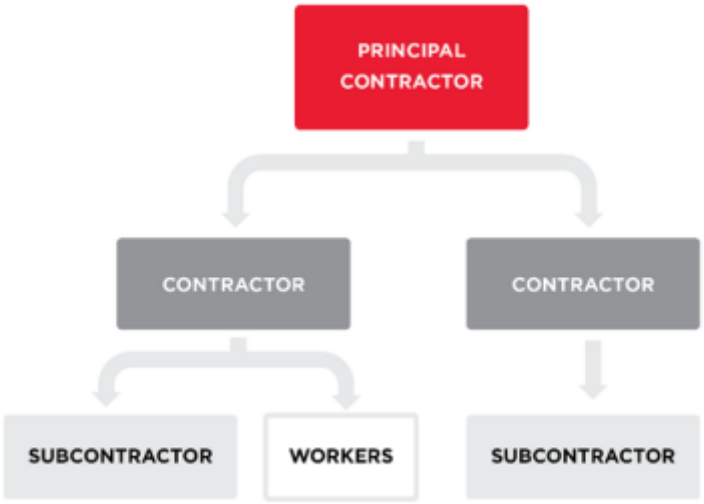


Figure 1 (above) – shows the relationship between the principal contractor, contractors, and subcontractors. It is good practice to understand your part in a contractual chain, as it will help you understand who you may owe WHS duties to and who may owe you a duty of care and allow for necessary consultation about these duties.

PERSON CONDUCTING A BUSINESS OR UNDERTAKING

WHS Act section 19

Primary duty of care

A PCBU has a primary duty to ensure the health and safety of workers while they are at work in the business or undertaking and others who may be affected by the carrying out of work, such as visitors.

A PCBU must eliminate or minimise (so far as is reasonably practicable) health and safety risks in the workplace and ensure (so far as is reasonably practicable) the health and safety of all workers.

The WHS Regulation includes more specific requirements for PCBUs to manage the risks associated with structures, including formwork.

The primary duty of care requires PCBUs to ensure so far as is reasonably practicable the:

- provision and maintenance of a safe work environment
- provision and maintenance of safe systems of work
- provision of accessible and adequate facilities (for example access to washrooms, lockers, and dining areas)
- provision of any instruction, training, information, and supervision; and
- monitoring of workers health and conditions at the workplace.

PCBUs have a duty to consult workers about WHS and may also have duties to consult, cooperate and coordinate with other duty holders.

PCBUs are also required to work through the hierarchy of controls when managing risks associated with construction work and implement control measures from the highest level of protection through to the lowest.

Section 2.1 of this Code provides more information about the hierarchy of controls.

FURTHER DUTIES OF PERSONS CONDUCTING BUSINESSES OR UNDERTAKINGS

WHS Act, section 20

Duty of PCBU involving management or control of workplaces

The person with management or control of a workplace must ensure, so far as is reasonably practicable, that the workplace, the means of entering and exiting the workplace and anything arising from the workplace are without risks to the health and safety of any person.

For example, the person with management or control of the workplace must take reasonable steps to ensure that information on underground essential services or ground conditions is obtained before allowing excavation work or erection work commences.

ADDITIONAL DUTIES OF PRINCIPLE CONTRACTOR

WHS Act Part 4 Division 5.3

WHS Regulation Part 6.4

The WHS Act provides that a principal contractor is required for a construction project where the value of the construction work is $250 000 or more.

The principal contractor must ensure, so far as is reasonably practicable, that the health and safety of workers and others is not put at risk from work carried out by the PCBU.

The principal contractor has duties to ensure the construction work is planned and managed in a way that eliminates or minimises health and safety risks so far as is reasonably practicable.

The principal contractor for a construction project must prepare a written WHS management plan for the workplace before work on the project commences. This includes any arrangements in place for managing any WHS incidents that occur and any site-specific health and safety rules.

The principal contractor must also ensure, so far as is reasonably practicable, that each person who is to carry out construction work in connection with a project is, before commencing work, made aware of the WHS management plan.

A construction project has only one (1) principal contractor at any specific time.

DESIGNERS, MANUFACTURERS, IMPORTERS, INSTALLERS AND SUPPLIERS OF PLANT, SUBSTANCES AND STRUCTURES

WHS Act section 22

Duties of PCBUs that design plant, substances, or structures

WHS Regulation section 294

Person who commissions work must consult with designer

WHS Regulation section 295

Designer must give safety report to person who commissions design

WHS Regulation section 296

Person who commissions project must give information to principal contractor

Designers, manufacturers, importers, installers and suppliers of plant, substances and structures have duties related to ensuring, so far as is reasonably practicable, the plant or structure they design, manufacture, import or supply is without risks to health and safety.

To assist in meeting these duties, the WHS Regulation requires:

- manufacturers to consult with designers of plant
- importers to consult with designers and manufacturers of plant; and
- the person who commissions construction work to consult with the designer of the structure (this may involve considering site specific design drawing before starting the formwork job).

Section 2 of this Code provides more information about the roles and responsibilities of designers, installers and suppliers of plant and structures in relation to the design, planning, and management of formwork.

OFFICERS

WHS Act section 27

Duty of officers

Officers, for example company directors, have a duty to exercise due diligence to ensure the PCBU complies with the WHS Act and WHS Regulation. This includes taking reasonable steps to ensure that the business or undertaking has and uses appropriate resources and processes to eliminate or minimise risks from formwork.

WORKERS

WHS Act section 28

Duties of workers

As defined in the WHS Act, workers include employees, contractors and subcontractors and their employees, labour hire workers, outworkers, apprentices, trainees, work experience students and volunteers. Workers have a duty to take reasonable care for their own health and safety and they must take reasonable care that their acts or omissions do not adversely affect the health and safety of other persons. Workers must:

- comply with reasonable instructions including training, as far as they are reasonably able
- cooperate with reasonable health and safety policies that have been notified to workers, if they have been told about it beforehand; and
- if personal protective equipment (PPE) is provided by the business or undertaking, the worker must, so far as they are reasonably able, use or wear it in accordance with the information and instruction and training provided.

OTHER PERSONS AT THE WORKPLACE

WHS Act section 29

Duties of other persons at the workplace

Other persons at the workplace, like visitors, must take reasonable care for their own health and safety and must take care not to adversely affect other people's health and safety. They must comply, so far as they are reasonably able, with reasonable instructions given by the PCBU to allow that person to comply with the WHS Act.

1.3 Other relevant duties

CONSULTATION

WHS Act, section 47

Duty to consult workers

The PCBU must, so far as is reasonably practicable, consult with workers who carry out work for the business or undertaking who are, or are likely to be, directly affected by a matter relating to work health or safety.

WHS Act, section 48

Nature of consultation

If the workers are represented by a HSR, the consultation must involve that representative.

A PCBU must consult, so far as is reasonably practicable, with workers who carry out work for the business or undertaking and the HSR (if any), who are (or are likely to be) directly affected by WHS matter. This includes consulting about the PCBUs risk management process such as identifying risks and choosing appropriate controls.

Consultation involves sharing of information, giving workers reasonable opportunity to express views, and taking those views into account before making decisions on health and safety matters.

Consultation with workers and their HSRs is required at each step of the risk management process. By drawing on the experience, knowledge, and ideas of your workers you are more likely to identify all hazards and choose effective control measures.

You should encourage your workers to report any hazards and health and safety problems immediately so that risks can be managed before an incident occurs, and you must consult your workers when proposing any changes to the work that may affect their health and safety.

Where there is more than one PCBU involved in work being carried out at the same location, each duty holder should exchange information to find out who is doing what task and work together in a cooperative and coordinated way, so risks are eliminated or minimised so far as is reasonably practicable.

Further guidance on consultation is available in the *Work Health and Safety Consultation, Coordination and Cooperation Code of Practice*.

INFORMATION, TRAINING, INSTRUCTION AND SUPERVISION

WHS Act section 19

Primary duty of care

WHS Regulation section 39

Provision of information, training, and instruction

The WHS Act requires that a PCBU must ensure, so far as is reasonably practicable, the provision of any information, training, instruction, or supervision that is necessary to protect all persons from risks to their health and safety arising from work carried out as part of the conduct of the business or undertaking.

The PCBU must ensure that information, training, or instruction provided to a worker is suitable and adequate having regard to:

- the nature of the work carried out by the worker
- the nature of the risks associated with the work at the time of the information, training and instruction; and
- the control measures implemented.

The PCBU must also ensure, so far as is reasonably practicable, that the information, training, and instruction are provided in a way that is readily understandable for the person to whom it is provided.

Workers must be trained and have the appropriate skills to carry out a particular task safely. Training should be provided to workers by a competent person.

In addition to the PCBU's general duty to provide any supervision necessary to protect all persons from WHS risks, the WHS Regulation also imposes specific duties to provide supervision necessary to protect a worker from risks to health and safety in certain circumstances. Most control measures depend on workers and supervisors having the appropriate competencies to do the job safety. Training should be provided to maintain competencies and to ensure new workers are capable of working safely.

For formwork, information training and instruction must cover the nature of the work, associated risks, and control measures to be implemented. For formwork, this could include:

- formwork systems, tasks, activities, and components
- the way the manufacturer or designer of the formwork system intended the system to be erected, installed, used, moved, altered or dismantled
- specific training and information required to undertake specific tasks or activities
- control measures to minimise exposure to risks, correct use of controls, and how to maintain the controls
- safe working procedures, including use of mechanical aids and devices, where appropriate
- how to use and maintain equipment, including any specific conditions and prohibitions on the use of equipment – referring to operator's manuals
- any specific safety information, ie precautions for working under certain conditions
- PPE required including instruction in fitting, use, cleaning, maintenance, and storage; and
- details of previous incidents involving the same work process(es).

For example: site specific design drawings, plans, elevations, sections with clear dimensions of the layout, centre to centre spacing between the frames, centre to centre spacing between the joists, timber packing details if applicable, construction load rating, details of lading platforms for steels or other materials.

SAFE WORK METHOD STATEMENTS (SWMS)

WHS Regulation section 291

Meaning of high-risk construction work

WHS Regulation section 299

SWMS required for high-risk construction work

WHS Regulation section 300

Compliance with SWMS

WHS Regulation section 301

SWMS – copy to be given to principal contractor

WHS Regulation section 302

Review of SWMS

WHS Regulation section 303

SWMS must be kept

WHS Regulation section 312

High-risk construction work – SWMS

Who is responsible for preparing a SWMS?

A PCBU must prepare a SWMS, or ensure a SWMS has been prepared, before carrying out work that may involve activities defined as 'high-risk construction work' under the WHS Regulations. The construction of formwork or any work on the resulting structure may involve 'high-risk construction work'.

The person responsible for carrying out the activity, such as principal contractor in consultation with the formwork contractor, is often best placed to prepare the SWMS.

Workers and their HSRs must be consulted when preparing SWMS. If there are no workers engaged at the planning stage, consultation must occur with workers when the SWMS is first made available to workers – such as during workplace- specific training or a toolbox talk.

If more than one PCBU has the duty to ensure a SWMS is or has been prepared, they must consult and cooperate with each other to coordinate who will be responsible for preparing it.

There may be situations when different types of high-risk construction work occur at the same time at the same workplace. In this situation, one SWMS may be prepared to cover any high-risk construction work activities being carried out at the workplace.

Alternatively, a separate SWMS can be prepared for each type of high-risk construction work. If separate SWMS are prepared, consider how the different types of work activities may impact on each other and whether this may lead to inconsistencies between control measures.

If the work is being carried out is in connection with a construction project, the SWMS must consider the WHS management plan prepared by the principal contractor of the construction project.

A PCBU must provide the principal contractor with a copy of the SWMS before high-risk construction work starts. If not made available, the principal contractor would need to take reasonable steps to obtain a copy of the SWMS before construction work commences.

More information on multiple and shared duties can be found in the Code of Practice: Construction work.

What should a SWMS include?

The content of a SWMS should provide clear direction on the control measures to be implemented. There should be no statements that require a decision to be made by supervisors or workers. For example, the statement 'use appropriate PPE' does not detail the specific types of PPE that should be used. The control measures should be clearly specified.

The SWMS must be accessible and understandable to any individual who needs to use it. It is important that those who need to carry out work in accordance with the SWMS understand the detail of the SWMS and what they are required to do to implement and maintain risk controls. For example, it should consider the literacy needs and the cultural or linguistically diverse backgrounds of the workers.

A SWMS must include the following information:

- identify the high-risk construction work activities to be carried out on-site
- the hazards and risks to health and safety arising from these activities
- the measures to be implemented to control the risks; and
- how the control measures are to be implemented, monitored, and reviewed.

Information provided in this Code, including Section 2 and 5 about safe work design approaches and common hazards and controls should be considered in the development of a SWMS.

EMERGENCY PLAN

WHS Regulation section 43

Duty to prepare, maintain and implement emergency plan

WHS Regulation section 314

Further health and safety duties – specific regulations

A PCBU at a workplace must also ensure that an emergency plan is prepared for the workplace that provides for the following:

- emergency procedures, including—
  - an effective response to an emergency
  - evacuation procedures
  - notifying emergency service organisations at the earliest opportunity
  - medical treatment and assistance

    - effective communication between the person authorised by the PCBU to coordinate the emergency response and all persons at the workplace
- testing of the emergency procedures, including the frequency of testing; and
- information, training and instruction to relevant workers in relation to implementing the emergency procedures.

Workers must be provided with information and training on emergency procedures and the procedures must be tested.

Responses to an emergency should be coordinated. The formwork contractor should consult with the principal contractor responsible for the broader workplace emergency plan to ensure potential incidents relative to formwork (formwork collapse or falls from a height) are included in that plan.

Formwork emergency plans should outline how to safely remove an immobilised or unconscious person from the structure e.g. pre-designed points of entry and doorways through decks, screens, jump forms or slip forms.

EMERGENCY PROCEDURES FOR SLIP FORMS OR JUMP FORMS

Emergency procedures for a slip or jump form should be documented and tested and include training and instruction for workers.

Fire extinguishers, hoses and other means of fire prevention should be provided on a slip or jump form in accordance with advice from a competent person.

The emergency procedures should include, but not be limited to:

- the method for alerting workers in an emergency
- the method of extracting workers from each location or cell that people have entry to, or could fall into
- when to evacuate workers from the form
- evacuation muster points both on and off the form
- training for using fire extinguishers
- identifying workers responsible for ensuring evacuations take place
- rescue procedures for severe medical conditions
- managing the impact of and replacing damaged componentry/components
- notifying emergency services at the earliest opportunity
- establishing communication protocols between relevant workers
- testing and reviewing emergency procedures
- frequency of emergency drill testing; and
- providing information, training and instruction to workers who may be affected by a formwork emergency.

Procedures should identify how to enter lift voids and other areas including cells within the core which may have limited entry.

Emergency services contacts should be clearly identified and available on site.

Additional information about Emergency Plans is available through Safe Work Australia and the Code of Practice - Managing the Work Environment and Facilities.

2. How to manage and control the risks

Duty holders must manage risks associated with formwork; this Code provides guidance to support using a systematic process that:

- **identifies the hazard** – find out what risks and hazard exist in connection to work activities
- **assess the risks** – understand what harm could be caused by the risk, and assess the likelihood of it happening and the seriousness of the harm
- **control the risk** – implement the most effective control measures, as far as is reasonably practicable in the circumstances, in accordance with the hierarchy of controls; and
- ensure the controls remain effective by consulting about the controls and **reviewing** them regularly.

As outlined in Section 1 of this Code – Safe Work Method Statement – PCBUs must prepare SWMS for high-risk construction work. Work involving formwork is likely to be captured as high-risk construction work and must have a SWMS.

A SWMS will help identify the work activities to be carried out at a workplace and the hazards and risks arising from these activities.

2.1 Hierarchy of Controls

The WHS Regulations require duty holders to work through the hierarchy of control measures when managing certain risks; however, the hierarchy can be applied to any risk. The hierarchy ranks control measures from the highest level of protection and reliability to the lowest. Further guidance on the risk management process and the hierarchy of control measures is in the Code of Practice: How to manage WHS risks.

Level 1. Eliminate the hazard (for example, discontinue activity or not use the plant).

You must always aim to eliminate the risk. If eliminating the hazards and associated risk is not reasonably practicable, you must minimise the risk by one or more of the following:

Level 2. Minimise the risk, by:

- substituting the system of work or plant (with something safer)
- modifying the system of work or plant (to make it safer)
- isolating the hazard (e.g. introduce restricted work area); and
- introducing engineering controls (e.g. guarding, fencing, safety screens, or intermediate working decks).

Level 3. Other minimising controls:

- adopting administrative controls and safe work practices (e.g. specific training and work instructions); and
- using PPE (e.g. safety lines, eye protection, helmets).

The control measures at **Level 1** give the best result and should be adopted. The measures at the lower levels are less effective and they require more frequent reviews of hazards and systems of work. In most situations a combination of control measures may need to be used. However, the control measures recommended by the contractor doing the work should be considered by the principal contractor as part of any WHS Management Plan. Any new control measures should be evaluated to ensure that they are effective, safe and that new hazards are not created.

The hierarchy of control provides control measures from the highest level of protection to the lowest. Where reasonably practicable, a hazard must be eliminated, the most effective control. Where this is not possible, the risk must be minimised as far as reasonably practicable.

If risk remains, it must be minimised by implementing administrative controls, so far as is reasonably practicable.

Any remaining risk must be minimised with suitable PPE.

Administrative control measures and PPE do not control the hazard at the source. They rely on human behaviour and supervision and used on their own tend to be the least effective in minimising risks.

The hierarchy of control measures is listed in terms of levels. Select from the highest level possible. You need to consider all possible control measures and decide which is reasonably practicable for your workplace. A combination of controls may be appropriate to minimise risks.

2.2 Design and planning for formwork

People involved in the design and planning for formwork construction have a range of responsibilities under WHS laws, including preparing and communicating about safety reports, communicating with contractors and commissioners of construction work, and structural design implications.

Careful planning and preparation are the first essential steps in ensuring work is done in accordance with WHS legislative requirements. Planning and preparation should involve consultation with anyone engaged in the work and include identification of hazards using the risk assessment and control process.

When preparing to start work, the PCBU with control of the work being undertaken must manage the risks associated with the work. The PCBU should ensure, so far as reasonably practicable, that all identified control measures have been put in place and no new hazards exist.

Preparation should include, but not be limited to:

- assessment of climatic and/or environmental conditions including lighting
- safe access to and from the workplace
- access to PPE on site - safety helmets, eye protection etc
- consultation with workers about any specific instructions
- provision of formwork drawings certified by a competent person, such as a structural engineer
- ensuring equipment required for lifting materials is available and suitable
- having residual current devices (safety switches) to protect users of portable electric powered tools; and
- emergency and evacuation procedures in the event of an incident, injury or other emergencies.

STRUCTURE DESIGN - FORMWORK DESIGN

The design of the final concrete structure can have a major effect on the ease of formwork construction and the health and safety of people during construction. PCBUs who design a structure to be used or could reasonably be expected to be used at a workplace have specific WHS duties. PCBUs should consider implementing a 'hold point' or 'safety in design' approach for construction activities to ensure hazards and risks are identified and controlled – construction inspection hold points can be useful when work cannot be inspected at a later time, for example, a hold point before a concrete pour permits verification of steel reinforcing before it is covered with concrete.

Formwork structures should be designed before being erected. A designer must undertake, or arrange for, sufficient calculations, analysis, testing or examination of the design to determine that the formwork assembly can safely support the imposed loads and is fit for purpose. Formwork structures should be capable of supporting the loads specified in AS 3610 *Formwork for concrete series*.

An experienced formwork designer should be consulted during the design of in-situ concrete structures to enable the health and safety risks that can occur during the design during formwork construction and dismantling to be considered. Consultation between principal contractor, the formwork contractor and other contractors may be necessary as needed to inform anyone else with a duty to manage risk as identified.

The formwork designer must be competent in formwork design including documenting temporary work platforms and special equipment needed for safe formwork construction on-site. A designer may use a technical standard or a combination of standards and engineering principles relevant to the design requirements as long as the outcome is a design that meets regulatory requirements.

A person who designs a structure that is to be used or could reasonably be expected to be used, as or at, a workplace, including during construction, maintenance, renovation, or demolition of the structure. Designers can include draftspersons, building designers, architects, and engineers. A builder could be a designer if they design a structure themselves or are involved in altering the design for a building, even after construction work has commenced.

A designer must consider the work practices necessary for safe erection and stripping/dismantling of formwork. This should include, but is not limited to:

- the formwork system or combination of systems to be used e.g. brand/model

- specific components to be used e.g. prop size, bearer size, drop heads, special adapters
- configuration e.g. prop extension, maximum beam spans, minimum bracing
- positioning and layout of frames and props
- conditions to ensure stability during construction e.g. lateral restraint, ground conditions
- conditions to ensure stability during concrete pour e.g. pour sequence, flow rate
- conditions to ensure stability during stripping/dismantling e.g. minimum cure time, back propping including slab deflection
- using designs that do not require in-situ formwork e.g. concrete girders formed on site, or delivered and then lifted into position by crane
- development of a construction methodology and sequencing appropriate for the building design
- minimising working heights for persons erecting and stripping/dismantling formwork
- fall protection measures such as edge protection, penetration covers, false decks, catch decks and temporary work platforms
- guardrail systems (including toe boards), perimeter safety screens, scaffolding or other means that can be installed when working at heights
- work positioning systems or fall arrest systems, including safety lines
- providing advice and information (such as drawings and/or scope of work instructions) to the principal contractor and the formwork contractor on the use of multiple-level frames or high strutting where additional safety precautions may be required
- identifying appropriate control measures where sloping surfaces on formwork are slip hazards
- manual handling risks associated the design; and
- safe access and egress.

The formwork designer must be competent in formwork design including documenting temporary work platforms and special equipment needed for safe formwork construction on-site. A designer must undertake, or arrange for, sufficient calculations, analysis, testing or examination of the design to determine that the formwork assembly can safely support the imposed loads and is fit for purpose.

Formwork should be:

- rigid, braced and tied together to maintain position and shape during construction. Watertightness should also be considered including:
    - all joints are properly sealed and cramped
    - the maximum rate of placement permitted is documented
    - line, level, plumb, shape etc during concreting is maintained; and
- able to be removed easily and safely without damaging the formed concrete, or have components that remain as part of the finished structure so the rest can be removed without damaging the structure.

Formwork drawings should include details of:

- formwork and formwork joints
- sealing procedures
- ties
- size and spacing of framing
- temporary loading zones and limits prior to concrete pour
- details of proprietary fittings or systems proposed to be used; and
- bond breakers, if used.

The formwork designer should determine the vertical pour rates for walls, columns, and other vertical concrete elements before completing the formwork design.

Details of the construction method and erection sequence should be included on the formwork drawings where appropriate. Where special methods like external vibration are involved the formwork design should allow for any resulting additional structural loads.

Where formwork is to be re-used, the formwork design should ensure form strength is retained after allowing for the deterioration of materials through use, handling, and storage.

This means PCBUs need to think about design solutions for reasonably foreseeable hazards that may occur as the formwork is build, commissioned, used, maintained, repaired, refurbished or modified, decommissioned, demolished or dismantled and disposed of or recycled.

All formwork drawings should be certified as complying with applicable Australian Standards (including AS 3610.1-2018). Components from different formwork systems should not be mixed unless a competent person, for example an engineer, has authorised the component use. Variations to a design of a system should be checked and verified in writing by a designer, engineer, or other competent person.

Further information can be found in the Code of Practice: Safe Design of Structures.

2.3 Designer safety report

WHS Regulation section 295

Designer must give safety report to person who commissions design

WHS Regulation section 296

Person who commissions project must give information to principal contractor

WHS Regulation section 297

Management of risks to health and safety

A designer must provide a written report to the PCBU who commissioned the design, specifying, so far as the designer is reasonably aware, the hazards relating to the design of the structure that:

- create a health and safety risk to anyone who will carry out the construction work; and
- are associated only with the particular design and not with other designs of the same type of structure.

A designer safety report applies to designs that have unique, unusual, or atypical features which present hazards and risks during the construction phase.

A designer safety report should include information about:

- any hazards or structural features
- the designer's assessment of the risk of injury or illness to workers arising from those hazards; and
- the action the designer has taken to control those risks such as changes to the design.

The PCBU who commissioned the design must provide a copy of the designer safety report to the principal contractor.

WHAT HAZARDS MUST BE INCLUDED IN THE DESIGNER SAFETY REPORT?

Any hazards the designer is aware of and that will create a risk to the health or safety of construction workers who will carry out any construction work on the structure must be included in the design safety report.

The designer safety report will recommend ways to control the risks associated with the identified hazards. This may be done in consultation with duty holders carrying out the work, by evaluating the hazards through a risk assessment process. The report may include:

- a reference to specific Australian Standards for specific requirements
- advice to the contractor to prepare a SWMS for any high-risk construction work, including work that involves a risk of a person falling more than 2-metres
- nomination of a competent person, for example a structural engineer, from whom the principal contractor can seek advice
- recommendations on the use of appropriate edge protection and fall protection, particularly where a person can fall from one level to another level, which is reasonably likely to cause injury; and
- nomination of the party responsible for implementing risk control measures identified in the report. This may include the designer, principal contractor, structural engineer, or contractor.

2.4 Commissioning construction work

The WHS Regulation requires a PCBU who commissions construction work to:

- consult with the designer/s of the whole or any part of the structure so far as is reasonably practicable, about how to eliminate health and safety risks arising from the design during construction. If it is not reasonably practicable to eliminate the risks, they should be minimised so far as reasonably practicable. Consultation must include giving the designer any information regarding known hazards and risks at the work site
- take all reasonable steps to have a copy of the designer's safety report if the PCBU did not themselves commission the design of the structure; and
- give the principal contractor any information they have in relation to hazards and risks at or in the vicinity of the project worksite.

In all circumstances, the person who commissions the work will remain the duty holder for the above duties.

People who might commission construction work include:

- a builder engaging a designer to design a large spanning roof truss system for a project
- property developers
- clients
- owner builders; or
- a subcontractor engaging an engineer to design precast and tilt-up panels for a project.

2.5 Planning by principal contractor

As a PCBU, principal contractors have a duty under Section 21 of the WHS Act to ensure work safety by managing risk to the extent of their control on site.

The principal contractor is the PCBU who: commissions the construction project (the client) or is engaged by the client to be the principal contractor and is authorised to have management or control of the workplace.

The principal contractor has duties to ensure the construction work is planned and managed in a way that eliminates or minimises health and safety risks so far as is reasonably practicable.

This duty includes, but is not limited to:

- providing and maintaining a safe workplace and safe systems of work
- use the information from the designer's safety report to identify any hazards specifically affecting formwork
- assess the risks involved in carrying out the work
- identify the most appropriate methods to control any risks including safeguards such as guardrail systems (including toe boards), perimeter safety screens and barriers and fall arrest or work positioning systems
- providing and maintaining plant that is safe and without risk to the safety of workers and other people at the business or undertaking
- ensuring that plant is operated only by workers and other people at the business or undertaking who are qualified to do so
- provide suitable and safe access to and from the construction site, including each place of work within the site
- ensure that all workers have received appropriate training, information and instruction
- ensure the location of formwork can adequately support the weight of the formwork and concrete and any additional live loads such as pumps, workers, mixers, pouring of concrete etc
- ensure that exclusion zones are implemented to prevent unauthorised persons from entering the work area i.e. physical barriers and hazard warning signs clearly displayed around formwork activities; and
- consulting workers on matters that directly affect their work safety.

To fulfil their obligations principal contractors must plan for work to be done safely. When planning the site layout and sequence of work, the principal contractor should prepare and document a WHS management plan. This plan should be based on consultation with contractors, including formwork contractors, and workers (or their representatives) and include documented SWMS.

Before formwork operations start, the principal contractor (in consultation with the formwork contractor carrying out work) should:

- undertake an assessment of the risks involved in carrying out the work
- identify the most appropriate methods to control any risk of injury. These include safeguards such as guardrail systems (including toeboards), perimeter safety screens, barriers and fall arrest systems
- provide safe access to and from the site and safe movement on site
- ensure that all workers have received appropriate training and instruction
- ensure electrical safety, including systems of work for the safe use of equipment

- ensure that the base on which formwork will be placed is adequate to support the weight of the formwork, concrete and any additional loads such as pumps, workers, mixers, placing concrete and so on
- ensure unauthorised persons are prevented from entering the work area (including physical barriers and signs clearly displayed to warn people)
- ensure the formwork complies with AS 3610 *Formwork for Concrete*
- develop a construction method appropriate to the structure's design
- minimise the number of columns and cantilevered floor sections
- reduce variations in floor depth and steps in formwork soffits
- allow sufficient clearance from adjacent structures and powerlines
- apply safe methods to moving large and heavy components, materials and equipment e.g. making allowances for cranes and other mechanical lifting devices; and
- provide the formwork contractor/formwork designer with all relevant information that may impact the formwork design e.g. if the concrete design mix and the concrete plasticiser admixtures are to be used, then this should be included in a designer's safety report.

PLANNING BY FORMWORK CONTRACTORS

Any contractor also carrying out work has duties under the WHS Act, including those of a PCBU, to ensure so far as is reasonably practicable that the health and safety of workers and other persons is not put at risk from work carried out by the business or undertaking.

As well as consulting with the principal contractor in the overall job planning, any contractor erecting, altering, and stripping/dismantling formwork should carry out at least the following:

- assess the risk in carrying out the work, including risks arising from manual handling tasks and the use of plant
- identify how to prevent the risk of injury including falling objects, falls, slips and trips
- provide a documented SWMS, describing the safe sequence of work tasks and activities and how the high-risk construction work will be done safely
- consider the level of a worker's experience when allocating tasks
- minimise the working heights for persons erecting and stripping/dismantling formwork
- secure single props to prevent accidental dislodgement, so far as reasonably practicable
- have a competent person assess the mixing of formwork components from different manufacturers
- ensure all proprietary formwork components and materials such as joists, bearers, plywood, support frames, jacks and U-heads are used in accordance with manufacturer's specifications
- ensure formwork is inspected and certified in writing for compliance in accordance with AS 3610 series prior to a pour
- strip/dismantle formwork in accordance with certified formwork and structural engineer's guidance or with guidance from AS 3610 series
- strip/dismantle formwork in a safe manner. This should generally be a reverse of the erection procedure and follow the SWMS and any site-specific instructions. Drop stripping is an unsafe practice and must not be carried out
- secure partially erected or dismantled formwork against overturning e.g. during high winds
- provide suitable and safe access to and from the formwork deck, including planning the position of frames to ensure safe access between frames and propping

- ensure workers are provided with appropriate training and instruction, including the SWMS; and
- regularly inspect and maintain formwork components, including for evidence of damage and the need to remove/replace damaged and/or worn components.

3. Types of formwork

This section looks at the different formwork systems and how they impact the safety of workers on site. The safety of workers erecting, altering, and stripping/dismantling formwork should be considered when choosing a formwork system for a job, in particular, consider stability, strength and the risk of falls and falling objects. Proprietary systems may have integrated safety features to help control the risks. In choosing a formwork system for a particular job, you should take into account the safety implications for workers erecting, using and dismantling the system. In thinking about safety factors, pay particular attention to three key issues: stability, strength and how you will control the risk of falls (both falling people and falling objects).

3.1 Traditional (Conventional) Formwork

Traditional formwork systems are typically constructed on-site from timber or plywood and supporting falsework elements such as frames, props, and bracing.

Conventional formwork systems should be constructed in accordance with pre-determined standard designs (bearer spacing, plywood spans, frame spacing, adjustable bases and post head types and extensions, suitable footings, and foundations etc.)

When using a traditional system, you should use standard formwork frames that have a known tested loading capacity wherever possible and ensure that they are spaced at no more than the recommended distances apart. Wherever practical, it is preferable to use a proprietary formwork system as this usually results in improved safety for workers erecting and dismantling the formwork and handling and storing materials.

Both modular and traditional formwork systems should be designed to comply with the loadings and general principles in *AS 3610: Formwork for Concrete*. Where a modular system is used in combination with a traditional system formwork, drawings should be certified as complying with applicable Australian Standards. Similarly, components from another system should not be used as an integral part of the modular framework system unless the designer of the modular system states that this is permitted by performing the necessary testing, calculations, and analysis.

Throughout this Code, the word ‘deck’ is used to refer to both traditional plywood formwork and the equivalent working platform for people where a modular or composite deck system is being used.

3.2 Modular Formwork

Modular formwork systems are specially designed and manufactured off-site. Modular systems usually have proprietary formwork components and rated load calculations set out by the manufacturer and are often made from hardboard, plastics, steel, aluminium products, or suitable composite materials. Most formwork systems use two or more materials, for example plywood facing to steel frames for wall panels.

Modular formwork systems should be constructed in accordance with manufacturer’s recommendations and pre-determined standard designs. **Note**: PCBUs should ensure that site specific developed designs are certified by the competent designer.

Modular systems are often lighter weight and require less physical effort than traditional systems. This may help PCBUs minimise the risk of injury resulting from manual tasks. However, because of their lighter weight, modular systems may be more susceptible to falling over when erecting the system due to factors like wind loading. As such, PCBUs should consider and implement the most effective controls for any additional risks posed by using modular systems, such as ensuring the modular formwork system is progressively braced in accordance with the suppliers' instructions during its erection.

3.3 Slip, jump and travelling forms

Slip forms and jump forms are self-climbing formwork systems designed to construct lift and stair cores in high-rise buildings and other concrete structures like silos, stacks, and chimneys.

The term 'climb form' is sometimes used to describe both slip or jump forms. The power for the climbing operation can be provided in a variety of ways, usually by hydraulic rams or electric motors connected to climbing feet or screw feet or screw shafts.

Slip forms and jump forms usually consist of a number of platforms or decks for workers and may also be fitted with trailing screens suspended from the form.

No two slip or jump forms will be identical because their design depends on the size and configuration of the permanent structure to be formed.

Slip forms usually climb slowly and continuously during the concrete pour. This allows high smooth concrete structures like chimneys to be constructed without obvious joints.

Travelling formwork moves horizontally allowing the repeated construction of structural elements, for example in-situ concrete bridge spans. The formwork is generally supported by the permanent structure as it is progressively completed so has the advantage that no falsework is required over the length of the bridge. Travelling forms are useful where there is limited capacity to construct supporting falsework for example over rivers and operating roads or railways.

The design of slip, jump and travelling forms can be more complex than that of traditional formwork systems. The work systems and layout of some crane-lifted forms may also be similar to those associated with slip and jump forms that can require the coordination and cooperation of numerous trades. This may be the case for crane-lifted forms provided for the inside of lift shafts or stairwells.

A designer must minimise the risks, so far as is reasonably practicable, with respect to access and egress as part of the design.

The jump form or slip form designer should be involved both in the initial form design and in addressing ongoing design issues during form erection and through the life of the building project. The designer should inspect the form at the workplace and consult with workers and the principal contractor to manage and rectify any issues on site.

The designer should consider:

- minimum concrete strength to be reached (and the minimum cure time) before climbing
- allowances for live loads
- allowances for the effect of eccentric loading at all times
- the maximum degree to which the form can be out of level during climbing, how to minimise this and remedy the situation if the form does get out of level

- rescue procedure requirements that may affect the design of the form e.g. entry to all levels of the form and cells, either through gates or removal of panels; and
- providing an operating manual that includes any procedures or limitations required for safe use and an alternate egress.

Figure 2 - slip form

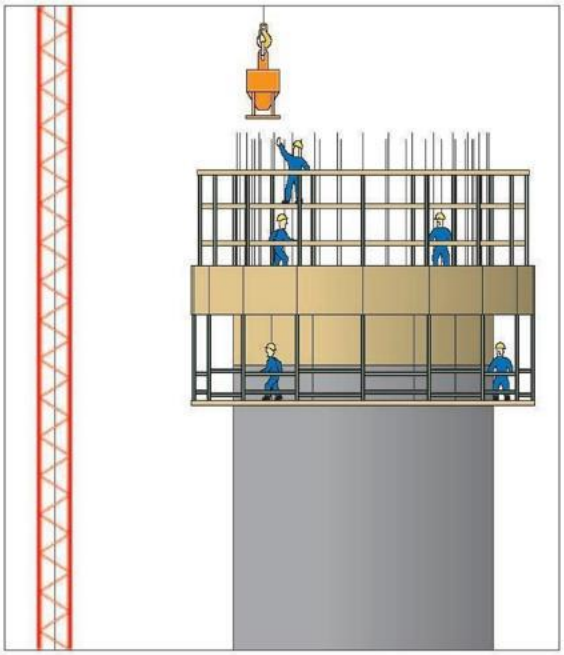
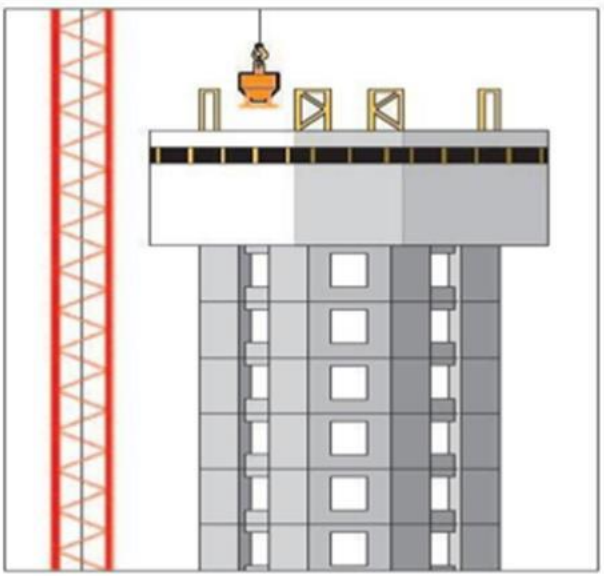
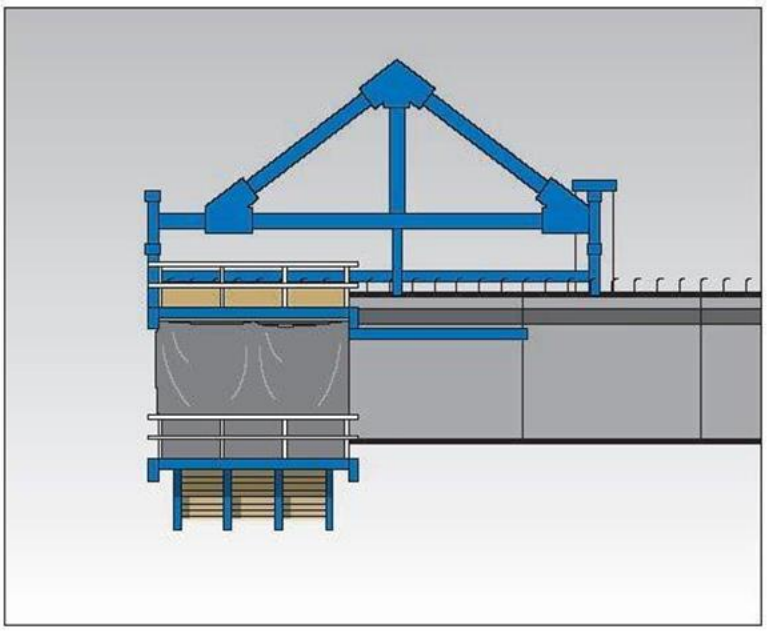


Figure 3 – jump form



More information about safe design and work operation of slip, jump and travelling forms can be found in the SWA Guide to slip, jump and travelling formwork systems.

Figure 4 – travelling forms



3.4 Loading

Formwork should not be subjected to a load until it is confirmed as meeting the design specification, for example by completing a pre-pour inspection before placing concrete. Loads should not exceed the design loading specified by the designer. Formwork should be designed for the most adverse combination of dead and live loads that can be reasonably be expected during construction, use and stripping/dismantling.

Dead and live loads should be calculated during design to ensure any supporting structure is capable of supporting the loads that will be applied. Loads should then be assessed during formwork erection, use, alteration, and stripping/dismantling so that load limits are not exceeded.

Dead loads relate to the self-weight of the structure and components including working, catch or access platforms, stairways, ladders, screens, sheeting, tie assemblies, scaffolding hoists, or electrical cables.

Live loads include:

- the weight of people, materials, debris, plant, tools, and equipment
- environment loads eg wind, rain; and
- impact forces.

To maintain stability of the forms the placement of concrete should not exceed the maximum calculated pour rate and the inboard part of formwork should be placed before proceeding to any cantilever section.

Hoisting, pumping and other equipment should not be attached to the formwork unless specifically allowed for in the formwork design.

Formwork should be monitored as it is loaded to check for indications of potential failure or collapse and that vertical and horizontal movements do not exceed specifications.

4. Erecting, altering, stripping/dismantling formwork

Foundations and footings should be designed and constructed to carry and distribute the full weight of the formwork including dead and live loads. Ground conditions and weather patterns, particularly wind and rain, should be considered when designing and preparing the foundation.

Formwork frames should be erected progressively to ensure the installers' safety and the stability of the overall structure. Conventional and modular formwork should be systematically erected and dismantled by a competent person in accordance with the designer's or manufacturer's instructions.

Braces should be attached to the frames as soon as practicable and designated access ways should be indicated by using bunting or by other means.

If side bracing or other edge protection is installed progressively on formwork frames other control measures to prevent a fall occurring may not be required.

Many conventional formwork frames consist of diagonal braces that cross in the middle. While these braces are not considered to be suitable edge protection for a completed formwork deck, they may provide reasonable fall protection during frame erection. This is only the case where braces are installed in a progressive manner as soon as the frames are installed.

As the height of formwork frames increase there is a greater need to provide lateral stability to the frames. Ensure framing, including bracing, is carried out in accordance with on-site design documentation and manufacturers' instructions. People erecting formwork must be trained to erect formwork using safe methods.

The risk of internal falls while erecting frames can be controlled by fully decking each lift of the formwork decks and false decks. This involves:

- positioning a full deck of scaffolding planks or other suitable decking at each lift
- positioning decking on the next lift while standing on a fully decked platform; and
- leaving each lift fully decked in place until it is dismantled.

During dismantling of a lift, decking should be removed while standing on a fully decked platform immediately below.

4.1 Wall and column forms

Wall and column forms should be designed to withstand wind loading before, during and after the concrete pour. The bracing and forms should not be removed from the cast element until it can safely withstand potential impact loads and wind loads.

Lateral support can be provided to vertical elements in a variety of ways including horizontal and angled braces and structural connections to other parts of the building. A bracing element design should be completed by a competent person.

The bracing element should also be able to resist both tensile and compressive loads that may be applied by the wind. Anchors for braces should preferably be cast-in type anchors or 'through-bolts' extending through both sides of the anchoring medium. Drill-in anchors of the following type may be used provided they are installed in accordance with the manufacturer's instructions:

- undercut type anchors that do not rely on friction to function
- expansion anchors of the high-load slip, torque-controlled type. These anchors have a working load of at least 60 percent of the first slip load and are generally suitable for structural tensile loads; and
- coil bolts—the correct operation of coil bolts is greatly dependant on them being installed in accordance with the manufacturer's specifications, for example drilling the correct size hole and applying the correct torque in concrete.

Drill-in anchors should be installed in accordance with the manufacturer's instructions. They should have their torque set using a torque wrench or other reliable method to verify the torque, for example a calibrated 'rattle gun'. Written records verifying the setting torque for drill-in type anchors should be available at the workplace.

4.2 Access platforms

Suitable access should be provided for wall and column forms and may include:

- mobile scaffolding
- purpose built access platforms; or
- elevating work platforms.

Edge protection should be provided on the access platforms. Preferred methods of entry to platforms include stair access systems or if this is not practicable secured industrial ladders.

The entry method should allow room for a person and be positioned at a height and distance from the form to minimise a person's effort and movement. The concrete pouring system should permit enough space for a person to stand with edge protection provided. Where stair access passes a formwork deck, joist or bearers should not protrude over the stairs.

Platforms should also be designed to resist loading that may be applied during a concrete pour to ensure the platform does not collapse or overturn. They may need to be tied in or counter weighted, particularly aluminium scaffolding which may not have the self-weight to prevent overturning.

Mobile work platforms should have their castors locked, except when relocating the mobile platform.

4.3 Trailing access system

The designer should ensure a trailing access system can support the loads that will be applied to it including wind conditions and an emergency evacuation situation. Both the system itself and the form should be able to withstand applied loads from the access system.

4.4 Lifting methods

Wall and column forms should be provided with designed lifting points - design drawings should confirm. Cutting holes in the form in-situ is not recommended as this can damage the form, be inadequate lifting points and make it difficult to safely attach lifting gear.

Wall and column forms should only be lifted with a positive lifting system, for example lifting lugs or by slinging the lifting slings around the form so the form cannot slip out of the slings. Purpose designed lifting lugs should be used instead of slinging the load because there is less risk of the load becoming inadvertently disconnected from the crane hook.

Where lifting lugs are attached to the form they should be attached in accordance with the design.

4.5 Installing bearers

Bearers are the primary horizontal support members for a formwork deck that are placed on top of formwork frames. They are usually timber but are sometimes metal. They should be placed in position by people located on a secure platform no more than 2-metres below them.

Bearers should be positioned so they will not fall off the top of the frames. The usual method to do this is by placing the bearers in U-heads on top of the frames and by minimising cantilevers. U-heads should be used where two bearers abut. Where only single bearers are placed in the U-head, the bearer should be placed centrally in the U-head unless a formwork designer, engineer, or other competent person states otherwise. This can be achieved by rotating the U-head or by using timber wedges.

Where the top of the supporting member consists of a flat plate, the bearer should be nailed or otherwise effectively secured to the plate. Flat plates should only be used where specified by a formwork designer, engineer, or other competent person (see Figures 5 and 6).

Figure 5 – Diagram showing the correct position of the U head rotated so it contacts both sides of a single bearer minimising movement. It is incorrect if the bearer Is butted up to one side.

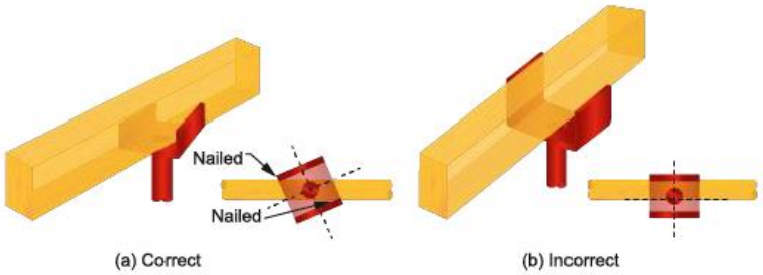
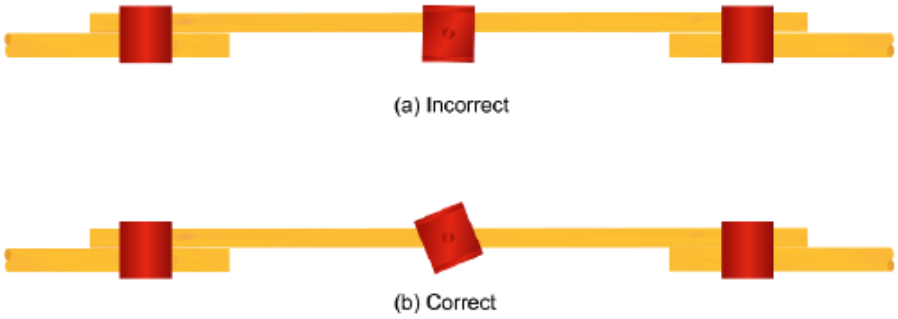


Figure 6 – Diagram showing the plan view of the correct position of the U-head. The U-head is rotated so it contacts both sides of a single bearer minimising movement. It is incorrect if the bearer is butted up to one side.



4.6 Installing joists

Where a false deck is provided at 2-metres or less below a worker, joists may be spread on the bearers with the worker standing on top at bearer level with adequate edge and fall protection.

If the height of the formwork deck being constructed is more than 2-metres above a continuous deck or surface below it, joists should be spread from a platform located within 2-metres of that surface, underneath the deck being constructed. This work platform should be a false deck, but an intermediate platform may be used.

A person should be provided with a secured working platform at least 450 mm wide (two planks) when the potential fall distance is less than 2-metres. It is not acceptable for a person to work from a single plank or bearer.

One example of a work system that may be used to do this is as follows:

- the joists are lifted by the workers from underneath and spread on top of the bearers into their approximate final positions whilst standing on a lower work platform; and
- the platform below the deck should be positioned at a suitable height for handling joists without introducing manual task risks and not greater than 2-metres above the continuous deck or surface below.

4.7 Laying out formply on the deck

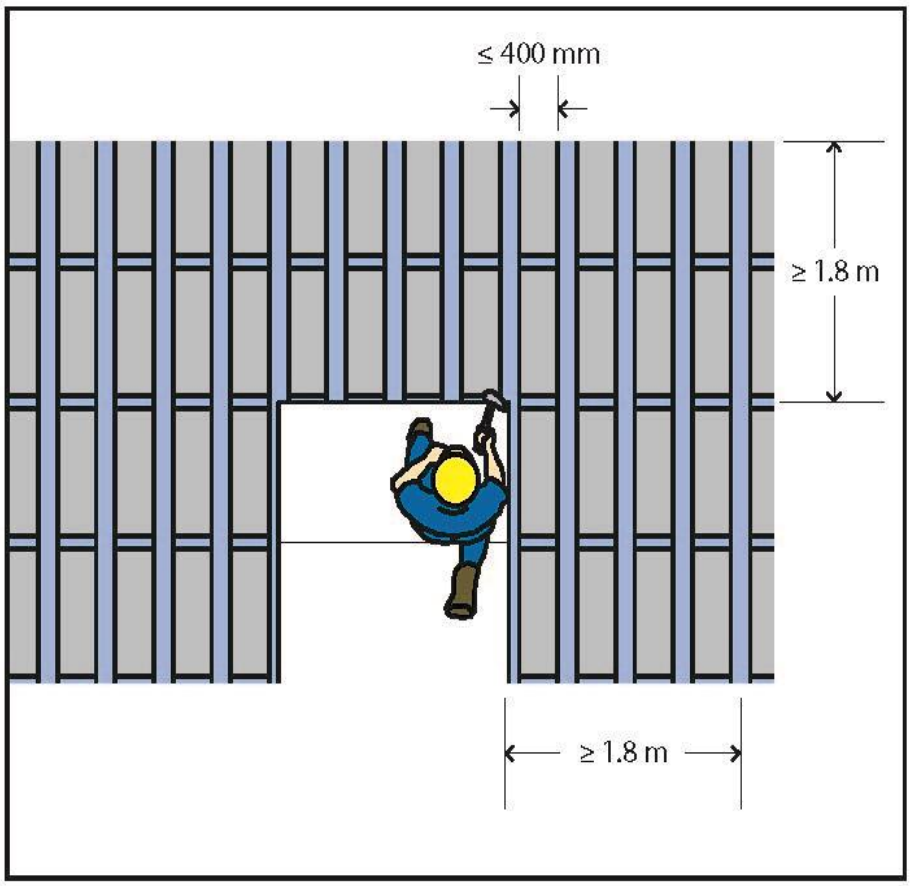
A formwork deck should be laid in a progressive way so people will be provided with a method to prevent them from falling below the deck.

This control measure is particularly important in situations where a false deck has not been provided within 2-metres below the level of the deck to be laid. In this situation formply may only be spread on the secured joists provided:

- a minimum of four secured joists at 450 mm centres—400 mm gaps, totalling 1.8 metres—are located on bearers next to the person and in the other direction joists are secured to bearers extend for at least 1.8 metres (see Figure 6). Therefore, if a person falls, they will fall onto the secured joists and should be prevented from falling further. Controls to minimise the sideways movement of joists should be put in place to further avoid potential falls through the secured joists. This is more likely to be a potential hazard when the person falls onto the secured joists in the same direction as the secured joists. Implementing controls to minimise sideways movement of joists will minimise this possibility
- people lay the formply in front of their bodies so if they stumble, they are likely to fall on top of the sheets being laid. The SWMS should detail how work will be completed to control the risk
- the gap between modular tableform and deck panel systems to be covered with infill strips should be limited to nominally 400mm. Should a person fall, they will fall onto the adjacent tableform or deck panel already covered by form sheeting/lining material
- installation and fixing of the infill strips covering the gaps should be carried out in accordance with appropriate SWMS to control falls through such gaps
- workers should lay and fix the infill strips in front of them so if they stumble, they are likely to fall on top of the tableforms or deck panels and the wrecking strips being laid
- where a leading edge is involved and the distance below the tableforms or deck panels where infill strips are being laid is greater than 2-metres, the SWMS must detail how work will be completed to control the risk of falls eg use of catch decks; and
- workers should start laying the formply sheets from the perimeter scaffolding or other edge protection provided on the perimeter of the formwork.

Where a leading edge is involved and the distance below the deck being constructed is greater than 2-metres the SWMS must detail how work will be completed to control the risk.

Figure 7 – Maximum spacing of timbers where deck is over 2-metres in height from the deck below



4.8 Formwork false decks

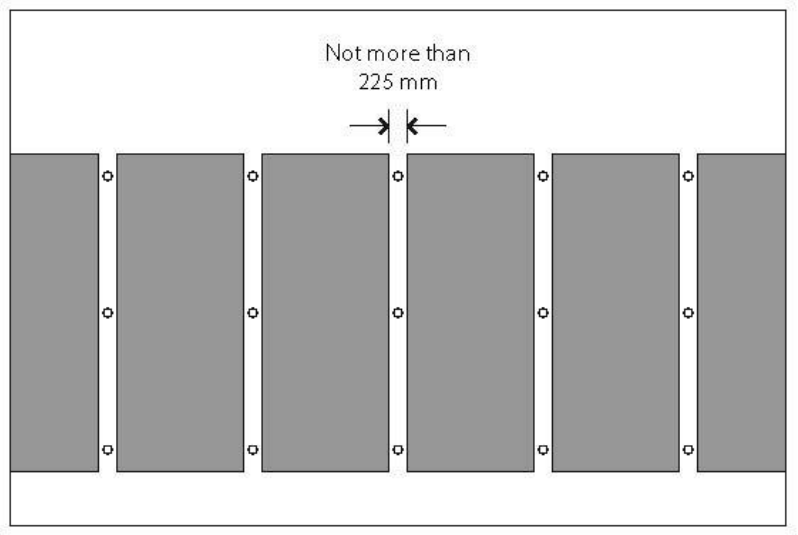
Where the next formwork deck would require people to stand at heights of 2-metres or more above the finished formwork deck to install bearers and joists for the next formwork deck, a continuous 'false' deck, which is a full deck the same area as the floor being formed, should be provided.

This deck should be provided both inside and between formwork frames and typically consist of formply, scaffold planks or modular platform sections.

A protected entry opening can be left in the deck to enable materials to be lifted. Using a captive platform system is preferable to lapped planks because a captive system cannot be accidentally dislodged. Lapped planks may only be used if secured against uplift and slipping.

The false deck should be constructed so there are no large gaps, and gaps only exist where a vertical member of a frame passes through the deck (see Figure 8). Gaps should not exceed 225 mm in width.

Figure 8 – Plan view of a false deck with gaps at vertical framing members



A false deck should be able to support the expected load of workers and materials during construction and people or objects that could fall onto the deck. Access should be provided to each of the false decks.

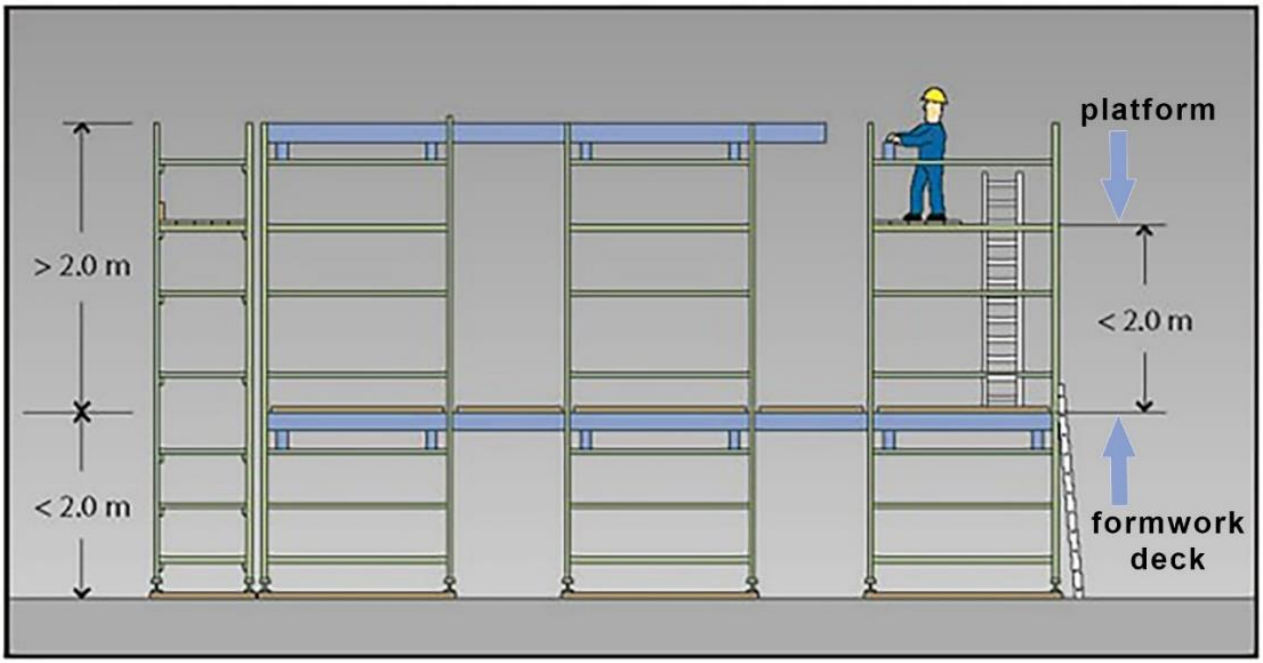
When considering the design of the deck for erecting, altering or dismantling formwork, the weight of the false deck and live load should be applied to the formwork support structure.

The height between the false deck and the pouring deck should allow entry for a person during stripping. Workers must take reasonable care for their own safety by not climbing the framework.

4.9 Intermediate platforms

Where the potential fall distance is less than 2-metres, an intermediate work platform can be provided that is at least 450 mm wide (see Figure 9).

Figure 9 – Worker erecting formwork from an intermediate platform less than 2-metres above a formwork deck where the deck-to-deck height is greater than 2-metres



4.10 Cantilevers

Cantilevered bearers, joists and ply sheets can be hazardous when left unsecured. The weight of material or a person standing on the cantilever may make the timber see-saw and cause the person or material to fall.

When designing the formwork system, the use of cantilevers should be kept to a minimum. In some situations, using cantilevered sections is unavoidable. In these cases, a formwork designer should consider the potential for people and stored materials to cause cantilevers to pivot. The locations of loads should be clearly shown on formwork plans.

Wherever the weight of a person will cause a cantilever to pivot, the formwork design should include measures to secure the cantilevers so this will not occur. This may include temporary propping, nailing, bolting or another effective method. If nailing is used the formwork design should specify the nailing detail and this should be followed. This may include the use of purpose designed or proprietary brackets.

Materials should not be stacked or stored on a cantilever section unless the section has been designed to carry the load. Temporary working platforms cantilevered from shoring frames are a form of cantilevered scaffold. Where a person or object could fall more than 4-metres from a scaffold, workers involved in erecting, altering or dismantling cantilever scaffolds must hold a scaffolding – high-risk work licence.

4.11 Changing floor levels

Formwork decks are rarely flat across the entire floor, generally due to deep beams or ‘drop downs’ sometimes called ‘capitals’ around columns. Uneven floors introduce fall hazards. These hazards are most effectively managed by ensuring formwork supports and the deck are progressively constructed for the lower parts of the deck before work starts on the higher-level areas of the deck.

4.12 Pre-loading inspection and certification

Inspection and certification processes each contribute to controlling risks during the construction of formwork and falsework. Formwork should comply with AS 3610: *Formwork for concrete*.

Inspections and clearance to load should occur at key stages during the construction of formwork including when formwork is being loaded, for example with formwork components, equipment, or pre-stressed tendons and prior to its completion.

This certification should be based on an engineer’s specifications for the building, the strength of the concrete mix and the time period that has elapsed since the pour.

A separate certification process should occur when the formwork is complete and prior to concrete being poured this should include a formwork deck handover certification which indicates that the completed work areas of formwork are suitable for other trades to commence work.

A competent person, such as a structural engineer, with the appropriate experience, should inspect and confirm installed formwork meets design specifications and is structurally sound before it is loaded with concrete. The scope of any certification work should be documented to show what has been inspected and certified.

A competent person should consider a range of matters in inspecting and confirming the installed formwork meets design specifications including some of the more common defects which may occur in a formwork system, such as:

- Sole plates
    - not levelled in or eccentrically placed
    - inadequate load-carrying capacity of the ground and uneven bedding
    - deterioration over time (eg due to weather conditions)
    - deterioration of load-carrying capacity of the ground
    - crushing due to inadequate load distribution from vertical and horizontal components
- Horizontal supports
    - folding wedges cut at too course a taper, not properly cleated, cut from wet material
    - inadequate lateral and torsional bracing
    - horizontal components not centrally placed in forkheads
    - inadequate supports to cantilevers (eg structs supporting deep beam sides on the outer face of the structure)
    - inadequate bearing areas to vertical supports and underside of principal components causing crushing
    - inadequate support to prevent overturning of deep principal components because stirrups or forkheads often omitted
    - bolted timer connections not staggered creating tendency to spit out

- Vertical supports
    - inadequate bracing during erection
    - support not plumb
    - inadequate lateral ties and/or vertical and plan bracing
    - no ties between standards at point of loading (most important where telescopic centres are being supported)
    - incorrect provision of props from floor to floor
    - lack of rigidity of screw connections due to over-extension or lack of bracing
    - adjustable steel props with nails, mid-steel bolts and reinforcing bars used in place of correct pins
    - omission of scaffold forkheads or supports, otherwise eccentrically loaded without allowance having been made for this condition
    - bearing plates distorted (top and bottom plates of steel props)
    - inadequate or discontinuous bracing to scaffold
- General
    - excessive tolerances in construction
    - failure to check tightness of bolts, wedges, etc
    - failure to control vertical rate of placement of concrete
    - failure to control placement of concrete, causing uneven loading of forms
    - inadequate allowance for uplift of concrete under inclined forms
    - inadequate allowance for the effects of vibration on joints
    - inadequate allowance for stress induced by prestressing, temperature and moisture movements
    - no allowance for wind loading
    - no allowance for the effect of vibration on ties, struts, braces, and wedges
    - unrealistic assessment of stress due to over-simplification of design assumptions; and
    - unequal load distribution between two or more components carrying a common load.

The certifying engineer should complete and provide a Formwork Structural Certificate to the person with management or control of the formwork, often the principal contractor. Appendix B of this Code provides an example of a Formwork Structural Certificate and further information can be found in the SWA Guide to Formwork.

Where a scaffold is being used, there are specific requirements to control entry to the scaffold and for inspection and certification prior to use. **Note**: WorkSafe ACT provides additional guidance to support activities in relation to scaffolds: Scaffolds - WorkSafe ACT.

4.13 Altering formwork

When altering formwork outside design parameters, you must:

- consult a competent person such as the formwork designer before making alterations
- ensure the relevant drawing or other documents be updated to clearly show the revisions
- complete the alterations in a safe manner under instruction from a competent person
- ensure alterations do not compromise the structural integrity of the formwork; and
- ensure regular inspections are in place to identify unauthorised interference with the formwork.

4.14 Monitoring

A competent designated observer should continuously monitor the formwork assembly during concrete placing operations and be provided with an appropriate communication system to alert others in case an emergency arises.

Other than a designated observer, no person should be underneath a formwork deck during concrete placement. An observer should not stand directly underneath an area where wet concrete is being placed into the forms. A designated person should observe the concrete placement from a safe distance where there is no risk to health and safety.

Competent persons should be available during concrete placement to carry out any emergency adjustments or repairs. The concrete placement should cease during adjustments and repairs.

4.15 Concrete placement

A concrete pour should not commence until the structural integrity of the entire formwork has been inspected by a competent person such as a structural engineer.

For stability, the placement of concrete should not exceed the maximum calculated pour rate and the inboard part of formwork should be placed before proceeding to any cantilever section.

Hoisting, pumping and other equipment should not be attached to, nor disturb, the formwork unless specifically allowed for in the design. Vibration under load may weaken the formwork structure and may lead to failure.

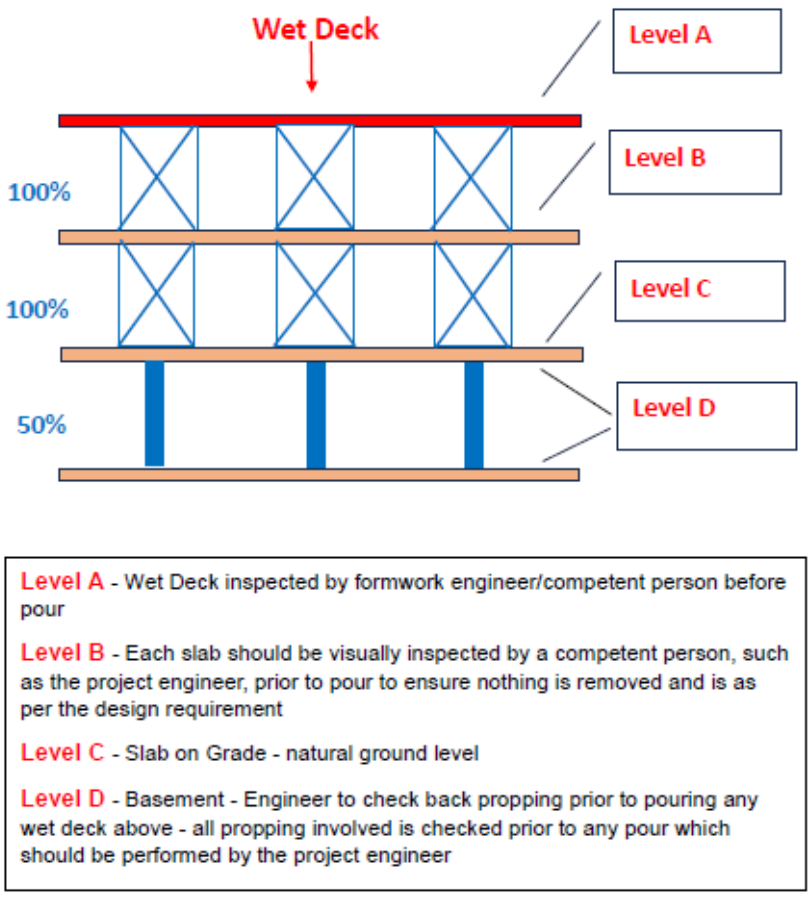
Formwork should be monitored as it is loaded to check for indications of potential failure or collapse, and that vertical and horizontal movements do not exceed specifications, and visually remain as per the intent of the design.

4.16 Pre-stripping certification

Before starting the stripping operation, a competent person, for example an engineer with experience in structural design or person with responsibility for the design, should provide written confirmation the permanent structure is self-supporting, and the formwork can be removed. The certification should be based on the design specifications for the structure, the verification of the strength of the concrete mix and the time elapsed since the pour.

Back propping should be installed as per the structural engineer’s design. Specific installation of the props should be done strictly in accordance with the manufacturer’s and/or designer’s specifications.

Figure 10



Documentation from the concrete supplier verifying the concrete specification should be available on request. A concrete sampling and testing procedure should be in place to verify the concrete meets its design specification.

A competent person should also provide input into the SWMS on formwork stripping to ensure the permanent concrete element will not fail and result in structural collapse.

4.17 Stripping and dismantling formwork

As with formwork erection, the stripping operation should be carried out in an orderly, systematic and progressive manner, considering the risks of falls, falling objects and manual task hazards.

When assessing the risks from stripping formwork consider:

- the number of people in the stripping crew
- the sequence of stripping activities - this should detail how the frames and other supports should be removed i.e. how far U-heads are to be lowered
- whether the support system will be completely removed in a zone before removing the formwork deck or whether the supports will be lowered slightly but remain under the formply while it is being removed
- removing nails and sharp fixings before stacking the components
- minimising damage to the components

- stacking the formwork components - do not obstruct access ways or work areas
- formwork components are not dropped or thrown from a building or structure
- flatheads are not supporting the ends of bearers
- when back-propping is required or only part of the support system is to be removed, how the structural members will remain in place and the type and layout of members that will replace the formwork system
- other special requirements involved in the stripping and or building process e.g. checking of back-propping after post-tensioning
- providing lighting for the work area and surroundings; and
- maintaining housekeeping, removing nails and rejected materials, stacking stripped formwork and removing tripping hazards e.g. concrete nails and brace anchor inserts from the floor.

Formwork removal should be carried out in a systematic way so the deck is gradually removed as the support system. Formply may be removed by partially lowering the support system and then dropping the segment of the deck (sheet) onto the support system. This eliminates the need to manually lift sheets of ply from ground level.

'Drop stripping' describes the method used when all of the formwork support system is removed and the formply is then allowed to drop to the level below either by its own weight or by people levering it off.

Uncontrolled release of formwork components must not permitted at any time.

4.18 Bond reduction

Stripping formwork is easier when the strength of the bond between the form material and the concrete is reduced. The bond will be dependent on the material characteristics and the smoothness of the form material. A liquid bond breaker can be used on wall and column forms to reduce the strength of the bond but use on floor forms is not encouraged because it can cause a slip hazard.

5 Common hazards and controls

This section provides information about common hazards and what to consider when controlling those hazards around formwork. This includes falls, electrical hazards, access, and egress, how to lift plant, using lifting points and collisions.

5.1 Slips, trips and falls

The design of the permanent structure affects the risk of injury from slips trips and falls (and from falling objects) during formwork construction and use. While often not reasonably practicable, permanent structure design measures that can reduce these risks include:

- reducing variations in the floor depth so it has one consistent depth. Formwork decks that are a consistent depth are easier to erect than variable depth floors and minimise the risk of injury. Deeper beams introduce ‘drop downs’ into the floor, creating trip and fall hazards and require more work to construct and strip after pouring
- beams designed to provide suitable access across the beam recess to prevent injury to workers from stepping into the form during construction
- reducing the number of columns required and where columns do exist, eliminating capitals and dropdowns; and
- reducing cantilevered floor sections.

The design of formwork systems can also reduce the risk of slips trips and falls by providing adequate safe access and fall and falling object protection.

5.2 Prevention of falls

WHS Regulation section 78

Management of risk of fall

WHS Regulation section 79

Specific requirements to minimise risk of fall

WHS Regulation section 225

Scaffolds

PCBUs must manage risks of falls before, during and after workers are on site.

When erecting or using formwork, the risk of falling increases around some hazards such as:

- inclement weather conditions like strong wind and rain
- loose materials, equipment or protruding objects below, or in adjoining work areas including tools, reinforcing steel
- penetrations and void areas not identified or protected e.g. ladder access voids, column voids
- incomplete formwork decks, scaffolds or loose components where work is being done, or is likely to be done

- inadequate training, instruction, and supervision of workers; and
- unsafe access/egress on a completed deck prior to concrete placement.

Risk controls should be implemented if a person is exposed to a risk of falling. A risk assessment must be conducted for all work at height. It is important that the person carrying out the risk assessment has the necessary information, knowledge and experience of the work environment and process to assess the risks competently.

Following a risk assessment, control measures must be implemented to address each risk that is identified. These control measures might include fencing, handrails, safety screens, scaffolding, guardrails (including mid rail and toeboards or equivalent), safety nets, elevating work platforms, fall arrest systems (such as nets) or a combination of these measures. In deciding what controls to use, consider:

- factors that increase the risk of falling (for example, a slippery surface which may cause slips and falls); or
- if it is a hazardous situation, such as where the surface condition onto which a person may fall would cause serious injuries (for example, falling on to reinforcing steel starter bars or building materials).

Control measures that provide the highest level of protection, such as those that prevent falls, should be used in preference to those providing a lower level of protection such as fall arrest systems. Fall protection systems should also be provided for workers installing and removing any safeguards.

The following hierarchy of control measures should be used until the risk of fall is minimised as far as reasonably practicable:

1. **temporary work platforms** - passive fall prevention devices include safe (temporary) work platforms (safety mesh, perimeter scaffolding or guardrailing, barriers or perimeter screens)
2. **fall arrest system (fall injury minimisation systems)** - equipment to prevent or reduce the severity of an injury if a fall happens, such as industrial safety nets, catch platforms and fall arrest systems (such as safety harnesses, nets or lazy joists)
3. **work positioning systems** - equipment designed to allow a worker to work safely in position for the duration of the task at heights. This requires greater competency and supervision of the worker than passive fall prevention devices. This includes use of industrial rope access systems, travel restraint systems; and
4. **ladders and administrative controls** - if ladders are used, the contractor should do a risk assessment to make sure the work is done safely - including limiting time spent at height and/or the number of workers who are at height.

5.3 Fall protection from the formwork deck

During formwork construction the structure is constantly changing so continual modification of fall protection measures is required.

Edge protection means a barrier to prevent a person or object falling from the edge of:

- a building or other structure
- an opening in a surface of a building or other structure
- a fall arrest platform or work positioning system e.g. a catch platform; and/or
- the surface from which work is to be done e.g. a formwork deck.

Examples where edge protection should be installed include:

- when a leading edge is to be left unattended and entry onto the deck by people other than formworkers is required, i.e. the formwork deck has not been barricaded and provided with 'keep out' signs
- at openings in stairwells or lift shafts
- open voids such as ventilation shafts or service risers
- penetrations; and
- intermediate working decks.

Control measures that can be considered at the planning phase to prevent the risk of workers falling include:

- handrails
- guardrails
- scaffolding
- perimeter protection screens
- intermediate working decks
- catch platforms
- temporary working decks; and
- penetration or void covers.

Industrial fall arrest (harness) systems or work positioning systems should not be used as a practical fall control from the perimeter of formwork.

5.4 Erecting a formwork deck and supports

Tasks that require particular attention in assessing the risk of falls in a formwork context are those carried out:

- on any structure or plant being constructed or installed, demolished or dismantled, inspected, tested, maintained, repaired or cleaned
- on a fragile surface (for example cement sheeting roofs, rusty metal roofs, fibreglass sheeting roofs and skylights)
- on a potentially unstable surface (for example areas where there is potential for ground collapse, including poorly backfilled or compacted ground, or unstable areas such as on top of stacks of building materials, timber pallets or bricks)
- using equipment to work at the elevated level (for example when using scaffolds, elevating work platforms or portable ladders)
- on a sloping or slippery surface where it is difficult for people to maintain their balance (for example on glazed tiles)
- near an unprotected open edge (for example near perimeters without guardrails, or incomplete stairwells); and
- near a hole, shaft or pit into which a worker could fall (for example trenches, pile holes or service pits).

If a safe working platform (passive fall prevention device) cannot reasonably be provided at the workplace, the contractor should use a safety harness or pole safety static-line if that is practicable (as part of the combination of control measures used to provide a safe system of work).

For more information on protective barriers or safe systems of work refer to the Code of Practice for Managing the Risk of Falls at Workplaces or the Code of Practice for Managing the Risk of Falls in Housing.

5.5 Perimeter - edge protection on the formwork deck

Perimeter protection screens can be an effective means of edge protection on a completed formwork deck. Perimeter protection screens may be installed on the formwork as it is constructed, as long as the formwork is designed to support the screens.

When it is not reasonably practicable to provide perimeter protection screens or scaffolding, use a work system to install perimeter edge protection to eliminate or minimise the risk of falls.

Screens may be supported by the building or structure. The upper edge of the perimeter protection screen shall extend high enough to provide adequate protection for the work to be undertaken, but no less than (1) one-metre above the level of the finished slab.

When selecting protection screens PCBUs need to consider:

- the capacity to support or contain imposed impact loads including building materials, equipment and waste materials
- resistance to wind loads on the supporting structure
- frequency of inspection
- chemical reactivity including flammability
- ventilation requirements
- light transmission requirements
- protection provided from rain or washing down operations
- the pattern and frequency of fixing points; and
- gaps created by a fixing method.

Perimeter protection screens should be assembled, installed, and operated someone who has received training from the screen manufacturer/supplier and deemed competent. Where rigging work involving perimeter safety screens and shutters is required, this work must be carried out by a person holding a high-risk work licence for basic rigging.

To prevent objects falling, protection screens should remain in position from the start of the formwork being erected until soffit stripping/dismantling is complete.

Any gap between perimeter screens and the formwork deck or floor should be minimised as far as reasonably practicable. This may include additional temporary measures such as a flexible flap that will not be damaged when a screen is lifted.

5.6 Perimeter containment screens

Perimeter containment screens are protective structures fixed to the perimeter structure or working platform to prevent objects and people falling outside the work area. This significantly minimises the risk of injury to other workers and the public.

Screens should be used throughout the whole construction process especially while erecting or stripping formwork. They are usually sheeted with timber, plywood, metal, or synthetic mesh.

Screens may be supported by the building or structure or by a specifically designed scaffold. The screens can also act as perimeter fall protection on a top working platform and should extend at least 2-metres above the working surface to provide protection for the public and workers outside the contained work area.

When selecting containment screens consider:

- the ability to support or contain imposed impact loads including building materials, equipment and waste materials
- resistance to wind loads on the supporting structure
- frequency of inspection
- chemical reactivity including flammability
- ventilation requirements
- light transmission requirements
- degree of protection provided from rain or washing down operations
- pattern and frequency of fixing points; and
- gaps created by a fixing method.

Containment screens should remain in position from the start of the formwork being erected until soffit stripping is complete to prevent objects falling throughout the process.

To prevent material from falling below, gaps between perimeter screens and the formwork deck or floor should be minimised as far as reasonably practicable and should not exceed 25 mm. This may include additional temporary measures such as a flexible flap that will not be damaged when a screen is lifted.

5.7 Protective Barriers

To provide a protective barrier in accordance with the regulation, the contractor should provide edge protection on the exposed edges of all work areas. These include the perimeters of any structure (such as the deck) and any opening (void) in the deck.

When putting in place a protective barrier, the contractor should make sure that the workplace (i.e. deck) is of solid construction – this means that:

- the surface can support people, material and other loads applied; and
- the surface and gradient of the deck is even and readily negotiable for workers.

The contractor should provide fall protection devices on the exposed edges of all work areas, including perimeters of any structure and opening in the deck, for example perimeter scaffolding.

Note: further information can be Managing the risk of falls code of practice.

5.8 Penetrations

Open penetrations like stairwells or penetrations to allow for services, create hazards for people on the deck. For example, a fall through a larger penetration, stepping into a smaller penetration or an object falling through the opening onto people below. A penetration where there is a risk a person or an object could fall through should be guarded.

Protect open penetrations with edge protection like handrails or by securely covering them so no one can fall through them. Penetrations in concrete slabs may include cast-in-mesh as a back-up system. The mesh should be of a small aperture, for example 50 x 50 mm mesh size or smaller and made of material capable of withstanding the potential imposed loads. Where mesh or other physical fall protection material is to be provided for larger penetrations, this should be included in the slab design specifications to ensure it can withstand potential loads including those applied by people, equipment, and material.

Where holes are cut in the mesh for services to pass through the hole should be cut to the profile of the service, so the mesh remains in the penetration and the load carrying capacity of the mesh is not reduced below design specifications.

Using plywood covers alone is not a satisfactory risk control because:

- the cover may be indistinguishable from other pieces of plywood
- it cannot be refitted without significant modification, once the first service is installed
- it may be difficult to determine if the plywood is properly secured; and
- secured plywood covers can be unsecured to gain entry and not re-secured.

Plywood covers should be structurally graded, painted in a bright colour and marked with wording, for example **'danger - penetration below**'. The cover should be firmly secured to the concrete and designed for potential loads that may be applied, for example workers, materials or plant that may travel over the cover.

Before stripping formwork, cover the penetration that will be exposed as the formwork is stripped or protect the penetration before starting the stripping operation.

Penetrations are also hazardous before the deck is laid. Joists placed up to the edge of the penetration should be secured so the timbers cannot spread if a person falls on them.

5.9 Scaffolding

Scaffolding, complete with guardrails (including top and mid rails), toe boards and containment netting can provide effective protection against the risk of falls at the perimeter of a building, providing the guardrail extends at least 900mm above the finished concrete slab.

If the gap between the slab and scaffold is greater than 225mm horizontally or 300mm vertically then hop-ups should be included.

The scaffold platform should be constructed to prevent people or materials falling between it and the edge of the formwork.

Scaffolding should be erected in accordance with AS/ NZS 1576 *Scaffolding* which recommends that temporary working platforms should be at least 450 mm wide. Cleats can be used to prevent planks from slipping off the frames. A risk control system should also be provided for persons exposed to a risk of falling.

For further detail on scaffolding please refer to Managing the Risk of Falls at Workplaces.

5.10 Guardrails and handrails

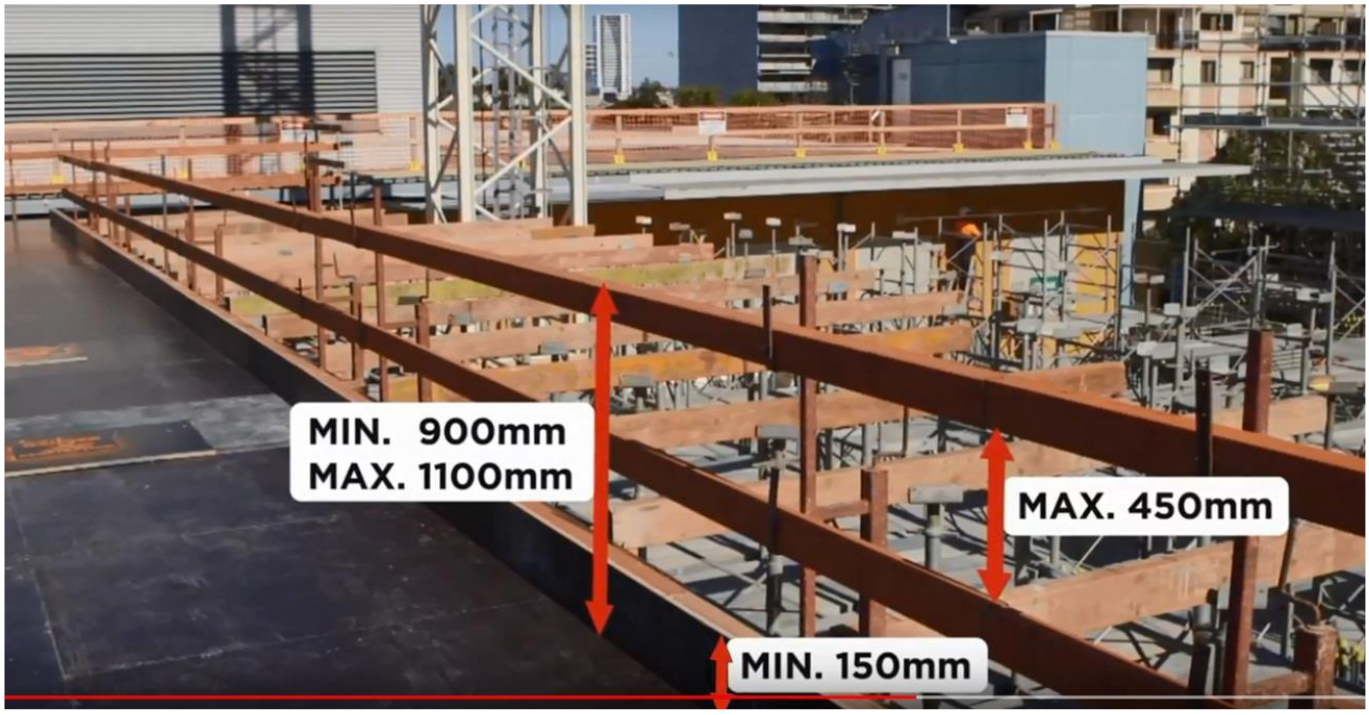
Framing timber has traditionally been used by the construction industry to create guardrails or temporary edge protection systems. However, the adequacy of timber guardrails is reliant on the standard of materials used, the spacing of supports and rails, the method of fixing.

It is recommended to use guardrails and handrails that have been designed and engineered as edge protection systems in accordance with AS 4994.1: *Temporary edge protection - general requirements*.

Guardrails and handrails generally incorporate a top rail, which should be a minimum of 900 mm above the working surface. They should also incorporate a mid-rail and a toe board/bottom rail (Figure 9).

Fixings used to secure posts to the deck should be fit for purpose and be able to withstand the force of a worker falling into the rail.

Figure 11



5.11 Climbing the form

It is important that the different parts of the form remain level during the climbing process. Climbing is usually carried out using a series of climbing devices set up to lift at the same time and at the same rate.

If the lifting system is not properly synchronised, the form may become wedged on the structure or structural members may be overloaded. There should be a system in place to prevent the form going out of level during the climbing procedure. This system may be automated or may rely on operators stopping the climbing process.

To climb the form safely:

- only allow people directly involved in climbing to be located on the form during the process
- identify and control potential nip or shear points where a person could be injured during the climb

- remove obstructions on the form before the climb. This includes the removal of ‘Z-bars’, ferrule bolts and other material that would snag on the structure if not removed. A sign-off procedure for this should be completed; and
- design services such as electrical cable and water pipes so they will not snag or rupture during the climb.

When removing a form from a vertical element, support the form so it never relies on suction for support.

Serious incidents occur when it is assumed a form is supported from above when it is relying on ‘through bolts’ through the wall for support. When the bolts are removed, the form falls with the people still standing on a platform attached to the form. This hazard can apply both to crane lifted forms and jump forms.

5.12 Ground conditions

Ground conditions must be stable at all times while supporting loads.

Principal contractors must provide information on any factors that may affect ground stability before the formwork is erected or during its use. Ground conditions should be assessed by a competent person (for example geotechnical engineer), in accordance with the required loads, to check the ground can bear the most adverse combination of dead, live and environmental loads that can reasonably be expected at any time.

Water or nearby excavations may lead to ground subsidence and the collapse of formwork. Any likely watercourse, e.g. storm water run-off, that has the potential to create a wash out under the structure should be diverted away.

Where foundations and footings are located on batters, these should be protected against scour by directing drainage away from the base of any supports and frames. Following any adverse weather that may impact ground conditions, foundations should be inspected by a competent person, such as a geotechnical engineer, and any rectifications or modifications undertaken as soon as practicable.

Anyone with management or control of a workplace must take all reasonable steps to obtain current underground essential services information before allowing excavation work to commence.

5.13 Adjacent buildings or structures

Where the formwork activity is likely to reduce the security or stability of any part of an adjacent structure, work must not start unless steps are taken to control the risk of:

- collapse of the formwork and the permanent structure it supports onto an adjacent building or structure; and
- collapse of part or all of the adjacent building or structure.

5.14 Collapse

Formwork collapse can occur at any time e.g. when placing the concrete on the structural members to be supported. The risk of collapse can be minimised by:

- designing the formwork to suit the specific workplace requirements including loads and environment
- designing formwork with adequate lateral restraint
- constructing the formwork as designed
- not adding to or altering the formwork unless authorised by the designer
- a competent person inspecting the formwork before loading materials to ensure it is complete and stable
- an engineer or competent person certifying formwork before the concrete pour
- regularly inspecting and maintaining the formwork during its life
- avoiding 'point' loading on any part of the formwork i.e. placing concrete unevenly
- having sound and level foundations under props, frames or any other supporting member or structure
- not placing props or frames close to the edges of excavations
- not exceeding the working load limit of props, frames or any other supporting member or structure; and
- using proprietary pins, not improvised bolts or reinforcing steel, in props or other systems requiring specific connecting devices.

5.15 Electrical power lines

Electrical power lines, whether overhead or underground, can be a significant hazard. Construction work carried out on or near energised electrical installations or services is 'high-risk construction work'. Work must not commence until the service provider responsible for the power lines has been consulted. A risk assessment must be conducted by the PCBUs directly involved, to determine safe working distances and other control measures. Control measures must be implemented that are consistent with any risk assessment and specific requirements of an electricity supply authority.

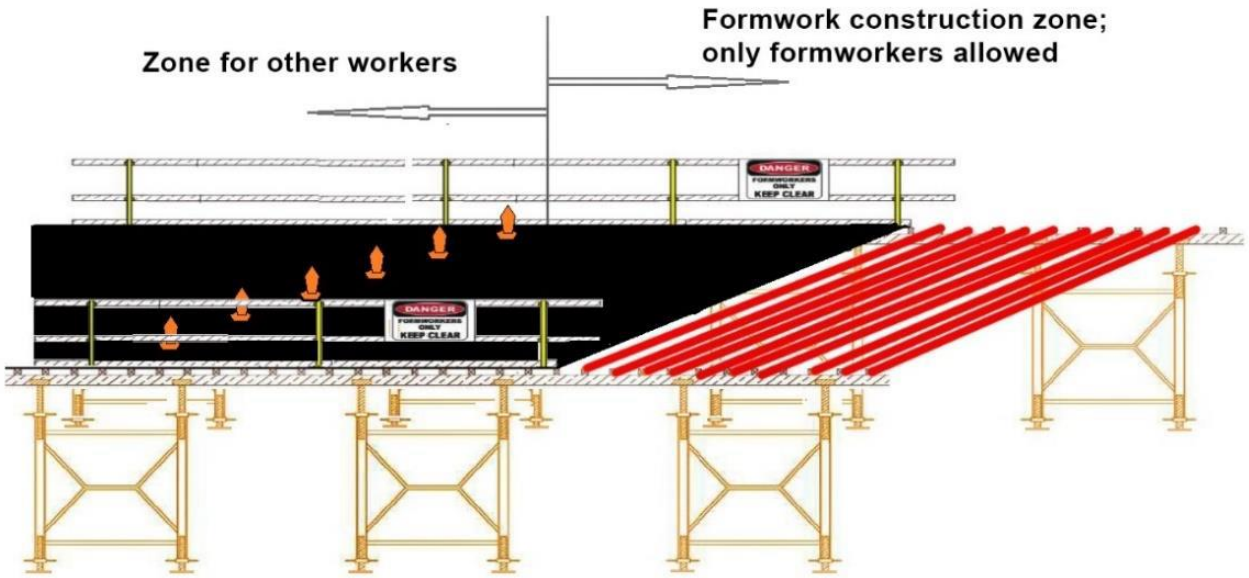
5.16 Working areas for steel fixers and others

Steel fixers, plumbers and electricians often follow closely behind the formwork erection. The formwork zone should be large enough to ensure these people are clearly separated from the formworkers.

A 'formwork only' zone should be maintained behind the leading edge. This zone should be clearly marked by signs and a mesh barrier. Figure 10 shows the work zone for 'other workers' zone, behind the formwork work zone.

The zone for other trade workers is only to be handed over for productive work once the formworker PCBU has deemed the working deck as complete.

Figure 12 – defining work zones. Example of defining work zones for other trade workers and formwork construction. Note guardrails removed for clarity.



Temporary walkways laid across reinforcement mesh can be used to control the risk of slips and trips when multiple trades are entering large areas where reinforcement mesh has been laid behind formworkers.

A physical barrier should be provided and maintained to separate the formwork work zone from other workers. This barrier should be rigid, capable of maintaining its integrity in an upright position and capable of supporting signage if required.

5.17 Stairways and Ladders

In considering how to ensure safe access, the contractor should consider the number of persons using each access point and any tools and equipment people may be required to carry to and from their work. Safe temporary access stairways and/or gangways with handrails should be provided where that is practicable.

When ladders are provided or used for access, each person at the workplace who conducts a business or undertaking must ensure that the ladder is of sound construction and is kept in a safe condition.

In addition, all ladders:

- should be secured against displacement
- should have non-slip feet
- should be used in a manner so that a safe and adequately sized landing place is provided for stepping off the ladder; and
- must have the stiles of the ladder extend at least (1) one-metre above that landing place.

Metal or wire reinforced ladders should not be used where there is a risk of contact with electrical conductor wires (powerlines) or of electrocution. Non-conducting ladders should be used, or a clearance of at least four-metres from conductors should be maintained at all times.

The WHS Regulation also places a key duty on each worker on site – if any person intentionally uses a ladder in a way that creates a risk to the safety of any person (themselves or someone else) they have committed an offence.

If a portable single ladder or extension ladder is used on site, it must be used so that:

- the horizontal distance between the ladder's top support point and its foot is less than or equal to one quarter of its supported length
- the ladder is placed on a firm footing; and
- the ladder is secured to prevent slipping and sideways movement.

If a ladder is used at a workplace to support planks for a working platform it must be a trestle ladder. Even where a trestle ladder is used for support, this type of working platform can only be used where the total weight on the ladder is less than 2.2kN (224kg), including a single point limit of 1kN (102kg).

For further detail on ladders please refer to Managing the Risk of Falls at Workplaces.

5.18 Manual tasks during formwork

The following practical guidance outlines some ways in which manual handling risks can be controlled in formwork erection and dismantling. PCBUs are still required to undertake their own risk assessments and implement control measures. This should also be included in any SWMS that is required.

In relation to manual tasks, each person required to ensure work safety by managing risk on site should, to the extent of their control:

- design or re design the manual task to eliminate or control the risk factor; and
- providing appropriate training to workers in safe handling techniques. This training should also include the prevention of manual handling injuries by an approach based on a hazard identification, risk assessment and control through job and task design.

Where re-design is not practicable, or when considering short term/temporary measures, the person should consider the following controls:

- provide mechanical aids and/or PPE. Manual handling risks may be controlled by using powered mechanical equipment to lift and move formwork frames and other materials such as floor centre spacings during erection and dismantling of formwork. Lifting equipment could include cranes, forklifts, electric pallet trucks and stackers. Mechanised systems such as climbing column formwork and table forms also eliminate manual handling
- arrange for team lifting to reduce the risk. Team lifting (sharing the load between two or more workers) should be used for loading, unloading, stacking and moving frames and other large items where it is impractical to use mechanical assistance
- ensure workers receive appropriate training in methods of manual handling involving team lifting procedures, correct use of the mechanical aids and PPE. Where the nature of the work activities or manual handling tasks are constantly changing, the risk assessment and control process and training provided should be on an ongoing basis
- weights that are manually handled should be minimised. Caution is particularly advised where loads are above 16-20 kg. In general, workers should not be required to lift, lower, or carry loads above 55 kg, unless mechanical assistance and/or team lifting arrangements are provided to lower the risk of injury. Where manual handling involves repetitive bending, twisting, over-reaching, work overhead or where persons have pre-existing injuries these loads should be

further decreased. Loads may be reduced by substituting lighter weight components where possible (for example, using smaller sheet sizes of plywood and shorter bearers, using aluminium beams in place of steel or timber). 1800 mm x 1200 mm ply sheets could be used in preference to larger sizes and bearer lengths should be limited to 4.8 m where possible

- the sequence of erection and frame components used should ensure that components can be removed separately to minimise weights that require manual handling. A combination of frame heights should be used to make up the height required instead of using telescoping extensions. Frames with telescoping extensions and screw jacks attached should not be manually lifted by one worker. Information about weights of framing components should be made available to workers
- frames should be selected in consultation with workers at the planning stage. This should take into account the methods of manual lifting and carrying that must be used, the weight and balance of the frame and the way in which the weight of the frame is to be supported
- frames and materials should be delivered as near to the work location as possible to eliminate double-handling
- materials should be stored on racks or other supports at a height of at least 600 mm where possible so that manual lifting can be done without excessive bending. Frames and sheets of ply that are carried in an upright position should be stored upright in a rack and secured in place
- the overhang of planks should be limited to 150 mm beyond the frames so that they do not obstruct frames being lifted which can cause excessive bending. The overhang may be used to temporarily support the frame before it is placed in its final location. Cleats can be used to prevent planks from slipping off the frames; and
- the rotation of work duties should be considered in consultation with workers so that workers are not subjected to the same task for their whole shift.

PCBUs must also remain alert to the presence of any new risks arising from the use of controls, such as the use of table/flying forms – while the use of table forms might reduce risks associated with manual handling, they can give rise to new risks.

For example, while there may be benefits of table form/ flying such as:

- fast construction for large floor layouts and reduction of long-term workforce requirement on site
- fully assembled units can be manoeuvred quickly into place; and
- using appropriate quality control, high-quality surface finishes can be achieved.

Flying forms are very heavy moving objects and may cause cuts, broken bones, contusions, or amputations. As such, PCBUs should consider:

- the design of flying forms must be done by a professional engineer and constructed, hoisted, moved, and set according to the instructions of the designer or manufacturer. Instructions must be followed
- danger signs and barriers must be put in place before moving any forms so that all workers and the public are aware of what is happening and are protected
- make sure all flying forms are free of loose material; and
- ensure that the landing area is free of debris to prevent/ensure workers don’t slip and fall.

The design of formwork systems can reduce the amount of manual handling required in formwork activity. To reduce manual handling risks, use:

- precast columns and beams to minimise fixing reinforcement, erecting and stripping column formwork and pouring concrete on site - work activities carried out in a factory environment are generally lower-risk
- table or flying forms - a large pre-assembled formwork and falsework unit often forming a complete bay of suspended floor slab; and
- modular formwork systems which are often lighter weight and eliminate the need for tasks like repetitive hammering.

However, when implementing systems to reduce the amount of manual handing, PCBUs need to be aware of other WHS risks, including those arising from use of prefabricated concrete.

Manufacturing of prefabricated concrete such as precast columns, beams, concrete flooring, and pipes may reduce risk directly arising from manual tasks at a construction site however, this may not eliminate all risks arising at the workplace.

Due to their size and mass prefabricated concrete elements can be vulnerable to uncontrolled collapse onsite.

Uncontrolled collapse can occur due to a range of reasons including:

- quality control issues during manufacture
- faulty concrete element design
- inadequate crane capacity and placement
- inadequate concrete strength for lifting and bracing inserts
- incorrect components; or
- inadequate or incorrectly designed or installed temporary support systems.

Additional information about the use of prefabricated concrete or precast concrete can be found at SWA.

Allow sufficient clearance to adjacent structures and safe methods for moving large and heavy components, materials and equipment i.e. making allowances for a crane and other mechanical lifting devices to be used.

5.19 Lifting plant and materials

Crane-lifted loads should be slung and secured by a high-risk work licence holder e.g. DG dogger so no part of the load can fall.

The following should be considered when carrying out formwork:

- tare mass of wall, lift or column forms should be provided with formwork documentation and made available for inspection
- formwork frames should be either tied together or secured with lifting slings around the load
- loads of joists or bearers should be strapped together before lifting
- formply loads should be strapped together and lifted in a flat position, with a full sheet supporting the bottom of the load
- loading materials during construction as stacked materials create point loadings that the formwork structure may not be designed to bear

- the safe storage and removal of damaged and/or waste materials; and
- only storing plant and materials on formwork where allowed for by design specifications, and when the structure or deck has been completed to the point that it is able to bear the load and is approved by a competent person responsible for designing the supporting structure.

Formwork is not suitable for full loading until it is fully secured i.e. when the deck is complete with tie-ins and back-propping. In practice, some loading often occurs before the deck is completed e.g. unloading pallets of plywood and joists used to construct the deck.

To minimise the risk of collapse and other hazards:

- design drawings should clearly identify the maximum point loadings for the temporary structure or deck
- formwork packs should be securely strapped prior to lifting
- appropriate use of lifting and rigging equipment – including use of chain reeving in securing loads
- point loadings should not exceed the maximum weight specified by a designer
- consider and follow purpose built and load rated lifting vessels or containers to ensure loads are securely contained
- work groups must consult to consider placement of materials that may compromise the structural integrity of the design and implement suitable controls
- crane crews should not lift plant or materials onto the temporary structure or deck until there is an agreed landing zone that is clearly communicated and documented
- do not place loads on the temporary structure or deck if the designer's documentation prohibits loading
- fall protection must be completed before workers access the deck. This can include handrails, perimeter scaffolding, edge protections and secured penetrations
- delivery of materials should be planned so loads are not lifted onto an incomplete or unsecured temporary structure; and
- before people leave the workplace, plant and materials should be secured against movement by wind.

5.20 Lifting Points

Slings attached to lugs or holes cut into part of the load are often used to lift formwork components, rather than wrapping the lifting slings around the load.

Where lugs or holes are used, designer information verifying the structural adequacy of the lifting points must be available including:

- the structural adequacy of the lifting lug or hole; and
- any instructions on its use, such as manufacturer's information on working load limit.

This includes lifting helicopters (powered concrete trowels) which are not to be lifted by any part of the machine that is not designed as a lifting point.

5.21 Mixing components

Plant components from different manufacturers or suppliers may sometimes look compatible but can have different dimensions and tolerances.

Mixing incompatible components can significantly affect the structural integrity of the formwork which could result in the collapse of the structure. It can also lead to increased wear on components, resulting in more difficult assembly, and potential injury.

A competent person must assess whether it is safe to mix components from different manufacturers and should provide testings, calculations, and analysis for their assessment.

They must determine whether:

- components are of compatible size and strength
- components have compatible deflection characteristics
- fixing devices are compatible; and
- mixing will lessen the strength, stability, rigidity, or suitability of the structure.

5.22 Plant and collision

A person with management or control of plant at a workplace must manage risks to health and safety associated with plant in accordance with Part 3.1 of this Code and the hierarchy of controls.

The person with management or control of powered mobile plant must manage risks to health and safety associated with the following:

- the plant overturning
- things falling on the plant operator
- the operator being ejected from the plant
- the plant colliding with any person or object; and
- mechanical failure of pressurised elements of plant that may release fluids that pose a risk to health and safety.

A person with management or control of powered mobile plant at a workplace must ensure, so far as is reasonably practicable, that a suitable combination of operator protective devices and warning devices for the plant is provided, maintained, and used.

Suitable warning devices that may be used include flashing lights, audible warning alarms, air horns and percussion alarms. For further information refer to the Managing the Risk of Plant in the Workplace Code.

5.23 Access and Egress

The WHS Regulation requires each PCBU at a workplace ensures that anyone coming into or leaving the workplace can enter, exit and move safely about the workplace, and is able to leave the workplace in an emergency. This duty also applies to a person in control of premises (such as the principal contractor) – each person with the duty must ensure the law is complied with to the extent of their control.

Workers must be provided with safe entry to and exit from the formwork, so far as is reasonably practicable. Safe entry and exit for formwork structures includes:

- fit for purpose temporary ramps (cleated)
- secured planks on top of steel reinforcements
- using the existing floor level of a building

- installing temporary stairs or portable ladder access systems when erecting the formwork
- personnel hoists, and non-mechanical forms of exit e.g. a ladder or stair tower in case of power failure or other emergency situation
- edge protection must be provided on any access platform; and
- castors on mobile work platforms must be locked at all times except when they are being moved.

Platforms must be designed to provide sufficient access and working space for the number of personnel required for specific tasks and must be positioned at a height and distance from the form to minimise reaching and stretching movements and limit a person's necessary exertion.

Mobile scaffolding, purpose-built work platforms or elevating work platforms may be suitable in providing the essential safe access to elevated work areas for dogmen, steel fixers and concreters.

All platforms must be designed for stability and resistance to any side loading that may be applied during a concrete pour.

Concrete pouring systems must provide adequate safe working space, with edge protection provided, for all workers. Lightweight aluminium scaffolding may not have adequate stability when subjected to side loading and may require additional bracing.

5.24 Storage of Formwork

Materials must be stored to minimise manual task hazards, trip hazards and the potential for falling objects.

Where practicable, frames and formply should be strapped until it is time to use them – and timbers should be stored in connected stakes to minimise falling.

Smaller components such as U-heads, couplers, base plates and 'Z-bars' should be contained in material boxes.

Bearers and joists should also be strapped together in bundles or stacks.

These bundles or stacks should be located back from the edge of the deck or openings to prevent materials or persons accessing the materials falling through, or off the deck.

Incorrect material delivery and storage practices can create significant manual handling risks. Safe work practices that can assist in minimising these risks include:

- ensuring that formwork materials are delivered as close as practicable to the job
- designing and designating a small section of the formwork deck as a loading platform for ply and other components
- storing loads on trolleys to minimise double handling, or on raised platforms to minimise manual lifting from ground level; and
- having an adequate storage space or lay down areas to safely store materials/equipment and to minimise double handling.

5.25 Housekeeping

On work sites where formwork is being erected or dismantled all areas of access should be kept clear and free of obstructions. In particular:

- all materials should be properly stored to reduce trip and slip hazards, including those during dismantling ensuring all areas are kept free of projecting nails
- all formwork materials should be free of projecting nails. All nails should be removed from the formwork material during the process of dismantling. High tensile nails, (for example, explosive power tool nails), should be removed with an appropriate tool to prevent nails becoming projectiles when being removed; and
- all plywood sheet offcuts and stripped plywood pieces should be stored to prevent sheeting becoming a trip/slip hazard (such as in a suitable frame).

5.26 Lighting

The WHS Regulation requires adequate lighting to be provided at a workplace by a PCBU at that workplace. What is adequate depends on the tasks being performed by workers at the time.

Lighting must be sufficient to:

- allow workers to work safely
- not create excessive glare or reflection
- allow people who are not workers to move safely within the workplace; and
- facilitate safe entry to, and exit from, the workplace.

5.27 Preventing falling objects

Falling objects cause serious injuries on sites. Some solutions are:

- perimeter edge protection should be constructed to effectively prevent any materials, tools or objects falling onto persons below
- lanyards on tools should be used where there is a risk of the tool being dropped and striking a person below
- loose formwork materials such as plywood and plant should be secured to prevent accidental displacement, especially during high winds
- props which are not braced or tied should be secured or removed to prevent accidental dislodgement; and
- a physical barrier such as a temporary kerb should be provided to prevent mobile plant (such as a pedestrian operated forklift truck) from falling off the edge of building or displacing formwork.

5.28 Moving loads and materials

Systems of work must ensure the safety of persons in the vicinity of materials or loads being moved. For example:

- tag lines should be used to guide, and control suspended loads

- a person in control of loads suspended from a crane must hold a high-risk work licence for dogging or the equivalent certificate of competency
- areas in the vicinity of materials or loads being moved should be clear of persons when moving long materials such as joists, bearers, planks, and frames to prevent striking persons nearby; and
- areas beneath suspended loads should be clear of persons.

6 Personal protective equipment (PPE)

6.1 Providing PPE

Under the WHS Regulation all persons that provide PPE as part of their duty to manage risk must ensure, to the extent of their control, that:

- the PPE is adequate for the person it is provided to
- the PPE minimises the risk for the person
- the person is told of any limitations of the PPE
- the person is given the instruction and training necessary to ensure the PPE minimises the risk for that person
- the PPE is properly maintained, and, repaired or replaced as necessary to minimise the risk for the person using it; and
- the PPE is kept in a clean and hygienic condition.

6.2 PPE and Formwork

Before erecting or dismantling any formwork, contractors should assess the risks likely to affect the health and safety of the workers and themselves, as identified by the risk assessment procedure, and must provide and arrange for the use of appropriate and compatible PPE. A fall arrest system is a form of PPE.

The following PPE should be provided where required by the WHS Regulation (because it is mandatory or because a risk assessment indicates it is needed).

6.3 Safety helmets

The use of safety helmets may prevent or lessen a head injury from falling objects or a person hitting their head against something. Where there is a likelihood of persons being injured by falling objects and overhead protection is not provided, persons should be provided with (and use) a safety helmet. Safety helmets should also be provided and used where a person may strike their head against a fixed or protruding object or where there is a risk of accidental head contact with electrical hazards.

6.4 Eye protection

Where workers are carrying out cutting, grinding, chipping, or welding of concrete or metals they should be provided with (and use) eye protection complying with AS 1337 *Eye protectors for Industrial Applications* to reduce the risk of eye injury. Eye protection complying with AS 1337 should also be provided (and used) where persons carry out other work, such as carpentry, where there is a risk of eye injury.

There should be sufficient supervision and monitoring conducted to ensure that employees are provided with (and use) the eye protection.

6.5 Safety gloves and footwear

Safety gloves and footwear should be provided when handling materials such as timbers, scaffolding components, and steel frames to reduce the risk of injury.

6.6 Protection from sun

Workers should be protected from sunlight/UV radiation by using a sunscreen with an SPF (sun protection factor) rating of at least 15+ and wearing hats, long sleeves, and long trousers. If short sleeved shirts and shorts are worn in very hot weather, the exposed parts of the body should be protected by using the appropriate sunscreen.

Persons exposed to reflective surfaces (such as formwork decks) should be protected from the risks of eye damage from the increasing exposure to the sun by UV protection glasses to AS 1337 and AS 1338 as part of PPE. Even with protection, there should be sufficient supervision and monitoring conducted to ensure that workers do not have extended exposure to strong sunlight and reflection.

6.7 Clothing

Clothing should be comfortable in all positions such as standing, bending, and crouching and be suitable for the work being done and the weather conditions. Loose clothing or equipment which may snag or create a trip hazard should be avoided where possible.

Appendix A: Glossary

These definitions are for the purposes of this Code:

Catch platform or catch deck	A catch platform is a temporary platform located below a work area to catch a worker in the event of a fall.
Competent person	A person who has acquired through training, qualification or experience, the knowledge, and skills to carry out the task.
Construction work	Means any work carried out on or near a construction site in relation to the construction of a structure, including: • demolishing or dismantling all or part of the structure and removing from the site anything resulting from the demolition or dismantlement • assembling prefabricated elements to form the structure or disassembling the prefabricated elements that formed the structure • excavation, landscaping, preparatory work, or site preparation on site; and/or • work carried out under water, including on a buoy, an obstruction to navigation, a raft, ship, or wreck.
Containment netting	Containment netting may also be referred to as containment sheeting or screening or scaffolding mesh or shade cloth.
Conventional framework	Also referred to as traditional framework – a formwork system typically constructed on-site from timber or plywood and supporting elements such as supporting frames.
Dead and live loads	Dead loads relate to the self-weight of a structure and components including working, catch or access platforms, stairways, adders, screens, sheeting, tie assemblies, scaffolding hoists, or electrical cables. Live loads include: • the weight of people, materials, debris, plant, tools, and equipment • environmental loads, e.g. wind, rain; and • impact forces.
Designer	A person who designs a structure that is to be used or could reasonably be expected to be used, as or at, a workplace, including during construction, maintenance, renovation, or demolition of the structure. Designers can include draftsperson, building designers, architects, and engineers. A builder could be a designer if they design a structure themselves or are involved in altering the design for a building, even after construction work has commenced.

Designer's safety report	A report identifying the hazards relating to the design of a structure that creates a risk to the health or safety of persons who are to carry out any construction work on the structure. The designer's safety report provides recommended ways to control the risks associated with the hazards identified throughout the life cycle of the structure. This may be done in consultation with other duty holders carrying out the work.
Duty holder	Any person who owes a WHS duty under the WHS Act including a PCBU, a designer, manufacturer, importer, supplier, installer of products or plat used at work, officer, or a worker.
Edge protection	A barrier to prevent a person falling, erected along the edge of: • a building or other structure • an opening in a surface of a building, or other structure; and/or • a raised platform.
Engineer	A competent person that has tertiary qualifications in an engineering discipline relevant to the design activity they are undertaking e.g. structural or civil engineer.
False deck	A deck provided to safely arrest a falling person or object, and/or provided as a working platform. Different to a pouring deck.
Falsework	The temporary structure used to support a permanent structure, material, plant, equipment, and people until the constructure of the permanent structure has advanced to the stage where it is self-supporting. Falsework includes the foundations, footings and all structure components supporting the permanent structural elements. Falsework can be used to support formwork for in-situ concrete, prefabricated concrete elements, steel sections or stone arches, for example during bridge constructure.
Formwork	Means the surface, support and framing used to contain and shape wet concrete until it is self-supporting. ***Note**: This term includes the forms on which the concrete is poured, the supports which withstand the loads imposed by the forms and the concrete, the bracing which may be added to ensure stability, and the footings. When complete, the formwork can be known as the formwork assembly. Supports and bracing mentioned above are sometimes known as falsework.*
Formwork contractor	Means the person responsible for the erecting and dismantling the formwork and associated equipment.
Formwork deck handover certificate	A document used to consider the completed work areas of formwork as designed that allows other trades to commence their work.

Formwork design	Design drawings that include all details of formwork, including verticals and stairs for size and spacing of framing and details of any proprietary fittings or systems proposed to be used. Where special requirements such as external vibration are involved, the formwork design should include any additional structural loads to be applied.
Hazard	A source or a situation that has the potential to harm a person, property and or the environment. Hazards at work may include noisy machinery, falling objects, a moving forklift, chemicals, electricity, working at heights, a repetitive job, bullying and violence at the workplace.
Health	Includes both physical and psychological health.
Health and safety representative (HSR)	A worker who has been elected by their work group under the WHS Act to represent them on health and safety matters.
High-risk construction work	Construction work for which a SWMS is required. Section 291 of the WHS Regulation provides a list of construction work that is considered to be high-risk for the purposes of the WHS Regulation.
Managing risk	A process set out in the WHS Act and WHS regulation to eliminate health and safety risks so far as is reasonably practicable, or if this is not reasonably practicable, minimise the risk so far as is reasonably practicable. It includes identifying hazards, assessing, and implementing control measures, and reviewing and maintaining the control measures to ensure their ongoing effectiveness.
Person conducting a business or undertaking (PCBU)	A person conducts a business or undertaking: • whether the person conducts the business or undertaking alone or with others; and • whether or not the business or undertaking is conducted for profit or gain. A business or undertaking conducted by a person includes a business or undertaking conducted by a partnership or an unincorporated association. Individuals who are in a partnership in conducting a business will individually and collectively be a PCBU and includes a sole trader or self-employed person.
Person in control of plant or a system	Means a person who is in control of plant or a system or the operation of the plant or system. This includes anyone with authority to make decisions about the plant or system, or its operation.
Plant	Includes machinery, equipment, appliances, containers, implements and tools and components or anything fitted or connected to those things. Formwork examples are items of plant designed as a structural component or are assembled to form a structure.

Principal contractor	(Often referred to as the head or main contractor) means the person with the overall responsibility for the construction work being undertaken.
Proprietary systems	Formwork components that are mass-produced, where the manufacturer provides technical information on the load-carrying capacities of the components and information or erection and stripping/dismantling methods.

Reasonably Practicable	Reasonably practicable, in relation to a duty to ensure health and safety, means that which is, or was at a particular time, reasonably able to be done in relation to ensuring health and safety, considering, and weighing up all relevant matters including:
	• the likelihood of the hazard or the risk concerned occurring
	• the degree of harm that might result from the hazard or the risk
	• what the person concerned knows, or ought reasonably to know, about:
	  ○ the hazard or the risk
	  ○ ways of eliminating or minimising the risk
	• the availability and suitability of ways to eliminate or minimise the risk; and
	• after assessing the extent of the risk and the available ways of eliminating or minimising the risk—the cost associated with available ways of eliminating or minimising the risk, including whether the cost is grossly disproportionate to the risk.

Risk	The possibility of harm (death, injury, or illness) that might occur when exposed to a hazard.
Safe work method statement (SWMS)	Means a (written) statement that: • identifies the work activity assessed as having a safety risk or risks • states the safety risk or risks associated with that activity • describes the control measures that will be applied to the activity • describes how safety measures will be implemented to do the work safely; and • includes a description of the equipment used in the work, the qualifications of involved workers and the training required to do the work safely. The primary purpose of a SWMS is to help supervisors and workers implement and monitor the control measures established at the workplace to ensure high-risk construction work is carried out safely.

Scaffold	A temporary structure erected to support access or working platforms.
Structure	Anything that is constructed, whether fixed or moveable, temporary, or permanent, and includes: • buildings, masts, towers, framework, pipelines, transport infrastructure and underground works (shafts or tunnels) • any component of a structure; and • part of a structure. Formwork examples of a structure includes formwork, falsework or any other structure designed or used to provide support, access, or containment during construction work.
WHS management plan	Means a site-specific plan to ensure work safety that includes: • a statement of responsibilities, listing the names, positions and responsibilities of all persons who have specific responsibilities for work safety on site • detailed arrangements for ensuring compliance with induction training requirements • detailed arrangements for the co-ordination of work safety issues for workers undertaking construction work on site • detailed arrangements for managing incidents when they occur, including the identities of and contact details of persons who will be available to prevent, prepare for, respond to, and manage recovery from incidents • any site safety rules, with detailed arrangements for ensuring all persons at the site (such as workers, contractors, suppliers, or visitors, are told of the rules • the hazard identification, risk assessment and risk control information for all work activities assessed as having safety risks; and • all required SWMS.
Worker	Means an individual who carries out work in relation to a business or undertaking, whether for reward or otherwise, under an arrangement with the PCBU. This includes employees, apprentices, independent contractors, outworkers, work experience students and volunteers.
Workplace	Any place where work is carried out for a PCBU and includes any place where a worker goes, or is likely to be, while at work. This may include offices, factories, shops, constructions sites, vehicles, ships, aircraft or other mobile structures on land or water.

Appendix B: example: Formwork Structural Certificate

An example Formwork Structural Certificate for use by a competent person to indicate formwork and falsework has been inspected and complies with specification and is structurally sound.

Engineer's Name: .....

Address: .....

Telephone: ..... Fax: .....

Mobile: ..... Date: .....

Project: .....

Level: ..... Area: .....

STRUCTURAL CERTIFICATE

This is to certify that the..... formwork for the above project has been inspected and is considered to be adequate to support the design loads in accordance with the relevant standards including AS 3610: *Formwork for concrete*.

The following items were included in the inspection:

ITEM	CONDITION Yes/No	WORK REQUIRED
Base plates	OK	No
Frame spacing	OK	No
Frame bracing	OK	No
Frame extensions	OK	No
Bearer size and spacing	OK	No
Joist size and spacing	OK	No
Prop spacing	Not OK	Replace props near columns
Prop bracing	OK	No
Eccentric loading	OK	No
Prop inclination	OK	No
Timber condition	OK	No
Steel condition	OK	No
Nails in plates as required	OK	No
Columns framing	OK	No
Columns bracing	OK	No
Plywood Fixing	OK	No

....

Engineer's Name Certifying Signature