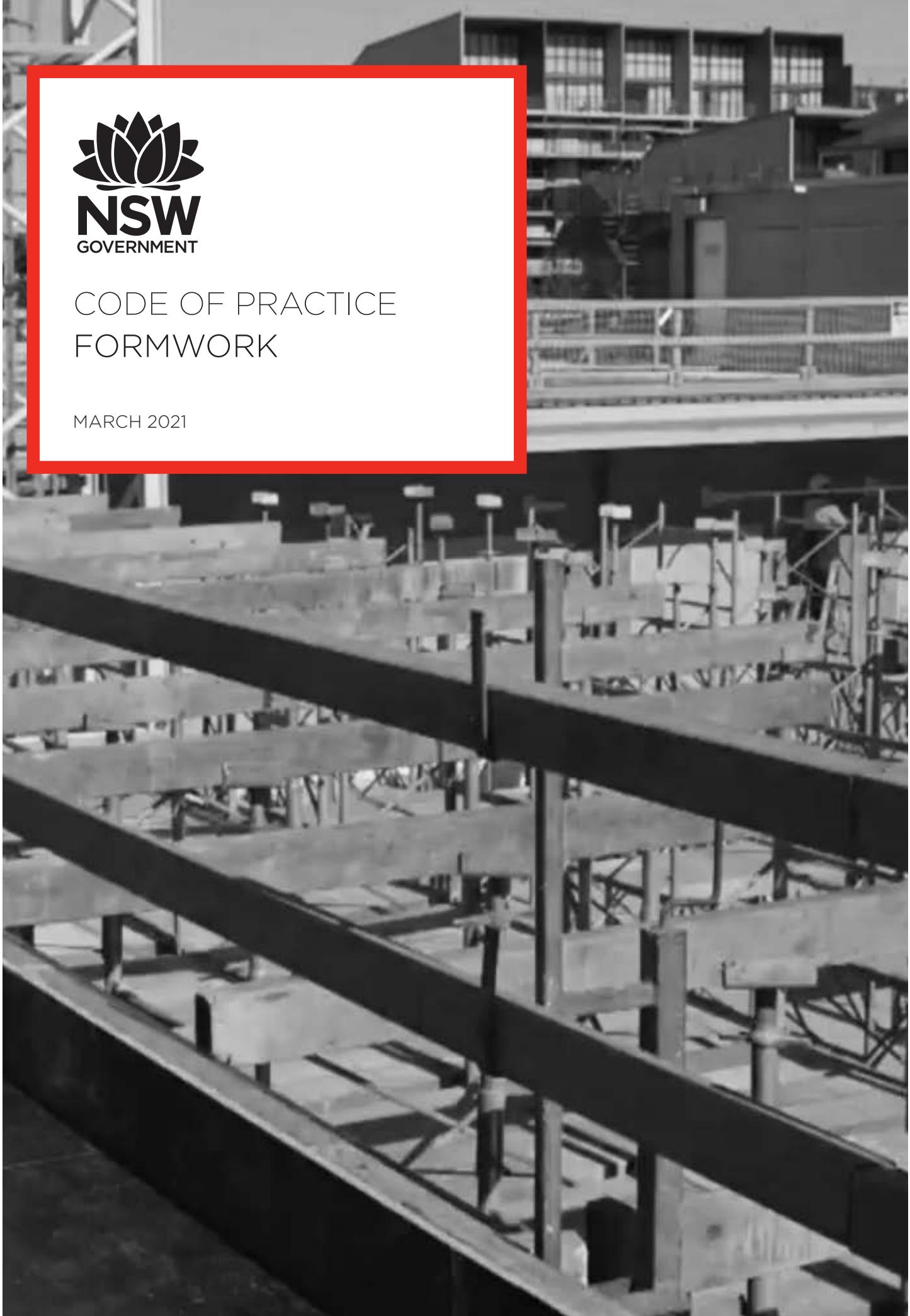




# CODE OF PRACTICE FORMWORK

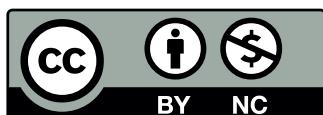
MARCH 2021





This Code of Practice has been developed by SafeWork NSW and has been approved under section 274 of the *NSW Work Health and Safety Act 2011*. Notice of that approval was published in the NSW Government Gazette referring to this Code of Practice as Formwork (page 3055) on Friday 26 June 2020. This Code of Practice commenced on Friday 26 June 2020. Subsequent amendments under section 274 of the *NSW Work Health and Safety Act 2011* have been published and commenced as noted in the Amendments section contained in this code.

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# CONTENTS

<b>CONTENTS .....</b>	<b>3</b>
<b>Foreword.....</b>	<b>5</b>
<b>Scope and application.....</b>	<b>5</b>
<b>How to use this Code of Practice .....</b>	<b>6</b>
<b>1. Introduction .....</b>	<b>7</b>
1.1 Who has duties under the law?.....	7
1.2 What is formwork .....	7
1.3 Managing risks associated with formwork .....	8
1.4 Consultation and communication.....	9
<b>2. Design and planning for formwork.....</b>	<b>11</b>
2.1. Designers of formwork .....	11
2.2. The designer safety report.....	12
2.3. Commissioning construction work .....	13
2.4. Planning by the principal contractor .....	14
2.5. Planning by the formwork contractor .....	14
2.6. Preparation .....	15
2.7. Conventional/modular systems.....	16
2.8. Slip forms and jump forms .....	16
2.9. Loading .....	17
2.10. Plant design .....	17
2.11. Formwork design modification .....	18
<b>3. Systems of work.....</b>	<b>19</b>
3.1. Information, training and instruction.....	19
3.2. Safe work method statements (SWMS) .....	20
3.3. Emergency plan .....	21
3.4. Emergency procedures for slip forms or jump forms .....	22
<b>4. Types of formwork.....</b>	<b>23</b>
4.1. Conventional formwork systems .....	23
4.2. Modular formwork systems .....	24
4.3. Scaffolding components in falsework.....	24
4.4. Slip forms and jump forms .....	25
4.5. Travelling forms .....	26
<b>5. Common hazards and controls .....</b>	<b>27</b>
5.1. Ground conditions.....	27
5.2. Adjacent buildings or structures .....	27
5.3. Collapse .....	27
5.4. Electrical power lines .....	28
5.5. Access and egress.....	28

5.6.	Working areas for following trades.....	29
5.7.	Falling objects .....	29
5.8.	Lifting plant and materials.....	30
5.9.	Lifting points.....	31
5.10.	Mixing components .....	31
5.11.	Plant and collision .....	32
<b>6.</b>	<b>Falls.....</b>	<b>33</b>
6.1.	Fall protection from the formwork deck.....	34
6.2.	Perimeter protection screens .....	35
6.3.	Scaffolding .....	36
6.4.	Guardrails and handrails.....	36
6.5.	Falls through penetrations .....	37
6.6.	Falls from ladders .....	38
<b>7.</b>	<b>Erecting, altering and stripping/dismantling formwork .....</b>	<b>40</b>
7.1.	Foundations and footings.....	40
7.2.	Conventional and modular formwork systems .....	40
7.3.	Wall and column forms .....	41
7.4.	Erecting formwork frames .....	42
7.5.	Formwork false decks .....	43
7.6.	Intermediate work platform .....	44
7.7.	Installing bearers.....	44
7.8.	Installing joists.....	45
7.9.	Laying out formply on the deck .....	46
7.10.	Cantilevers .....	47
7.11.	Changing floor levels .....	47
7.12.	Pre-loading inspection and certification .....	47
7.13.	Altering formwork .....	48
7.14.	Monitoring .....	48
7.15.	Concrete placement.....	48
7.16.	Pre-stripping/dismantling authorisation .....	49
7.17.	Stripping and dismantling formwork.....	49
<b>8.</b>	<b>Slip and jump forms.....</b>	<b>51</b>
8.1.	Access and egress.....	51
8.2.	Trailing screens and platforms .....	52
8.3.	Climbing the form.....	52
<b>Appendix A – Glossary.....</b>	<b>54</b>	
<b>Amendments .....</b>	<b>59</b>	

# Foreword

The SafeWork NSW Formwork Code of Practice (**this Code**) on how to manage the risks associated with formwork is an approved code of practice under section 274 of the *Work Health and Safety Act 2011 (WHS Act)*.

An approved code of practice provides practical guidance on how to achieve the standards of work health and safety required under the *WHS Act* and the *Work Health and Safety Regulation (WHS Regulation)*.

A code of practice should be used by anyone who has a duty of care in the circumstances described in this Code. In most cases, following an approved code of practice would help achieve compliance with the health and safety duties of the *WHS Act*, in relation to the subject matter of the code. Like regulations, codes deal with particular issues however do not cover all hazards or risks that may arise. Duty holders are required to consider all risks associated with work, not only those for which regulations and codes exist.

Codes of practice 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 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 work health and safety than the code.

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

## Acknowledgement

SafeWork NSW wishes to acknowledge the contribution and collaboration of industry stakeholders throughout the public comment period and technical development of this Code.

Additionally, the cooperation of other WHS regulators and Safe Work Australia is acknowledged to align materials where appropriate, in particular from Safe Work Australia's Formwork and Falsework Guidance Material.

## Scope and application

**For the purpose of this Code, the term 'formwork' will be used to describe both formwork AND falsework, unless otherwise specified.**

This Code is intended to be read by PCBUs who have management or control of formwork in the workplace. It includes information about specific control measures required under the *WHS Regulation* for formwork.

You should use this Code if you design, construct, erect, alter, maintain, dismantle or remove formwork.

This Code may be a useful reference for persons interested in duties that relate to construction work under the *WHS Act* and *WHS Regulation*.

You should read this Code in conjunction with the *SafeWork NSW Code of Practice Construction Work*.

## **How to use this Code of Practice**

This Code includes references to the legal requirements under the *WHS Act* and *WHS Regulation*. These are included for convenience only and should not be relied on 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.

This Code comprises eight sections as outlined below. At the start of each section is a list of any relevant sections from the WHS Act and/or clauses from the WHS Regulation, which can be referred to for more information.

Section 1. Introduction - what is formwork, managing risks associated with formwork, consultation and communication.

Section 2. Design and planning of formwork - steps involved, responsibilities, safety reports, preparation, modifications.

Section 3. System of work - information, instruction and training, safe work method statements, emergency plans and procedures.

Section 4. Types of formwork – conventional, modular, scaffolding, slip and jump forms, travelling forms.

Section 5. Common hazards and controls – ground conditions, surrounding structures, collapse, electrical hazards, plant and collision.

Section 6. Falls – fall protection, perimeter screens, guardrails, ladders and penetrations.

Section 7. Erecting, altering, stripping/dismantling formwork – foundations, wall and column forms, false decks, installation, alterations, stripping/dismantling.

Section 8 – Slip and jump forms – entry and exit, trailing screens and platforms, climbing forms.

# 1. Introduction

This section defines what formwork is, the different types of formwork and what is involved in managing the risks associated with formwork. This section also explains the hierarchy of controls and how to apply it, as well as consulting with workers and other duty holders.

## 1.1 Who has duties under the law?

Everyone in the workplace has a work health and safety duty. A range of people have specific responsibilities for formwork including:

- A person conducting a business or undertaking (PCBU)
- an officer of a PCBU
- principal contractors
- designers, manufacturers, suppliers and importers of formwork, footings and foundations
- contractors and workers who carry out formwork activities
- other workers and persons at the workplace who are directly or indirectly involved with the formwork process e.g. electricians roughing in conduits, plumbers roughing in pipes or the installation of post tension cables, steel fixers, concrete placement and finishing trades, line pumps, satellites, etc.

## 1.2 What is formwork

'Formwork' means the surface of the form and framing used to contain and shape wet concrete until it is self-supporting.

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

Falsework includes the foundations, footings and all structural members supporting the permanent structural elements. Falsework can be used to support formwork for in-situ concrete, prefabricated concrete elements, steel sections or stone arches e.g. during bridge construction.

### 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 e.g. silos, stacks, chimneys or tunnels, and ventilation shafts.

The term 'climb form' is sometimes used to describe both slip and jump forms. Power for the climbing operation is usually by hydraulic rams or electric motors connected to climbing feet or screw feet or screw shafts.

Jump forms climb in steps following each concrete pour. This type of construction is more suited to high rise building cores where there are regular levels (floors) and joints will not be seen.

'Travelling formwork' moves horizontally, allowing the repeated construction of structural elements e.g. 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, e.g. over rivers and operating roads or railways.

## 1.3 Managing risks associated with formwork

<b>WHS Regulation clause 297</b>	Management of risks to health and safety
<b>WHS Regulation clause 32</b>	Application of part 3.1
<b>WHS Regulation clause 33</b>	Specific requirements must be complied with
<b>WHS Regulation clause 34</b>	Duty to identify hazards
<b>WHS Regulation clause 35</b>	Managing risks to health and safety
<b>WHS Regulation clause 36</b>	Hierarchy of control measures
<b>WHS Regulation clause 37</b>	Maintenance of control measures
<b>WHS Regulation clause 38</b>	Review of control measures

This Code provides guidance on how to manage risks associated with formwork using the following systematic process:

- identify hazards - find out what risks could cause harm
- assess risks - understand what harm could be caused by the risk, how serious the harm could be and the likelihood of it happening. This step may not be necessary if you are dealing with a known risk with known controls
- control risks - implement the most effective control measures, reasonably practicable in the circumstances, in accordance with the hierarchy of control
- ensure that controls remain effective by reviewing them regularly.

The *WHS Regulation* requires duty holders to work through the hierarchy of control when managing risks associated with construction work; however, the hierarchy of control can be applied to any risk.

The hierarchy ranks control measures from the highest level of protection and reliability through to the lowest. Where reasonably practicable, you must eliminate a hazard, which is the most effective control.

If this is not reasonably practicable you must minimise the risk so far as is reasonably practicable, by doing one or more of the following:

- substitute hazards with a safer alternative e.g. for formwork, this could include using precast columns and beams instead of constructing formwork and pouring concrete on site
- isolate the hazard from people, e.g. by creating an exclusion zone to prevent people entering an area where formwork is to be erected and stripped/dismantled; or

- use engineering controls, such as handrails and edge protection to prevent falls from heights.

If a risk remains after implementing the above control measures, you must implement the following controls in the order below to minimise the remaining risk, so far as is reasonably practicable:

- administrative controls to minimise any remaining risks, and
- then use personal protective equipment (PPE) to minimise any risks that remain.

A combination of controls may be used if a single control does not adequately minimise the risks.

Duty holders must ensure control measures are maintained so they remain effective. A duty holder must regularly review and revise control measures, so far as reasonably practicable, in the work environment. Duty holders need to consult with workers and take into consideration changes such as the nature and duration of work to ensure that each control measure is functioning as planned.



Figure 1 – the risk management process

Further guidance on the risk management process and the hierarchy of control measures is contained in the *SafeWork NSW Code of Practice - How to Manage Work Health and Safety Risks*.

## 1.4 Consultation and communication

**WHS Act section 46**      Duty to consult with other duty holders

**WHS Act section 47**      Duty to consult workers

**WHS Act section 48**      Nature of consultation

Consultation involves sharing information, giving workers a reasonable opportunity to express views and taking those views into account before making decisions on health and safety matters, and then advising workers of the outcome of the consultation in a timely manner.

A PCBU must consult, so far as is reasonably practicable, with all workers who are likely to be affected, along with their health and safety representatives (if any) or health and safety committee (if any) when deciding how to manage the hazards and risks of formwork activities on site.

This might include toolbox talks or pre-start meetings where both the builder and sub-contractors can provide information on how formwork can be carried out in a safe and healthy manner.

If more than one person has a duty in relation to the same matter, each person with the duty must, so far as is reasonably practicable, consult, cooperate and coordinate activities with all other persons who have a duty in relation to the same matter.

A PCBU will have health and safety duty to workers and persons at the workplace who are directly or indirectly involved with the formwork process. This might include, but is not limited to electricians roughing in conduits, plumbers roughing in pipes or the installation of post tension cables, as well as concrete placement trades.

When a formwork deck is ready for other PCBUs to work on, a Formwork Deck Handover Certificate may be used to facilitate consultation.

Further information is contained in the *SafeWork NSW Code of Practice - Work Health and Safety Consultation, Cooperation and Coordination*.

# 2. Design and planning for formwork

This section explains the roles and responsibilities of people involved in the design and planning for formwork construction, information on design safety reports and how they are to be used, and which hazards must be included in the report. Section 2 also provides detail on the planning responsibilities of each party involved in constructing the various types of formwork.

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 (see Section 1 for detail).

Further guidance can be found from the Australian Standard (AS) series AS 3610 *Formwork for concrete*, as well as any manufacturer recommendations.

## 2.1. Designers of formwork

<b>WHS Act section 22</b>	Duties of persons conducting businesses or undertakings that design plant, substances or structures
<b>WHS Regulation clause 294</b>	Person who commissions work must consult with designer
<b>WHS Regulation clause 295</b>	Designer must give safety report to person who commissions design
<b>WHS Regulation clause 296</b>	Person who commissions project must give information to principal contractor

PCBs who design a structure to be used, or could reasonably be expected to be used, as or at a workplace have specific WHS duties.

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 series.

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

- 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.

For detailed guidance on designer duties refer to the *SafeWork NSW Code of Practice - Safe Design of Structures*.

## 2.2. The designer safety report

<b>WHS Regulation clause 295</b>	Designer must give a safety report to persons who commission design.
<b>WHS Regulation clause 296</b>	Person who commissions project must give information to principal contractor
<b>WHS Regulation clause 297</b>	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 safe work method statement 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
- 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.

## **2.3. Commissioning construction work**

**WHS Regulation clause 294** Person who commissions work must consult with designer

**WHS Regulation clause 295** Designer must give safety report to persons who commission design

**WHS Regulation clause 296** Person who commissions project must give information to principal contractor

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
- a subcontractor engaging an engineer to design precast and tilt-up panels for a project.

## 2.4. Planning by the principal contractor

The principal contractor has a statutory duty imposed by the *WHS Act*, to 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 must plan for work to be done safely.

When planning the sequence of work, the principal contractor and all other PCBUs, must consult with other duty holders and workers, including contractors. Safe work method statements provided by the contractor should be reviewed.

Before formwork operations start, the principal contractor, in consultation with the contractor carrying out the work, should check the formwork design complies with AS 3610 series and must undertake at least the following steps:

- 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
- 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.

## 2.5. Planning by the formwork contractor

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
- identify how to prevent the risk of injury including falling objects, falls, slips and trips
- provide a documented safe work method statement, describing the safe sequence of work tasks and activities and how the high risk construction work will be done safely
- assess hazardous manual handling tasks
- 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 safe work method statement 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 safe work method statements
- regularly inspect and maintain formwork components, including for evidence of damage and the need to remove/replace damaged and/or worn components.

## 2.6. Preparation

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 personal protective equipment 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
- emergency and evacuation procedures in the event of an incident, injury or other emergencies.

## 2.7. Conventional/modular systems

Structural designers are responsible for the permanent structure design which subsequently influences the design of formwork, formwork decks, falsework, supporting structures, integrated access and work platforms, and structural connections.

To minimise risk the principal contractor, in conjunction with the designers of the permanent structure, should:

- 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
- 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.

Lifting and placing loads is common practice in formwork. Designers should consider appropriate work systems so formwork structures withstand loads.

Formwork designers should also:

- determine the vertical pour rates for walls, columns and other vertical concrete elements before completing the installation design
- consider the method and sequence of erecting and stripping/dismantling the designed formwork and the related risks e.g. manual tasks and working at height
- allow for perimeter protection screens to be fixed to the formwork.

For standard formwork such as conventional, flat or raft slabs and band beam structures, standard formwork details or manufacturer's publications should be referenced and may be used for formwork layout.

## 2.8. Slip forms and jump forms

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.

When designing complex formwork systems duty holders, including the designer, must comply with the risk assessment methodology outlined in Part 1.3 of this document.

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 principle 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
- providing an operating manual that includes any procedures or limitations required for safe use and an alternate egress.

## 2.9. Loading

Formwork should be designed for the most adverse combination of dead and live loads that can reasonably be expected during construction, use and stripping/dismantling.

Dead loads relate to the self-weight of the formwork structure including deck, catch or access platforms, stairways, ladders, screens, sheeting, tie assemblies, scaffolding hoists or electrical cables that are likely to act continuously.

Live loads include the weight of people, materials, debris, plant, tools and equipment that are not continually in place, as well as environmental loads like wind, rain and snow.

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.

The designer should be consulted if the formwork is to be altered e.g. wind and rain loads may increase if perimeter protection screens, shade cloth or signs are attached to the formwork.

Scaffolding should not be used to support formwork and plant unless the scaffold installation is specifically designed for this purpose.

## 2.10. Plant design

Structural components, including frames specifically intended to support formwork, do not require design registration. However, if traditional prefabricated scaffolding is used as part of the supporting structure, the prefabricated scaffolding does require design registration. The

design registration number should be obtained from the scaffolding supplier and be readily accessible.

The formwork designer is responsible for selecting the appropriate structural components and preparing a design specifically for the job. Different types of formwork components should not be mixed unless they are identified as compatible in the manufacturer's instructions or by the owner of the design or their representative.

The formwork components are considered plant and may be purchased, hired or supplied by a suitable contractor.

An importer of prefabricated formwork who is unable to source the necessary information from the original designer or manufacturer has a duty to demonstrate that the plant satisfies health and safety requirements. This can be achieved by providing test reports from a facility registered by the National Association of Testing Authorities (NATA) and having a competent person develop the information that complies with the relevant Australian Standard(s).

Further information about the safe design of plant is in the *SafeWork NSW Code of Practice Managing the Risks of Plant in the Workplace*.

## 2.11. Formwork design modification

A formwork designer includes anyone who modifies a design. As an example, if the capacity of formwork is to be increased by adding more components, a designer must complete additional calculations to ensure the modified structure is capable of supporting the extra load. The person designing the addition has designer duties. If they are not the original designer, they should consult the original designer to ensure the new configuration does not compromise the existing design specifications or safety factors.

Design modifications do not include where a designer has included provisions for site-based variation within their design e.g. specifying a minimum and maximum frame spacing and allowing the formworker to choose the spacing provided it remains within these values.

If changes are made to a construction procedure the designer should be consulted and the relevant documents updated to clearly show the revisions. Provisional updating by marking up or preparing hand drawn detail and signing and dating the mark-up or new detail should be countersigned by the designer where applicable.

Further information on safe design is in the *SafeWork NSW Code of Practice Safe Design of Structures* and Safe Work Australia's *Guide for Safe Design of Plant*.

# 3. Systems of work

This section looks at the need for a system of work for changing circumstances as a formwork build progresses and what might be included in that system, what training is required for different workers on site, safe work method statements for high risk construction work and the need for emergency plans.

A system of work should be clear but able to be reviewed to meet changing circumstances as work progresses. Systems of work should provide for the assessment and control of any new risks arising from proposed changes to work before the changes take place.

A documented safe system of work is an administrative control that complements higher level controls. This could include:

- communication and consultation
- a project risk assessment
- safe work method statements for high risk construction work
- access and egress
- exclusion zones
- permit-to-work systems
- fall arrest or work positioning systems
- inspection and maintenance
- evaluation of controls
- emergency evacuation arrangements
- changes to work arrangements.

## 3.1. Information, training and instruction

**WHS Regulation clause 39** Provision of information, training and instruction

**WHS Regulation clause 316** Duty to provide general construction induction training

**WHS Regulation clause 317** Duty to ensure worker has been trained

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. Reference must be made to operator's manuals
- any specific safety information i.e. precautions for working under certain conditions
- personal protective equipment required including instruction in fitting, use, cleaning, maintenance and storage
- details of previous incidents involving the same work process(es).

A PCBU must ensure that anyone undertaking construction work has successfully completed general construction induction training.

For some tasks, a person will need to hold the appropriate high risk work licence e.g. for scaffolding work or operating cranes, hoists, forklifts or boom-type elevating work platforms to construct formwork.

A person who erects or dismantles formwork should be provided with all necessary information, training and instruction to ensure they are competent to do the work safely.

Any training, instruction and information must be provided in a form that can be understood by all workers. Training should require workers to demonstrate that they are competent in performing the required tasks. It is insufficient to simply give a worker a task and ask them to acknowledge that they understand and are able to perform it.

Most control measures depend on workers and supervisors having the appropriate competencies to do the job safely. Training should be provided to maintain competencies and to ensure new workers are capable of working safely.

Training can include:

- completion of formal qualification CPC31511 – Certificate III in Formwork/Falsework
- verification of competencies by industry-recognised courses that give consideration to all or some of the units of competency contained in CPC31511
- working under direct supervision of a suitably qualified or a competent person.

## 3.2. Safe work method statements (SWMS)

<b>WHS Regulation clause 291</b>	Meaning of "high risk construction work"
<b>WHS Regulation clause 299</b>	Safe work method statement required for high risk construction work
<b>WHS Regulation clause 300</b>	Compliance with safe work method statement
<b>WHS Regulation clause 301</b>	Safe work method statement – copy to be given to principal contractor
<b>WHS Regulation clause 302</b>	Review of safe work method statement
<b>WHS Regulation clause 303</b>	Safe work method statement must be kept
<b>WHS Regulation clause 312</b>	High risk construction work – safe work method statements

The construction of formwork or any work on the resulting structure may involve activities defined as 'high risk construction work' under the *WHS Regulation*.

A safe work method statement (SWMS) must be prepared for high risk construction work before any work starts. The SWMS must:

- identify the type of high risk construction work being done
- specify the health and safety risks arising from the work
- describe how the risks will be controlled
- describe how the controls are to be implemented, monitored and reviewed.

The SWMS must be developed in consultation with the workers undertaking high risk construction work and their representatives. The SWMS must be kept and be readily accessible, generally at the workplace where the high risk construction work will occur. If the SWMS is not kept at the workplace, then it should be stored at a location where it can be delivered to the workplace quickly. A SWMS can also be kept electronically.

Further information on high risk construction work, SWMS and a SWMS template are contained in the *SafeWork NSW Code of Practice - Construction Work*.

### 3.3. Emergency plan

**WHS Regulation clause 43**      Duty to prepare, maintain and implement emergency plan

**WHS Regulation clause 314**      Further health and safety duties – specific clauses

An emergency plan must be prepared and maintained for the workplace and must provide procedures for an effective response to an emergency.

The plan should include:

- evacuation procedures
- how to notify emergency services at the earliest opportunity
- medical treatment and assistance, and
- how to communicate with emergency services and others at the workplace.

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.

## 3.4. 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
- 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.

For further information see *Fact Sheet: Emergency Plans* (available on Safe Work Australia's website), and *SafeWork NSW Code of Practice - Managing the Work Environment and Facilities*.

# 4. Types of formwork

This section looks at the different formwork systems and how they impact the safety of workers on site, as well as the uses of slip and jump forms and travelling forms. 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 risk of falls and hazardous manual tasks.

## 4.1. Conventional formwork systems

Conventional formwork systems are typically constructed on site, from timber and plywood with supporting 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 conventional system, a standard formwork frame with a known tested loading capacity should be used wherever possible. Standard frames can minimise the risk to workers erecting and stripping/dismantling the formwork and can be used for handling and storing materials.

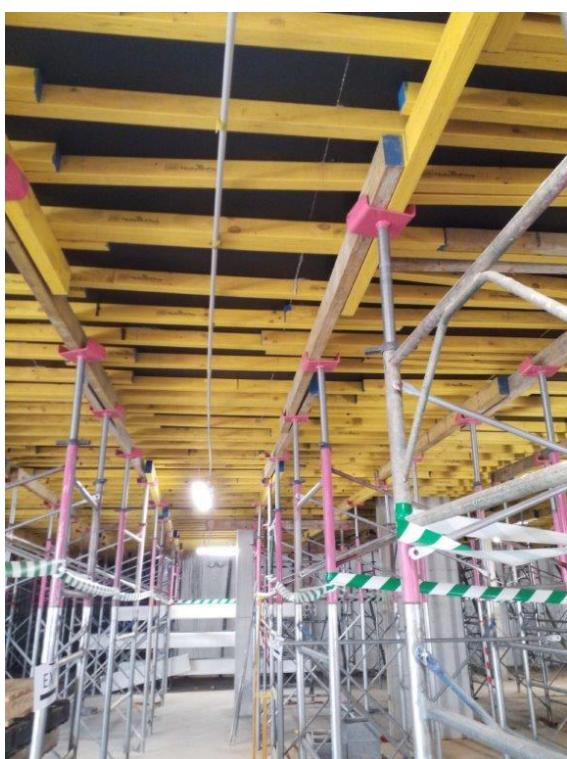


Figure 2 – conventional formwork system

## 4.2. Modular formwork systems

Modular formwork systems are specially designed and manufactured off site. Modular systems usually have proprietary components and rated load calculations set out by the manufacturer. These systems are often made from hardboard, plastics, steel and aluminium.

Modular formwork systems should be constructed in accordance with manufacturer's recommendations and pre-determined standard designs.

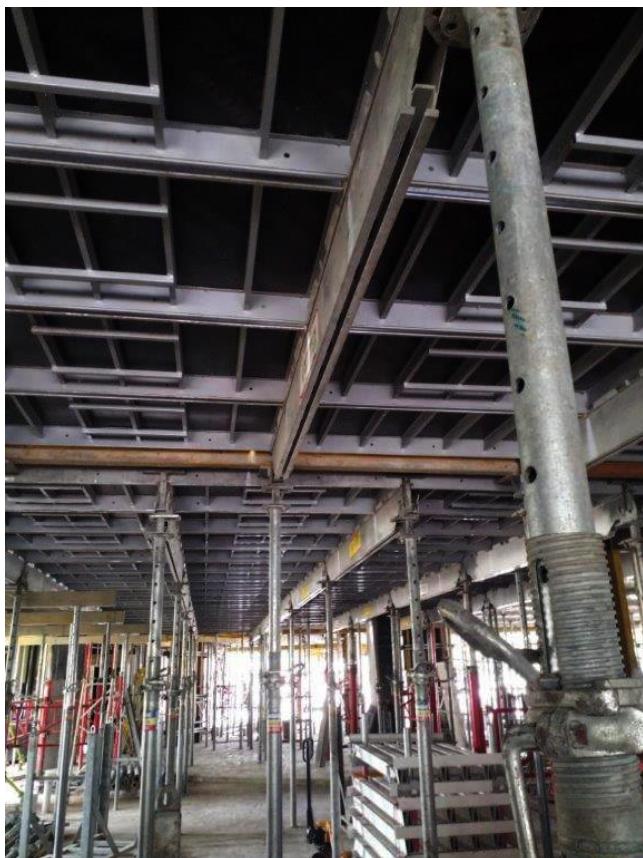


Figure 3 – modular formwork system

## 4.3. Scaffolding components in falsework

Falsework systems are specifically designed to support formwork structures, including components that transmit all or part of the loads to a lower level. This includes undisturbed supports, back props, props and shoring.

Scaffolding equipment may be used as falsework to support formwork. Formwork is not considered to be a scaffold platform. Falsework supporting only formwork is not considered to be a scaffold, even if it is constructed using traditional scaffolding components.

Where falsework is not specifically designed or erected to support working platforms and has only been designed and erected to support concrete, it does not require a person to hold a high risk work licence to erect it.

However, where completed falsework will support scaffold platforms from which a person or object could fall more than 4m, then the persons erecting will require a scaffolding high risk work licence. This does not include the erection of platforms, false/intermediate decks and catch decks used for the construction of the falsework and formwork.

## 4.4. Slip forms and jump forms

Slip forms and jump forms are the terms given to 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 either slip or jump forms. Power for the climbing operation is usually provided 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.

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

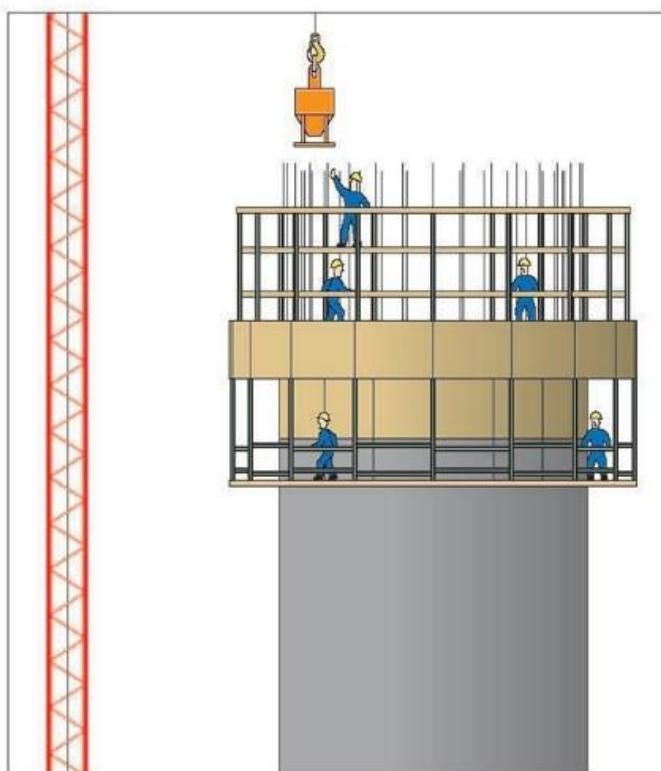


Figure 4 – slip form

Jump forms climb in steps following each concrete pour. This type of construction is more suited to high rise building cores where there are regular levels (floors) and joints will not be seen.

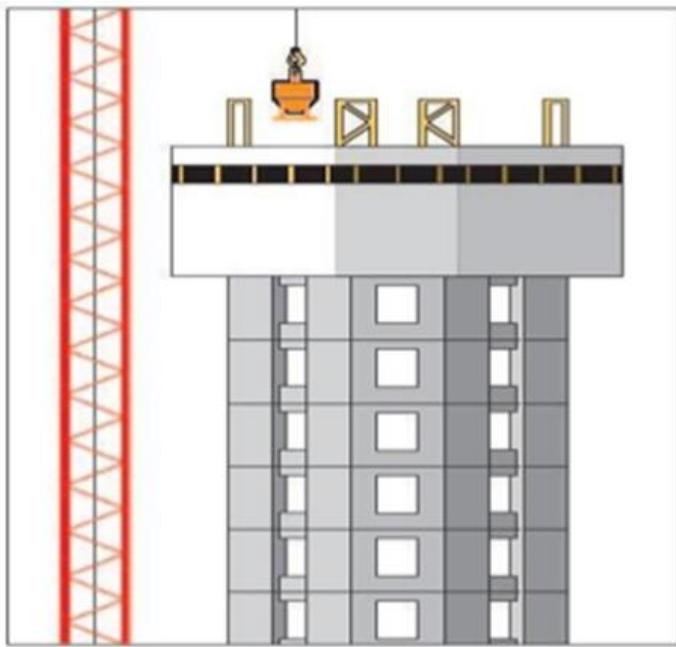


Figure 5 – jump form

## 4.5. Travelling forms

Travelling formwork moves horizontally, allowing the repeated construction of structural elements such as 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 e.g. over rivers and operating roads or railways.

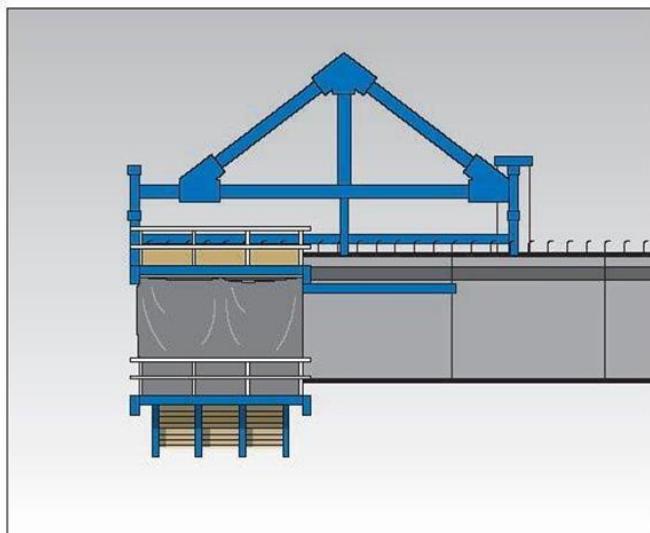


Figure 6 – travelling form

# 5. Common hazards and controls

This section provides information about common hazards and what to consider when controlling those hazards around formwork. This includes electrical hazards, access and egress, how to lift plant, using lifting points and collisions. Section 6 addresses the specific hazards around falls.

## 5.1. 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.

Further information on excavation work is in the SafeWork NSW *Code of Practice Excavation work*.

## 5.2. 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.

## 5.3. 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 (WLL) of props, frames or any other supporting member or structure
- using proprietary pins, not improvised bolts or reinforcing steel, in props or other systems requiring specific connecting devices.

## 5.4. Electrical power lines

**WHS Regulation clause 166**      Duty of person conducting a business or undertaking

**WHS Regulation clause 291**      Meaning of “high risk construction work”

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.

## 5.5. Access and egress

**WHS Regulation clause 40**      Duty in relation to general workplace facilities

**WHS Regulation clause 78**      Management of risk of fall

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
- non-mechanical forms of exit e.g. a ladder or stair tower in case of power failure or other emergency situation.

## 5.6. Working areas for following trades

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

A ‘formwork only’ exclusion zone should be maintained behind the leading edge, clearly marked by signs and a barrier. Figure 7 shows the work zone for ‘other workers’ 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.

Further information is contained in the *SafeWork Code of Practice Managing the Risk of Falls at Workplaces*.

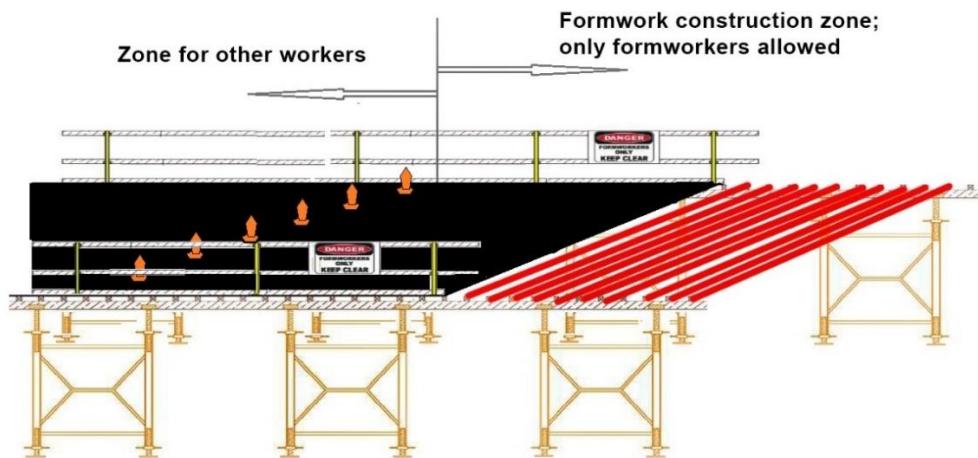


Figure 7 - defining work zones. Example of defining work zones for other trade workers and formwork construction. Note guardrails removed for clarity.

## 5.7. Falling objects

**WHS Regulation clause 54** - Management of risk of falling objects

**WHS Regulation clause 55** - Minimising risk associated with falling objects

In managing the risk of falling objects, the following control measures should be considered:

- overhead protective structures

- perimeter protection screens
- catch platforms
- tool tethering
- kickboards
- exclusion zones.

For larger objects, a reasonably practicable control measure would be to install an industrial safety net below the working deck and around the perimeter of the structure. Alternatively, an exclusion zone could be established below the structure.

Before using perimeter protection screens, consider other risks like electricity and additional dead and live loads. Factors such as extra wind loading should be considered, in consultation with the principal contractor and structural engineer, when selecting a screening material. The framework must be able to support the screen load.

Containment netting will be significantly heavier and less permeable to wind when wet, so both dead and wind load will increase and need to be accounted for in a risk assessment.

## 5.8. 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
- formly 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
- 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 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
- point loadings should not exceed the maximum weight specified by a designer
- 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
- before people leave the workplace, plant and materials should be secured movement by wind loads.

## 5.9. 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.

## 5.10. 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. 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.

## 5.11. Plant and collision

<b>WHS Regulation Part 3.1</b>	Managing risks to health and safety
<b>WHS Regulation clause 203</b>	Management of risks to health and safety
<b>WHS Regulation clause 214</b>	Powered mobile plant – general control of risk
<b>WHS Regulation clause 215</b>	Powered mobile plant – specific control measures

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 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
- 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 *SafeWork NSW Code of Practice - Managing the Risks of Plant in the Workplace*.

# 6. Falls

<b>WHS Regulation clause 78</b>	Management of risk of fall
<b>WHS Regulation clause 79</b>	Specific requirements to minimise risk of fall
<b>WHS Regulation clause 225</b>	Scaffolds

This section provides information specific to the risk of falls on and around formwork, and considerations around how to adequately address this risk including scaffolding, rails, penetrations and falls from ladders.

The risk of falling should be managed 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
- unsafe access/egress on a completed deck prior to concrete placement.

Engineering controls like handrails, edge protection and perimeter protection screens can minimise the risk of a fall from one level to another.

Perimeter protection screens are fixed to the permanent structure or working platform to prevent objects and people falling outside the work area. This significantly minimises the risk of injury.

Temporary catch platforms or industrial safety nets can catch falling objects and minimise the distance a person could fall during work at height.

Work positioning systems or fall arrest systems should only be used where other risk controls are not reasonably practicable.

Further information on falls is contained in the *SafeWork NSW Code of Practice Managing the Risk of Falls at Workplaces*.

## 6.1. Fall protection from the formwork deck

During formwork construction, the structure is constantly changing so continual modification and monitoring of fall protection is necessary.

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
- 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
- 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
- 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.

## 6.2. Perimeter protection screens

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 one (1) metre above the level of the finished slab.

When selecting protection screens the PCBU(s) 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
- 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.

## 6.3. 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 (figure 8).

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

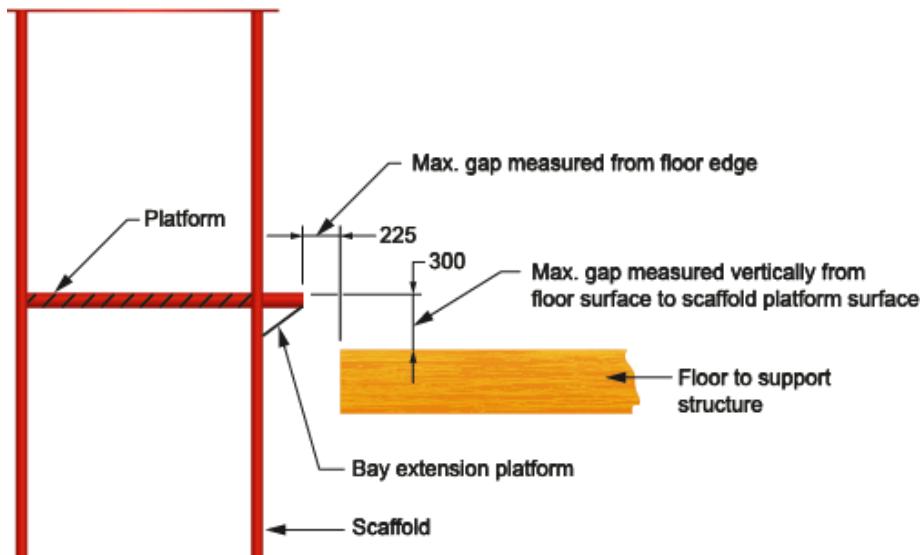


Figure 8 – Example of scaffold configuration when used as fall protection.

## 6.4. 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 900mm 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 9 – Guardrails for prevention of falls

## 6.5. Falls through penetrations

Penetrations on a formwork deck need to be covered by fit-for-purpose material and secured in position, clearly visible and identified, or have leading or perimeter edge protection.

Where a person or object could fall through a penetration, guarding must be installed. Open penetrations commonly found in formwork, for example stairwells, risers or access for services, create risks such as trips, falls or falling objects.

Protect open penetrations with edge protection such as handrails or by securely covering them.

Penetrations in concrete slabs can include cast-in-mesh as a back-up system. Where utilised, the mesh should be of a small aperture (50mm x 50mm mesh size or smaller) and made of material capable of withstanding potential imposed loads. Where mesh or other physical fall protection material is used for larger penetrations, this should be included in the slab design specifications to ensure it can withstand potential loads including people, equipment and material.

Penetration covers using plywood should be structurally graded and identified using a bright colour paint. The cover must be firmly secured to the concrete or formwork deck and designed for potential loads.

Before stripping/dismantling formwork, cover any penetration that will be exposed during the stripping/dismantling process.

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.

## 6.6. Falls from ladders

Ladders can be a means of access and egress onto a formwork deck. However, a safer method of accessing the formwork deck should be provided, such as scaffold or scaffold stairs. The risk of falls needs to be managed in accordance with Part 3.1 and the hierarchy of controls.

If a ladder is used, it must be set up on a solid and stable surface and set up to prevent slipping. Single and extension ladders can be prevented from slipping by:

- placing ladders at an angle of 4:1 to the wall
- securing ladders at the top or bottom (figure 10).

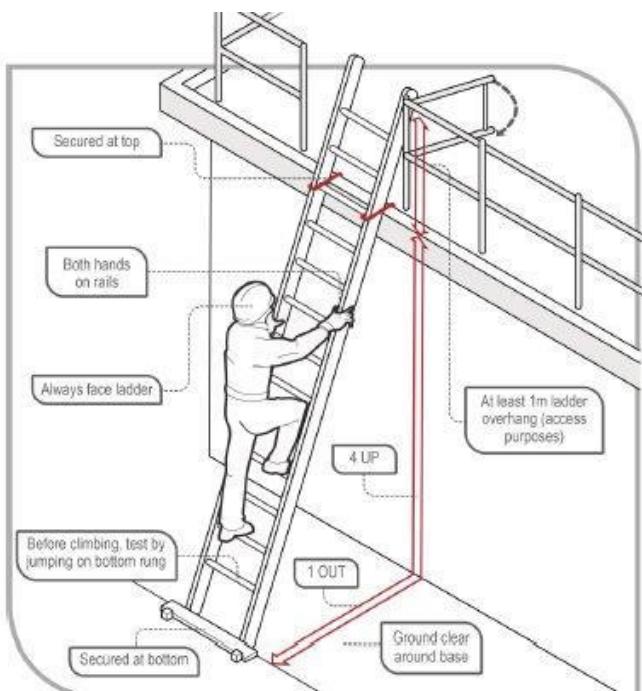


Figure 10 – ladder slipping prevention

In setting up fixed or extension ladders for access or egress, check that:

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

Ladders should be regularly inspected by a competent person in accordance with the manufacturer's recommendations. Ladders with any of the following faults should be replaced or repaired:

- fibreglass stiles cracked, chipped or severely faded with fibres exposed
- metal stiles twisted, crushed or with cracked welds or damaged feet
- rungs, steps, treads or top plates missing, damaged or loose
- tie rods missing, broken or loose
- ropes, braces, or brackets missing, broken or worn
- missing, loose, bent or worn fasteners e.g. rivets, bolts and pins
- worn or damaged feet, including non-slip material.

# 7. Erecting, altering and stripping/dismantling formwork

This section discusses the hazards that need to be considered in the stages of erecting, altering and stripping/dismantling formwork, when working with differing types of formwork systems. Information includes use of trailing access systems, wall and column forms, framing and working on and around false desks. This section also provides detail on installing bearers and joists, the requirements for altering formwork and the process of stripping/dismantling formwork.

## 7.1. Foundations and footings

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.

## 7.2. Conventional and modular formwork systems

Conventional and modular formwork should be systematically erected and dismantled by a competent person in accordance with the designer's or manufacturer's instructions.

Falsework may be constructed from prefabricated modular scaffold components, provided the structure is capable of withstanding the loading in AS 3610 series and such loading is permitted by the component manufacturer.

Falsework is not a scaffold, and a high risk work licence is not required to erect falsework.

An existing scaffold should not be used to support falsework unless permitted by the scaffold designer/manufacturer. If utilised, the scaffold should be capable of supporting the loads in AS 3610 series and also meet the operational requirements of AS/NZ 1576.1.

A high risk work licence is required to add any falsework components to existing scaffold from which a person or object can fall more than 4 metres. Safe systems of work should be developed relevant to the type and complexity of the formwork design to eliminate or minimise risk.

These systems might include:

- minimising working at height by assembling components on the ground
- providing safe temporary work platforms if work at height is required
- providing for the safe handling and operating of plant and equipment - large structures may require scaffolding or mobile plant to be located on suspended floors
- providing suitable plant and material handling, placement and storage arrangements to minimise manual tasks, and
- regular inspection and maintenance of individual components.

## 7.3. 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 per cent of the first slip load and are generally suitable for structural tensile loads
- coil bolts - the correct operation of coil bolts is greatly dependant on them being installed in accordance with the manufacturer’s specifications, e.g. 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.

### 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.

### **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.

### **Lifting methods**

Wall and column forms should be provided with designed lifting points. Design drawings should confirm this. 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.

## **7.4. Erecting formwork frames**

Formwork frames should be erected progressively to ensure the installers' safety and the stability of the overall structure.

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

If diagonal bracing or other edge protection is installed progressively on formwork frames, other fall prevention control measures may not be necessary.

Many conventional formwork frames consist of diagonal braces that cross in the middle. These braces are not suitable edge protection for a completed formwork deck, but they may provide reasonable fall protection during frame erection where braces are installed in a progressive manner as soon as the frames are installed.

As the height of formwork frames increases, there is a greater need to provide lateral stability.

Ensure framing, including bracing, is carried out in accordance with on-site design documentation and manufacturer's instructions.

When erecting or stripping/dismantling formwork frame towers that require people to work at heights of two (2) metres or more above a level below, a formworker can work within the formwork frame tower if there is fall protection within the frame tower structure.

Controlling the risk of falls while erecting or stripping/dismantling frames can be achieved by:

- providing fall protection within the frame structure during erection, by positioning an internal full deck, consisting of scaffolding planks or other suitable decking, no more than two (2) metres below a temporary working deck platform level.
- providing fall protection to all four sides of a frame structure, using the formwork frame along with the diagonal bracing or temporary handrails.

## 7.5. Formwork false decks

In situations where a deck is at a height that would require persons to stand two (2) metres or more to install bearers and joists for the formwork deck, a ‘false’ deck - a full deck the same area as the area being formed - should be provided (see figure 11).

This deck should be provided both inside and between formwork frames and can typically consist of formply, scaffold planks or modular platform sections. When erecting backpropping frame towers over two (2) metres high, a full deck of planks should be provided within the tower.

A protected access opening can be left in the deck to enable materials to be lifted up. A captive platform system is preferable to lapped planks as 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 that no gap exceeds 225mm wide and gaps may only exist where a vertical member of a frame passes through the deck.

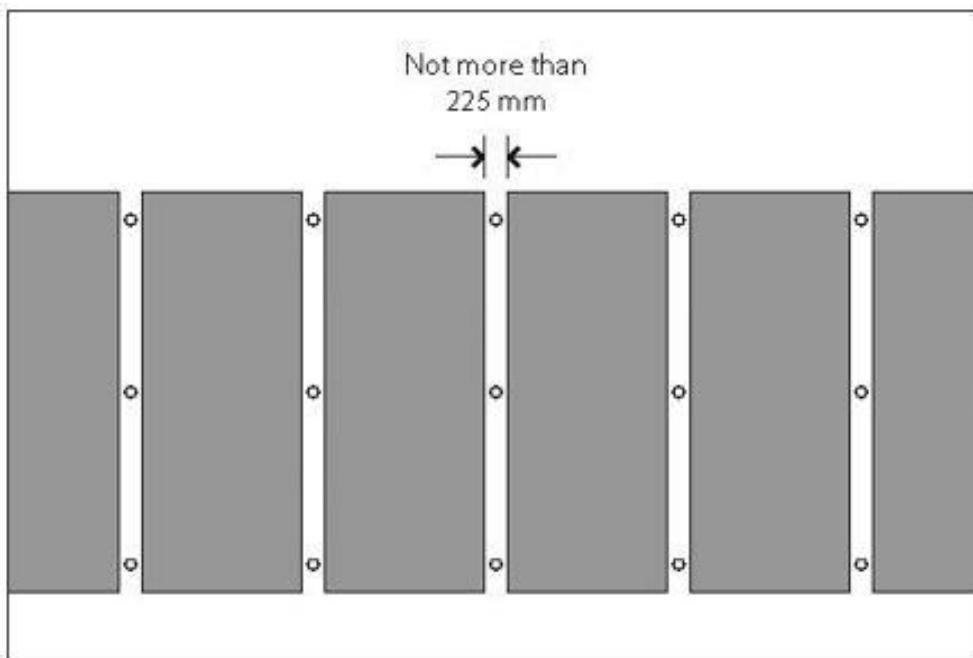


Figure 11: Plan view of a false deck with gaps at vertical framing members

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 stripping/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/dismantling. Workers must take reasonable care for their own safety by not climbing the framework.

## 7.6. Intermediate work platform

Where the potential fall distance is less than two (2) metres, an intermediate work platform can be provided that is at least 450mm wide (see figure 12).

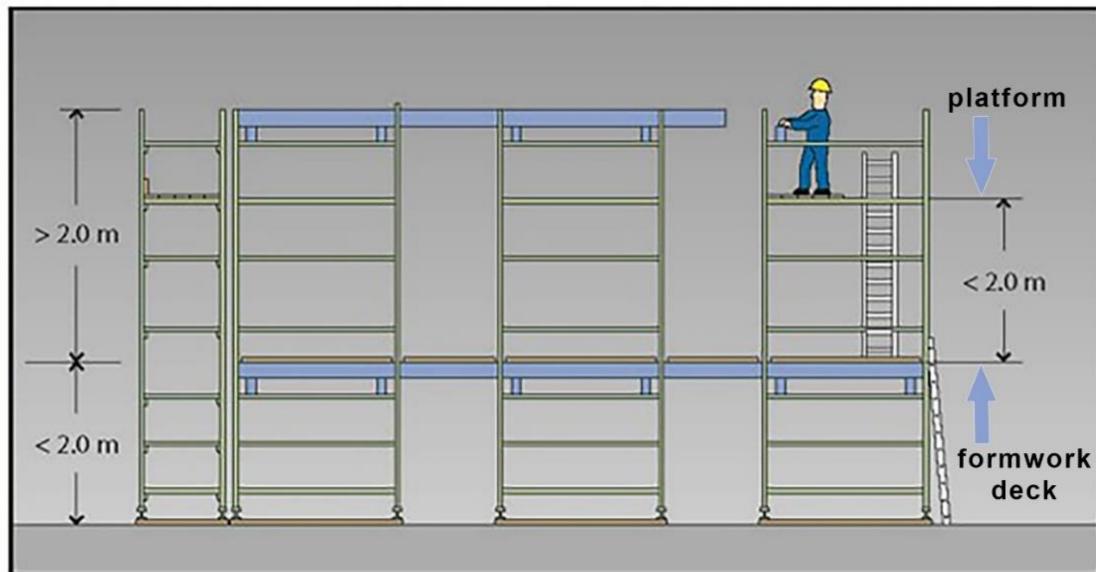


Figure 12: Worker erecting formwork from an intermediate work platform less than two (2) metres above a formwork deck where the deck to deck height is greater than two (2) metres.

## 7.7. Installing bearers

Bearers are the primary horizontal supports for a formwork deck, placed on top of formwork frames or props. They are usually timber. They should be placed in position from a work platform no more than two (2) metres below them.

Bearers should be positioned so they will not fall off the top of the frames. Usually, this is done by placing the bearers in U-heads on top of the frames and 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 unless a competent person requires otherwise. This can be done 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 effectively secured to the plate. Flat plates should only be used where specified by a competent person (See figures 13 and 14).

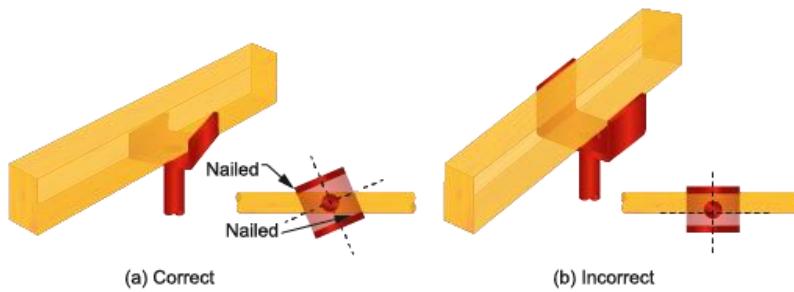


Figure 13 (above)

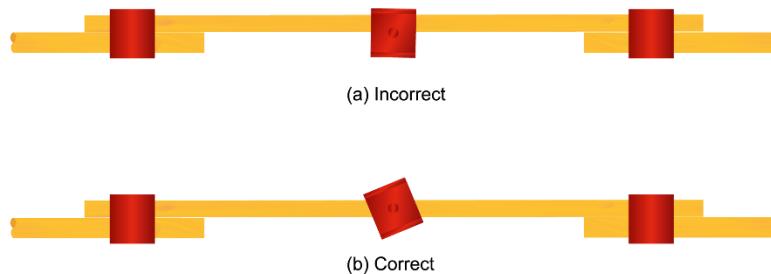


Figure 14 (above)

## 7.8. Installing joists

Where a false deck is provided at two (2) metres or less below a worker, joists may be spread on the bearers with the worker standing on top at bearer level.

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

A working platform at least 450mm wide e.g. two scaffold planks, should be used when the potential fall distance is less than two metres.

**It is not acceptable for a person to work from a single plank or bearer.**

The platform below the deck should be positioned at a suitable height for handling joists without introducing manual task risks and not greater than two (2) metres above the continuous deck or surface below.

## 7.9. Laying out formply on the deck

A formwork deck should be laid in a progressive way to prevent workers from falling.

This is particularly important where a false deck has not been provided within two (2) metres below the level of the deck to be laid.

In this situation formply may only be spread on the joists provided:

- a minimum of four joists at 450mm centres - 400mm gaps, totalling 1.8 metres - are located on bearers next to the person and in the other direction joists extend for at least 1.8 metres (figure 15). Therefore, if a person falls, they will fall onto the joists and should be stopped from falling further. Controls to minimise the sideways movement of joists should be put in place to further avoid potential falls through the joists
- workers should lay the formply in front of them so if they stumble, they are likely to fall on top of the sheets where a leading edge is involved and the distance below the deck being constructed is greater than two (2) metres, 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 two (2) metres, the SWMS must detail how work will be completed to control the risk of falls e.g. use of catch decks
- Workers should start laying the formply sheets from the perimeter scaffolding or other edge protection provided on the perimeter of the formwork.

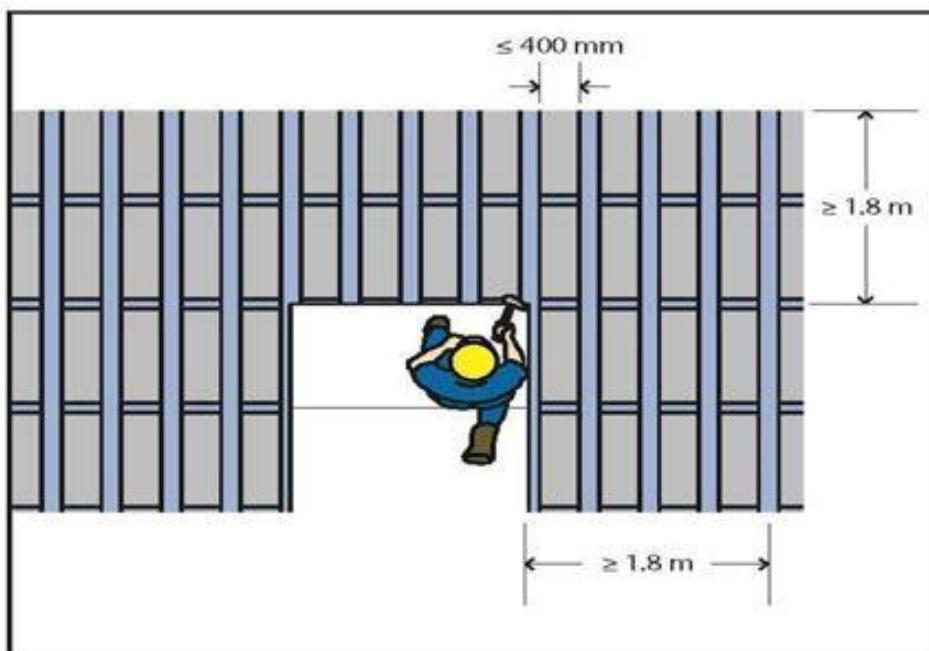


Figure 15: Maximum spacing of timbers where deck height is over more than two (2) metres in height from deck below.

## 7.10. Cantilevers

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

When designing a formwork system, the use of cantilevers should be kept to a minimum unless unavoidable. Then a formwork designer should consider the potential for the cantilevers to pivot. The design should include measures to secure the cantilevers so this will not occur. This could include temporary propping, nailing, bolting etc. If nailing is used, the formwork design should specify the nailing detail to be followed including 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. The locations of loads are clearly shown on formwork plans.

## 7.11. 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.

Fall hazards from uneven floors are most effectively managed by ensuring formwork supports and the deck are progressively constructed for the lower parts before work starts on the higher-level areas of the deck.

## 7.12. Pre-loading inspection and certification

Inspection and certification processes contribute to controlling risks during the construction of formwork. Formwork should comply with AS 3610 series (formwork for concrete).

Inspections and clearance to load should be done by a competent person at key stages during construction i.e. if formwork is being loaded with components, equipment or pre-stressed tendons.

A separate certification process should occur when the formwork is complete and prior to concrete being poured.

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.

## 7.13. 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
- ensure alterations do not compromise the structural integrity of the formwork
- ensure regular inspections are in place to identify unauthorised interference with the formwork.

See also section 2.11 Formwork design modification.

## 7.14. Monitoring

A competent, designated observer should continuously monitor the formwork assembly during concrete-placing operations and have an appropriate communication system for emergencies.

Nobody should be underneath a formwork deck during concrete placement so far as reasonably practicable, nor should they stand directly underneath an area where wet concrete is being placed into the forms. Equipment such as CCTV or remote mounted cameras can be used to safely assess a pour.

Competent persons should be on site during concrete placement to make any emergency adjustments or repairs. The concrete placement should stop during adjustments and repairs at the discretion of a competent person.

## 7.15. 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.

## 7.16. Pre-stripping/dismantling authorisation

Before stripping/dismantling, a competent person such as an engineer with experience in structural design should provide written confirmation the permanent structure is self-supporting and formwork can be removed. The certification should be based on the design specifications for the structure, the verification of the cure and strength of the concrete and the time elapsed since the concrete 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.

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 review the methodology of formwork stripping/dismantling to ensure the permanent concrete element will not fail and result in structural collapse.

## 7.17. Stripping and dismantling formwork

As with formwork erection, stripping/dismantling should be carried out in an orderly, systematic and progressive manner so the deck is gradually removed. While falling objects are the primary hazard, there may also be fall hazards as a result of floor collapse and manual tasks hazards from working in awkward postures, repetitive handling of materials and limited task variety.

Formly may be removed by partially lowering the support system and dropping the sheet onto the support system. This eliminates the need to manually lift sheets from ground level.

In conventional tableform and most hybrid systems, safe, sequential removal involves:

- unwinding jacks and the removal of formwork sections individually
- keeping the removal area free of trip hazards
- managing height issues such as perimeter falls through penetrations and voids (e.g. service risers, shafts lift shafts stair voids) with rails, scaffold, secured and marked covers or other forms of fall protection
- provision of appropriate task lighting.

**Drop stripping (uncontrolled release of formwork components) is not permitted at any time.**

When assessing the risks from stripping/dismantling formwork, consider:

- the number of people needed in the crew
- the sequence of stripping/dismantling 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 deck or whether the supports will be lowered slightly but remain under the formly 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/dismantling and/or building process such as checking of back-propping after post-tensioning
- providing lighting for the work area and surroundings
- maintaining housekeeping, removing nails and rejected materials, stacking stripped/dismantled formwork and removing tripping hazards like concrete nails and brace anchor inserts from the floor.

### **Bond reduction**

Stripping/dismantling formwork is easier when the strength of the bond between the form material and the concrete is reduced. A liquid bond breaker can be used on wall and column forms but use on floor forms is not encouraged as it can cause a slip hazard.

# 8. Slip and jump forms

This section provides information specific to slip and jump forms, and the hazards that relate to their construction and use including safely climbing forms and using trailing screens and platforms.

## 8.1. Access and egress

Access to the form can include one or more of the following:

- personnel hoists on the building
- permanent stair systems in the building
- a trailing stair system suspended from the slip form or jump form
- a trailing ladder system.

The use of a trailing stair system should be considered instead of a ladder system as it minimises the risk of falls. Emergency evacuation is also generally easier on a stair system.

The entry area between the trailing access system and the building should be clear of trip hazards with no gaps between platforms.

A formwork designer should ensure a trailing access system is designed for loads that could be applied in an emergency evacuation. Both the system itself and the form should be able to withstand applied loads from the access system.

Where the designer of the formwork specifies a lesser live load than 2.5 kPa (250kg/m<sup>2</sup>), the formwork contractor should:

- fix a sign in a visible position stating the stair's maximum load
- develop and implement written procedures to ensure the maximum number of people on the form is not exceeded.

Entry ladders should be secured in place (refer to part 6.5 of this document).

Entry openings for ladders on working decks should have guardrails and trapdoors that are closed except when being used. Trapdoors should easily open from above with a device that does not pose a trip hazard for people on the deck

Workers must be provided with safe entry to and exit from the formwork, falsework, jump form, slip form or travelling form during erection, use and stripping/dismantling. This includes for people slinging or unslinging loads.

Safe entry and exit to large or complex formwork structures include:

- installing permanent stairs, platforms or ramps
- installing temporary stairs, with temporary treads and landings, or ladder access systems, and
- personnel hoists, but non-mechanical forms of exits should also be provided in case of power failure or emergency (e.g. ladder or stair tower).

Stair towers secured to scaffold bays provide suitable and flexible entry. Fixed industrial single ladders, not extension ladders, may be used for entry to and exit from a scaffold. Ladders should not be used as a work platform.

## 8.2. Trailing screens and platforms

Trailing screens can provide edge protection, a means of preventing falling objects and be designed to incorporate working platforms. Where platforms are provided these are usually for the purpose of carrying out minor repairs and for entry to the form.

A formwork designer should specifically address all issues for which the trailing screen system is designed, including:

- a suitable design loading for platforms on the trailing system, with signs fixed to the platforms stating the maximum load permitted in kilograms. Everyone should be aware of the maximum loading that may be applied to the trailing platform and this should be documented at the site
- controlling the risk of falling objects
- securing platforms to prevent uplift or other movement
- minimising the number of people on trailing platforms while platforms are lifted or suspended by a crane.

Anyone on a platform while it is being lifted or suspended by a crane should hold at least a dogman or rigger licence or should be supervised by a person who holds one. Ensure there is a clear method of communication between the crane operator and the dogman or rigger responsible for directing the lift, for example a whistle or two-way radios.

Fall protection should be in place for any gaps that may exist on the inside edge of a platform i.e. between the platform and the wall being constructed.

Fall arrest harnesses may be provided so long as workers are trained in their safe use, and a rescue procedure document exists for retrieving workers after a fall. To prevent objects falling, heavy-duty containment netting should be used rather than small aperture mesh with edge protection.

## 8.3. 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
- 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.

# Appendix A – Glossary

Term	Description
<b>Builder</b>	A person conducting a business or undertaking (PCBU) that commissions the construction work and is authorised to manage, control and coordinate the construction work at the workplace.
<b>Catch platform or catch deck</b>	A catch platform is a temporary platform located below a work area to catch a worker in the event of a fall.
<b>Competent person</b>	A person who has acquired through training, qualification or experience, the knowledge and skills to carry out the task.
<b>Construction work</b>	Any work carried out in connection with the construction, alteration, conversion, fitting-out, commissioning, renovation, repair, maintenance, and refurbishment, demolition, decommissioning or stripping/dismantling of a structure.
<b>Containment netting</b>	Containment netting may also be referred to as containment sheeting or screening or scaffolding mesh or shade cloth.
<b>Conventional frame</b>	A component comprising two vertical members braced by horizontal and or diagonal members that are used in pairs when separated by bracing members to support formwork.
<b>Control measure</b>	An action taken to eliminate or minimise health and safety risks so far as is reasonably practicable. A hierarchy of control measures is set out in the WHS Regulation to assist duty holders to select the highest control measures reasonably practicable.  Note: the WHS Regulation also refers to a control measure as a risk control measure or a risk control. In this Code, control measure is used.
<b>Conventional formwork</b>	A formwork system typically constructed on-site from timber or plywood and supporting elements such as supporting frames.
<b>Dead and live loads</b>	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: <ul style="list-style-type: none"><li>• the weight of people, materials, debris, plant, tools and equipment</li><li>• environmental loads e.g. wind, rain, and</li><li>• impact forces.</li></ul>

Term	Description
<b>Designer</b>	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.
<b>Designer's safety report</b>	A report identifying the hazards relating to the design of a structure that create 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.
<b>Duty holder</b>	Any person who owes a work health and safety duty under the WHS Act including a PCBU, a designer, manufacturer, importer, supplier, installer of products or plant used at work (upstream duty holder), officer or a worker.
<b>Edge protection</b>	A barrier to prevent a person falling erected along the edge of: <ul style="list-style-type: none"> <li data-bbox="557 1012 949 1046">• a building or other structure.</li> <li data-bbox="557 1046 1256 1080">• an opening in a surface of a building or other structure.</li> <li data-bbox="557 1080 822 1114">• a raised platform.</li> </ul>
<b>Engineer</b>	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.
<b>False deck</b>	A deck provided to safely arrest a falling person or object, and/or provided as a working platform. Different to a pouring deck.
<b>Falsework</b>	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. Falsework includes the foundations, footings and all structural members 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 construction.
<b>Formwork</b>	The surface of the form and framing used to contain and shape wet concrete until it is self-supporting. Formwork includes the forms on or within which the concrete is poured and the frames and bracing which provide stability, during the curing process. Although commonly referred to as part of the formwork assembly, the joists, bearers, bracing, foundations and footings are technically referred to as falsework. In this Code, the term 'formwork' includes falsework, unless otherwise specified.

Term	Description
<b>Formwork design</b>	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.
<b>Formwork deck handover certificate</b>	A document used to consider the completed work areas of formwork as designed that allows other trades to commence their work.
<b>Hazard</b>	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.
<b>Health</b>	Includes both physical and psychological health.
<b>Health and safety committee</b>	A consultative body established under the WHS Act. The committee's functions include facilitating cooperation between workers and the person conducting a business or undertaking to ensure workers' health and safety at work, and assisting to develop work health and safety standards, rules and procedures for the workplace.
<b>Health and safety representative</b>	A worker who has been elected by their work group under the <i>WHS Act</i> to represent them on health and safety matters.
<b>High risk construction work</b>	Construction work for which a safe work method statement (SWMS) is required. WHS Regulation clause 291 provides a list of construction work that is considered to be high risk for the purposes of the WHS Regulation
<b>Intermediate working deck</b>	Constructed using joists and formply sheeting or secured planks.
<b>Managing risk</b>	A process set out in the WHS Regulation to eliminate health and safety risks so far as is reasonably practicable, or if this is not reasonably practicable, minimise the risks 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.
<b>Officer</b>	An officer under the <i>WHS Act</i> includes:
	<ul style="list-style-type: none"> <li>– an officer under section 9 of the <i>Corporations Act 2001</i> (Cth)</li> <li>– an officer of the Crown within the meaning of section 247 of the <i>WHS Act</i>, and</li> <li>– an officer of a public authority within the meaning of section 252 of the <i>WHS Act</i>.</li> </ul>
	A partner in a partnership or an elected member of a local authority is not an officer while acting in that capacity.

Term	Description
<b>Person conducting a business or undertaking (PCBU)</b>	<p>PCBU is an abbreviated term which intends to capture all types of working arrangements or relationships.</p>
	<p>A PCBU includes a:</p>
	<ul style="list-style-type: none"> <li>– company</li> <li>– unincorporated body or association</li> <li>– sole trader or self-employed person.</li> </ul>
	<p>Individuals who are in a partnership that is conducting a business will individually and collectively be a PCBU.</p>
	<p>A volunteer association (defined under the <i>WHS Act</i>, see below) or elected members of a local authority will not be a PCBU.</p>
<b>Plant</b>	<p>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.</p>
<b>Proprietary systems</b>	<p>Formwork components that are mass-produced, where the manufacturer provides technical information on the load-carrying capacities of the components and information on erection and stripping/dismantling methods.</p>
<b>Reasonably practicable</b>	<p>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 to ensure health and safety, taking into account and weighing up all relevant matters including:</p> <ol style="list-style-type: none"> <li>a) the likelihood of the hazard or the risk concerned occurring</li> <li>b) the degree of harm that might result from the hazard or the risk</li> <li>c) what the person concerned knows, or ought reasonably to know, about the hazard or risk, and ways of eliminating or minimising the risk</li> <li>d) the availability and suitability of ways to eliminate or minimise the risk, and</li> <li>e) 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.</li> </ol>
<b>Risk</b>	<p>The possibility harm (death, injury or illness) might occur when exposed to a hazard.</p>
<b>Scaffold</b>	<p>A temporary structure erected to support access or working platforms.</p>
<b>Slip form / jump form</b>	<p>Self-climbing formwork systems specifically intended to contain concrete in walls and columns in high rise buildings and other concrete structures like stacks and chimneys. Usually consists of a number of platforms or decks and may also be fitted with trailing screens suspended from the form.</p>

Term	Description
<b>Structure</b>	<p>Anything that is constructed, whether fixed or moveable, temporary or permanent, and includes:</p> <ul style="list-style-type: none"> <li>a) buildings, masts, towers, framework, pipelines, transport infrastructure and underground works (shafts or tunnels), and</li> <li>b) any component of a structure, and</li> <li>c) part of a structure.</li> </ul>
	<p>Formwork example of a structure include formwork, falsework or any other structure designed or used to provide support, access or containment during construction work.</p>
<b>Subcontractor</b>	<p>A PCBU that enters into a contract with a builder or principal contractor to undertake specified construction work.</p>
<b>Safe work method statement (SWMS)</b>	<p>A written document that sets out the high-risk construction work activities to be carried out at a workplace, the hazards and risks arising from these activities and the measures to be put in place to control the risks. Its primary purpose 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.</p>
<b>Travelling formwork</b>	<p>Formwork which moves horizontally allowing the repeated construction of structural elements such as in-situ concrete bridge spans. The formwork is generally supported by the permanent structure as it is progressively completed and therefore has the advantage that no falsework is required over the length of the bridge.</p>
<b>Work group</b>	<p>A group of workers established to represent workers in the work group by one or more health and safety representatives. A work group may be all workers at a workplace but it may also be appropriate to split a workplace into multiple work groups where workers share similar work conditions or are exposed to similar risks and hazards. For example, all workers on night shift.</p>
<b>Worker</b>	<p>Any person who carries out work for a PCBU, including as an employee, contractor or subcontractor (or their employee), self-employed person, outworker, apprentice or trainee, work experience student, employee of a labour hire company placed with a 'host employer' or a volunteer.</p>
<b>Workplace</b>	<p>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, construction sites, vehicles, ships, aircraft or other mobile structures on land or water.</p>

# Amendments

This Code was amended in March 2021 to correct publishing errors and to standardise terminology.

## **Disclaimer**

This publication may contain information about the regulation and enforcement of work health and safety legislation in NSW. It may include some of your obligations under some of the legislation that SafeWork NSW administers. To ensure you comply with your legal obligations you must refer to the appropriate legislation.

Information on the latest laws can be checked by visiting the NSW legislation website [www.legislation.nsw.gov.au](http://www.legislation.nsw.gov.au)

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THIS CODE OF PRACTICE PROVIDES  
PRACTICAL GUIDANCE ON HOW TO  
MANAGE HEALTH AND SAFETY RISKS  
ASSOCIATED WITH FORMWORK

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