SafeWork

Scaffolding Industry Safety Standard

March 2022

NSW GOVERNMENT

Preface

On 1 April 2019 a steel modular scaffold collapsed at a construction site in Sydney, crushing two workers. Christopher Cassaniti was fatally injured while Kahled Wehbe suffered permanent life changing injuries.

The scaffold was a wedge-lock type birdcage scaffold, originally used as a bridge between a personnel and materials hoist and the building under construction. At the time of collapse the hoist had been removed and the scaffold was being used to store material and to complete the remaining façade work on the exterior of the building.

The subsequent investigation by SafeWork NSW identified issues with the planning, design, management and modification of the scaffold, as well as a lack of clarity regarding its duty rating. It also identified a need for clear written guidance regarding:

- Management of contractors
- Management of scaffolding work
- Management of erected scaffolds, particularly on-going modification
- Training and qualification of workers
- Role of engineers, sign-offs and verifications

The prosecution resulted in a WHS Project Order made under Section 238 of the *NSW Work Health and Safety Act 2011*, to develop a Scaffolding Industry Safety Standard to provide this guidance.

Contents

1. Introduction

1.1 General

This document is the NSW Scaffolding Industry Safety Standard.

Parties who participated in the development of this document were:

- SafeWork NSW
- GN Residential Construction Pty Ltd
- Construction, Forestry, Maritime, Mining and Energy Union
- Master Builders Association NSW
- Waco Kwikform
- Layher
- Ballina Scaffolding
- Australian Constructors Association
- Laing O'Rourke (Australia) Construction

1.2 Scope

The purpose of this document is to provide practical management tools to principal contractors, scaffolders, engineers, and other parties responsible for the provision and safe use of scaffolding.

This document is targeted at the provision of prefabricated steel modular scaffolding used in multi-level construction projects. However, many of the principles described may also be used for other scaffolds and industries.

Effective management of scaffolding involves, but is not limited to:

- Effective consultation between scaffolders and principal contractors prior to scaffold design and construction
- Effective communication and transfer of information
- Designing and erecting scaffolds that are suitable for the project
- Engagement of engineers to assess/verify scaffold designs
- Appropriate training and licensing of workers
- Supervision and management of scaffolders and scaffolding work
- Ongoing (site) management of erected scaffolds
- Management of contractors using and working near erected scaffolds
- Issue resolution, incident notification and emergency response

2. Project Management, Engagement and Planning

2.1 Overview

Individual construction projects are unique, and the management structure and the division of responsibility between parties involved in a project is almost infinitely variable. However, when using scaffolding there are scaffold design and management requirements that are common to all projects, as well as specific Work Health and Safety duties that need to be satisfied.

The purpose of this chapter is to outline a high-level scaffold management process, using a 'milestones' approach, that can be adapted to individual site needs. This approach is intended to ensure safe scaffolding throughout the life of the construction project.

2.2 Scaffold project milestones

Throughout a construction project there are several scaffold-related milestones that need to be achieved, including:

- **Identifying scaffolding requirements**
  - Determining the type, purpose and general configuration
  - Considering the influence on the construction process
- **Tendering/quoting**
  - Request for tender/quote
  - Providing sufficient information to allow representative quotes/tenders
  - Selection of scaffolding contractor
- **Detailed scaffold planning and design**
  - Developing a site-specific scaffold design solution
  - Determining consultation arrangements
  - Planning for project variations and scaffold design changes
  - Obtaining third party (engineers) audit/verification of scaffold design solution
- **Implementing scaffold management plan and design**
  - Initial scaffold erection and handover
  - Independent/ongoing inspections of scaffold
  - Management of workers using erected scaffold
  - Management of planned scaffold alterations
- **Design reviews**
  - Managing unplanned scaffold alterations or rectification
  - Managing construction project design changes
  - Managing incidents and resolving scaffolding issues

These milestones are described in more detail in Chapters 2.3 to 2.7.

2.3 Identifying scaffold requirements

The principal contractor will need to determine how a scaffold is to be used during their construction project.

For example, will it be used for:

- access/egress
- working platforms
- storing equipment
- landing platforms for hoists or craned loads
- containment or perimeter edge protection
- hoardings
- shoring/support of other plant or structures

This is best done early in the project design phase as the type/design of the scaffold may influence, or be affected by, the build sequence and construction processes used by other trades. Specific examples of this are given in Appendix A.

The principal contractor should determine whether the scaffold will have multiple uses, for example:

- As perimeter edge protection during falsework/formwork erection, then
- As storage and working platforms for subsequent façade work

The principal contractor should also identify any operational requirements that may influence the scaffold design, for example:

- Whether scaffold platforms must be level with building floors/slabs
- Whether access is required directly from the scaffold to the building
- Any clearances required for later addition of cladding or veneer to the building façade
- Whether stairs/stretcher access is required

Identifying these scaffold needs will allow scaffold contractors tendering for the project to consider not just the initial scaffold design, but also how the scaffold design may need to change as the construction project progresses. This will better enable them to estimate things such as:

- Volume of material/equipment required
- Number of scaffolders and the high risk work licence classes required
- Frequency and duration of site attendance
- Returns to site for planned and unplanned alterations
- Design changes (hop-up, tie movement)
- Ongoing inspection requirements
- Additional complexities (additional engineering, special equipment etc)

Which in turn should allow for more accurate quoting of cost over the duration of the project.

2.4 Tenders or request for quotes

A scaffold contractor cannot design or supply a suitable scaffold if they have not received the minimum information necessary to design it from the principal contractor.

Information the principal contractor will need to provide so a fit-for-purpose scaffold can be designed includes, but is not limited to:

- Intended use/general operational requirements (see Chapter 2.3)
- Required duty rating
- Required height
- Surface it will be erected on
- Structure it will/can be tied to
- Construction sequence
- Site or footprint limitations e.g. that may require cantilevers, needles, spurs etc.
- Scaffold access requirements e.g. stretcher stairs, direct access to/from building
- Plant/traffic management and collision protection
- Site access requirements e.g. vehicular or other access openings in the scaffold structure
- Powerlines
- Unique site issues e.g. heritage building work, restricted street access, work over water

Often the project design is not finalised prior to a tender/quote request, thus some of the scaffold details may not be available or are subject to change.

However, the principal contractor should provide as much information as is available, and as a minimum the information discussed in Section 2.3, to prospective contractors when going to tender or requesting quotes.

When selecting a scaffold contractor, the principal contractor must consider more than upfront cost. Selecting a contractor with the capability to undertake the scope of work safely and efficiently with minimum interruption can significantly benefit the construction project.

Consideration should be given to factors such as:

- Familiarly/existing relationship with contractor
- Safety performance
- Experience with the particular work
- Ability to provide suitable equipment
- Size, capability and resources i.e., ability to provide sufficient equipment or workers, response time
- Availability of WHS policies, procedures, Safe Work Method Statements (SWMS) etc.
- Availability of records of training/Verification of Competency (VOC) and licensing of workers
- A regime for inspecting and maintaining serviceable scaffolding equipment
- Design and engineering support
- Adequate administrative support

The principal contractor may also consider pre-assessment of potential scaffold contractors based on the above criteria prior to inviting them to tender and maintaining a pool of pre-assessed scaffold contractors for future projects (an example checklist for this is given in Appendix B).

2.5 Detailed scaffold planning and design

Once the scaffold contractor has been chosen, detailed planning and design work can be undertaken.

This involves:

- Determining consultation arrangements
- Providing additional information required to complete design
- Completing the scaffold structural and operational design
- Documentation and provision of scaffold design information
- Engineering sign-off, including third party verification of scaffold design
- Planning for:
  - undertaking scaffolding work
  - management of erected scaffolds
  - scaffold alterations
  - process for design changes
  - issue resolution

The intention should be to thoroughly plan before beginning construction, and to identify or anticipate issues and fix them before they occur on the construction site.

The scaffold design work will likely require one or more face-to-face meetings between the principal contractor, scaffold contractor and other contractors with special requirements when using the scaffolding. Consultation arrangements must be established that ensure effective transfer of information between all duty holders involved with the scaffold (see Chapter 3.2)

At the completion of the detailed design there should be a documented scaffold design and a clear understating of:

- What type of scaffold will be erected
- How it will be erected
- How it will be tied to the supporting structure
- How it can be used, in particular
  - duty rating(s)
  - number of duty rated levels
  - location of duty rated levels
- Type of access/egress
- How/when it will be modified as project progresses

Engineering signoffs should be obtained for non-standard scaffold designs or design features (see Chapter 3.3).

For higher complexity scaffolds, once the design is documented it should be independently assessed/verified by a third party that was not engaged in the detailed design process. Any issues identified should be addressed before scaffold erection work begins (see Chapter 5.6).

Scaffold planning and design are covered in more detail in Chapter 3.

2.6 Implementing scaffold management plan and design

Once the detailed planning and design work is completed the scaffold erection work can start. This should be undertaken in accordance with the scaffold design and requires effective co-ordination between the principal contractor and scaffolders.

Principal contractors must ensure the site is prepared and ready for scaffolding work, all workers are inducted and other trades do not access incomplete scaffolds or hinder the scaffolding work.

Scaffolders must ensure work is undertaken in accordance with accepted erection procedures and documented SWMS, and that the erected scaffold conforms to the scaffold design. Variations, alterations or changes to the scaffold structure must be in accordance with design parameters or undergo design and assessment as per Chapter 2.7 prior to proceeding.

Once the scaffold is erected both an inspection and a handover certificate are required prior to allowing the scaffold to be used (see Chapter 5.5). For higher complexity scaffolds that have had the detailed design assessed by a third party, a competent person who is independent from the scaffold contractor should also undertake an inspection to confirm the erected scaffold conforms to the scaffold design prior to allowing the scaffold to be used (see Chapter 5.6).

Specific detail on how principal contractors and scaffolders can manage scaffolders and scaffolding work is given in Chapter 5.

Once in-service the principal contractor is responsible for ensuring the scaffold is used correctly, that workers on site are aware of the correct scaffold use, and that any issues are identified/reported and rectified.

Specific detail on how principal contractors can manage in-service scaffolds is given in Chapter 6. Broadly, it involves ensuring:

- Scaffold is not overloaded
- Ties are not removed
- Decking components, edge protection, hop-ups and other components are not removed
- Only appropriately licenced scaffolders undertake scaffolding work (erection, alteration or dismantling)
- Scaffolds are inspected at appropriate intervals
- Scaffold alterations are undertaken according to the detailed design
- Workers have been instructed how to report issues or request scaffold modifications
- Workers are prevented from accessing closed scaffolds

2.7 Design review

It is the nature of construction projects that designs may need to change as the project progresses. However, this need is foreseeable and thus must be planned for.

Consultation procedures and the detailed scaffold planning and design should establish processes for responding to:

- Construction project design changes
- Scaffold design change requests
- Unapproved scaffold modifications
- Unapproved loading
- Overloading
- Scaffold incidents, damage, weather events etc

Broadly, this will require ensuring all scaffold changes, including any required engineering assessment or verification, are planned prior to starting the alteration or rectification work.

Where misuse or unapproved modifications to a scaffold are observed, for example unapproved removal of components, these must be rectified in a safe and timely manner, by appropriately qualified workers. The root cause leading to the issue occurring should also be investigated. Consideration must be given to whether the issue is likely to be repeated, and whether consultation procedures or the scaffold planning, management or design needs to be amended to prevent re-occurrences.

Specific detail on how these can be addressed is given in Chapter 7.

2.8 Emerging technology

New technologies are becoming available that may further aid management of scaffolds in service. These should be considered during the tendering and detailed scaffold design phases.

Examples include:

- Tamper-resistant locking devices to prevent unauthorised removal of components
- Real-time (app-based) monitoring of scaffold components and live load
- QR codes for tracking components and documentation
- Geo fencing for handover certificate (must be in location to issue certificates)
- Augmented reality technologies
- Building Information Modelling/Scaffold Information Modelling
- Radio frequency identification (RFId) on ScaffTags

New technologies that attach to, or modify the use of, existing scaffold components should only be implemented in consultation with the scaffold contractor and scaffold system supplier/manufacturer. New technologies must not adversely affect the performance of scaffolding components whilst in service.

> *Note: at the time of writing this Industry Safety Standard the technologies listed above are not widely available. However, many of these technologies offer a higher-order engineering control for risks traditionally controlled though administrative measures such as training, documentation, and procedures. Safety management processes should periodically assess new and emerging technologies and consider whether they can be adopted to improve safety outcomes.*

3. Detailed Scaffold Planning and Design

3.1 Overview

Scaffold planning and design must consider the life of the construction project and thus is not solely the responsibility of the scaffolder.

Implementing an effective scaffolding solution for a given project requires effective transfer of information between the scaffolder, principal contractor, engineers and workers who use the erected scaffold

Effective scaffold planning and design should result in a scaffold design that is fit-for-purpose, has all relevant engineer sign-offs, can be safely erected and has clearly identified duty rating. It should be documented in sufficient detail such that the current configuration and use of the erected scaffold can be compared or verified to the design at any stage of its service life.

3.2 Effective consultation

Consultation is a legal requirement under WHS legislation and is covered in detail in the NSW Code of Practice, Work health and safety consultation, cooperation and coordination.

Consultation arrangements must result in effective transfer of information that specifically relates to the scaffold. This transfer occurs between the principal contractor, scaffold contractor, engineers and other trades. The flow of information must be comprehensive enough to allow each duty holder to undertake their work effectively. All parties depend on information from others to undertake their work effectively, for example:

- A scaffold contractor cannot design, supply or modify a scaffold without information from the principal contractor regarding the project needs
- A principal contractor cannot manage scaffolding on site without information from the scaffold designer about the correct use of a particular design
- Workers cannot use or co-ordinate use of scaffold on site without information and instruction from the principal contractor
- Engineers cannot assess or verify scaffold designs if they have not received sufficient design information or information that matches the latest design iteration

Consultation should be co-ordinated by the principal contractor. However, it is the responsibility of all parties to ensure successful transfer and understanding of information.

Consultation arrangements must:

- Ensure clarity around who is responsible for which aspects of the scaffold design
- Identify responsibility for ongoing scaffold management processes
- Identify the appropriate contacts should further information be required, or issues arise
- Involve the actual people or entities undertaking the work, particularly if subcontracting arrangements are in place
- Ensure workers involved in the scaffold (design, installation, use and management) have a means by which to obtain information, contribute to scaffolding safety and raise issues or concerns

As the scaffold constantly changes with the building during construction, effective consultation is required throughout the construction project, not simply at the beginning of the project during the design and tender phases.

3.3 Scaffold design principle

The objective of undertaking a detailed design process prior to erecting a scaffold is to determine a layout that suits the needs of the construction project whilst complying with relevant Australian Standards and WHS laws. It also gives an opportunity to identify and rectify issues at the planning stage before they impact the construction schedule.

Consideration must be given to the entire construction project, including the initial scaffold erection, how the scaffold structure will need to change to accommodate various trades during building construction and final dismantling.

Most scaffold incidents occur well into the construction project when the scaffold structure has changed from the initial design. The scaffold designer should anticipate how the scaffold must change to accommodate the construction work and incorporate this into in the design.

Examples of common alterations to in-situ scaffolds include:

- Adding lifts as the building height increases
- Moving ties to facilitate other trades (façade work, glazing etc.)
- Moving hop-ups for façade finishing
- Adding access or openings
- Adding crane loading platforms
- Adding unplanned encapsulation or signage
- Using scaffold to support lifting equipment (e.g. gin wheels)

The complexity of a scaffold design can vary depending on the project. It may consist of a simple layout that is erected and left as is for the remainder of the project, or a complicated layout that is erected and altered over many stages as the construction project progresses. The scaffold designer must ensure all stages of the scaffold design meets the performance and operational requirement specified in Chapter 3.4.

Where specific project information is not yet available to design for the life of the project, the detailed plan should, as a minimum, cover the initial scaffold erection plus outline the procedures for ensuring future modifications/alterations are designed and have third party verification prior to starting scaffolding alteration work.

3.4 Scaffold structural and operational requirements

The scaffold designer must ensure the scaffold design to be erected complies with:

- Instructions provided by the manufacturer of the scaffolding system
- The design and operational requirements of AS/NZS 1576.1 *Scaffolding - general requirements*

Where manufacturer's instructions do not exist, the scaffold may comply with:

- Appendix A of the SafeWork NSW Guide Erecting altering and dismantling scaffolding, Part 1: Prefabricated steel modular scaffolding, or
- AS/NZS 1576.6 *Tube and coupler scaffolding – Deemed to comply*

In situations where the above criteria are not met a structural analysis of the proposed design or design feature is required to confirm it complies with AS/NZS 1576.1 (see Chapter 3.5). Note, there are many common examples of the above design criteria not being met, including, but not limited to:

- Single leg ties
- Raker ties
- Non-prescribed tie patterns
- Cantilevers
- Spurs
- Needles
- Ladder beams
- Access openings
- Special duty ratings and bay dimensions
- Reinforcing standards, e.g. double legging
- Use of containment sheeting
- High wind or environmental loading
- Tie anchorage to weaker materials (masonry, aerated concrete, Hebel, Dincel etc.)
- Alterations involving removal or omission of transoms, ledgers, bracing or ties
- Compatibility of components from mixed scaffold systems or suppliers
- Scaffold used to support other plant/structure (e.g. hoists, formwork)
- Stretcher stairs, particularly those having height greater than 10 metres
- Dynamic/impact loading (e.g. pitched roof falls)

The scaffold design must be comprehensive and ensure the scaffold configuration need not be improvised on site by scaffolders. However, the scaffold designer may prescribe a range of design parameters, allowing for scaffolders to make site-based decisions provided the as-built scaffold remains within these parameters. For example, the designer may specify a maximum interval between ties or a maximum bay length whilst allowing the scaffolder to choose a lesser interval if site constraints require.

3.5 Structural (engineering) analysis of scaffolds

Where a structural analysis of the proposed scaffold design or design feature, including tie patterns, is required (see Chapter 3.4) it must be performed prior to the scaffold being erected.

The assessment must only be performed by a structural or temporary works engineer, or similar competent person with structural analysis training and familiarity with scaffold.

Notes:

1. *Scaffolders do not typically have the training or experience to perform structural analysis of a scaffold design, thus should not be assessing non-standard designs or design features.*
2. *The assessment does not need to be site-specific. Previous assessments of designs/design features can be re-used wherever the same design conditions exist. An example of this may be a standardised design for an access opening that could be incorporated into any typical scaffold installation.*
3. *Training and competency requirements of scaffolders and engineers are given in Chapter 4.*

3.6 Scaffold ties

Investigations of scaffold collapses frequently identify lack of ties, or removal of ties, as a significant contributing factor. Risks from inadequately tied scaffold must be addressed during both the design phase and ongoing management of a scaffold.

Scaffold ties connect the scaffold to an adjacent support structure to provide stability. Ties may also provide rigidity to the scaffold.

The type, number and spacing between ties depends on numerous factors, such as:

- The scaffold height and lift height
- Scaffold dimensions, especially bay and base dimensions
- Scaffolding systems inherent properties (stiffness, material properties, connection type etc)
- Presence or type of containment sheeting
- Expected wind conditions (e.g. coastal areas, high structures, cyclone prone areas)
- Type of supporting structure to connect to
- Tie anchorage type

The tie design (type, number, pattern, anchorage) should be pre-determined and designed in accordance with Chapters 3.4 and 3.5 prior to starting scaffold construction. Tie design should be included in the site documented detailed scaffold design (as per Chapter 3.7).

Tie designs should not be improvised as the scaffold is being erected. However, the tie design may be specified in a manner which allows for some onsite flexibility (e.g. vertical spacing not to exceed 4m). Where the pre-determined tie plan cannot be followed advice should be sought from the scaffold designer or other competent person (e.g. an engineer).

Ties are critical to the safety of the scaffold yet are at risk of being moved or removed without approval, or contrary to the design. This is often due to the ties impeding the work of other trades.

The risk of this occurring should be minimised in the design phase by the principal contractor and scaffold contractor working together to position ties where they are not in the way of planned work. Where this can't be achieved, the risk can be managed by:

- Identifying which ties may impact work
- Incorporating staged plan to move/remove these ties into the detailed design
- Sequencing construction work to:
    - allow time for scaffolders to return and relocate ties in accordance with detailed design
    - ensure tie alterations are made before other trades are affected
- Develop site procedures around future alterations to scaffold design

Further details on scaffold ties are also given in Appendix D.

3.7 Documentation and provision of design information

The scaffold designer and supplier must provide the information necessary to use scaffolding as per its intended design.

Information the scaffold contractor will need to provide the principal contractor includes, but is not limited to:

- Scaffold design drawings
- Engineering sign-offs
- Tie patterns
- Duty ratings, including:
  - whether duty rating is the same for every scaffold platform
  - whether duty rating can change depending on use
  - limitations for loading multiple levels simultaneously
- Sequence and implementation of planned alterations, including:
  - topping up scaffold as building levels are completed
  - repositioning ties
  - moving hop-ups and decking components
- Means of entry/exit
- Inspection and handover processes
- SWMS for scaffolding work
- Point of contact and process for issue resolution

This information must be documented, either electronically or physically, and provided to the principal contractor to enable them to effectively manage the scaffold and scaffolding work.

The principal contractor should not allow scaffolding work to begin until this documented information has been received. This information should be readily available on site until the scaffold is dismantled.

3.8 Project and scaffold design changes

Detailed design and planning prior to beginning scaffold work will identify and address most issues before they occur on site. However, despite the best planning it should be expected that variations to the scaffold design will be required as the construction project progresses, and processes should be in place to manage this.

The project design may not be finalised at the time the detailed scaffold design is taking place. Additionally, the design of the building to be constructed, foundations, service locations, site access etc. may change after the project has entered the construction phase.

Where the principal contractor identifies new information or changes that may affect the existing or planned scaffolding on site, they must pass this information on to the scaffolding contractor. Examples of new information may include:

- Revised sequencing of permanent works
- Additional floor levels
- Revised floor slab thicknesses affecting imposed weight implications
- Revised openings affecting planned tie positions
- Unfinished ground levels
- Excavations
- Revised hoist and crane positions.
- Additional hoists, cranes etc

The principal contractor and scaffolding contractor must then work together to identify whether any design changes are required, and if so, ensure they are also undertaken and documented in accordance with Chapters 3.4 to 3.7.

4. Training and Licensing of Workers

4.1 Overview

A business must ensure that information, training, instruction and supervision provided to a worker in an understandable form, and is suitable and adequate having regard to the nature of the work carried out, the nature of the risks associated with the work and the control measures implemented.

While scaffolding is recognised as an effective control measure for falls and falling objects in the construction process, scaffolding work and the misuse of scaffolds can expose workers and the public to serious risk.

As such, the information, instruction, training and supervision of workers interacting with scaffolds must be thorough, understandable and monitored.

> *Note, consideration must be given to first language and literacy of those receiving information. Diagrams, drawings, pictographs, cartoons etc. may assist.*

This chapter identifies the specific competencies required by the various workers involved in the erection, inspection, use and management of scaffolds on site.

4.2 Specific competencies

Principal contractors

Principal contractor workers who have management control of scaffolds on site require practical knowledge of scaffolds and scaffolding work. As a minimum, they should:

- Be familiar with the design and correct use of the scaffolds at their site
- Understand components from different scaffold systems should not be mixed
- Know basic scaffold terminology
- Understand scaffold duty ratings
- Be familiar with common tie arrangements and the consequences of unapproved tie removal
- Be capable of recognising obvious scaffolding risks, such as:
    - missing edge protection
    - unsafe access/egress
    - incomplete decks
    - missing/removed ties
    - removed components
    - workers exposed to risk of falls
    - falling objects
    - overloading
    - inadequacy in supporting surface or structure
    - scaffold instability, buckling or excessive lateral movement
    - proximity to power lines

Scaffolders

Scaffolders must be trained and competent to undertake their work. Simply holding a high risk work licence does not ensure these requirements are met. As a minimum, scaffolders should:

- Have detailed knowledge of the scaffolding system(s) they are using
- Have detailed knowledge of scaffold configurations within their class of high risk work licence (HRWL), and how to erect and dismantle them
- Be capable of erecting/dismantling a scaffold to a predetermined design and sequence
- Know when engineering assessment of a scaffold design is required
- Know the erection methodology given in the SafeWork NSW guide *Erecting, altering & dismantling scaffold Part 1*
- Know what type of scaffolding work is allowed under the particular class of HRWL they hold
- Be capable of identifying damaged/unserviceable components
- Be capable of identifying incompatible components from a different scaffold system

Additionally, scaffold supervisors/leading hands should:

- Be capable of reading scaffold drawings and other scaffold design information
- Be capable of assessing integrity of scaffold during erection, alteration and dismantle
- Be able to recognise scaffold design or erection issues
- Be able to effectively communicate with other scaffold-related stakeholders

Engineers

Simply holding an engineering degree or equivalent level of education does not make an engineer competent to undertake design analysis of scaffold structures. Engineers are relied on to assess the performance of a scaffold structure and determine its suitability for a particular application. This requires:

- Familiarity with scaffolding work
- Familiarity with construction sequence
- Considering buildability in the design
- Being capable of designing structures to suit the end use
- Experience designing temporary structures
- Being capable of undertaking calculations to analyse temporary flexible structures
- Understanding of scaffold design standards (AS/NZS 1576 series, AS 1170 series etc)
- Knowing the material properties and technical characteristics of the scaffold system being analysed
- Producing drawings, documents and/or other communication that can be understood by target audiences

Other workers on site

Correct scaffold use and any site-specific rules regarding scaffolds must be covered during worker induction to the site. Trade or task-specific scaffold information must be covered in toolbox talks.

Any workers who have access to scaffolds must, as a minimum:

- Know not to modify any scaffold for any reason
- Know who to contact if they require changes to scaffolding
- Be able to recognise scaffold fall risks (e.g. missing planks or edge protection)
- Know who to contact if they identify scaffolding issues
- Know who to contact if they require information relating to scaffold use
- Know any site-specific rules, for example:
  - use of scaffolds for emergency access/egress
  - operation of plant in vicinity of scaffold
  - hot work in vicinity of scaffold
  - exclusion zones
  - permit systems or other documents/processes used to manage risks

In addition, any worker who is authorised to work from or store materials on a scaffold must also:

- Know the duty rating for the scaffold platforms they are using
- Know what platforms are open and closed
- Be able to estimate the loads on the scaffold platforms in use
- Know whether other trades are also using the scaffold at the same time
- Know what work activities are occurring above/below, and associated risks

4.3 High risk work licencing requirements

General

A high risk work licence (HRWL) is required to erect, alter or dismantle a scaffold where a person or object could fall more than 4m from a platform. This includes where the actual scaffold or platform is less than 4m above the supporting surface but a fall of more than 4m is still possible (e.g. scaffolds erected adjacent to a balcony edge or on needles cantilevered out from the building).

Scaffolding work includes erecting, altering/modifying and dismantling scaffolds.

Removing ties, planks or other individual component is scaffolding work and can only be done by appropriately licenced scaffolders (i.e. other trades cannot remove components that are hindering their work).

Licence classes

A minimum Basic Scaffolding (SB) HRWL is required to erect prefabricated modular scaffolding where a person or object could fall more than 4m.

If the prefabricated modular scaffold incorporates spurs, cantilevers or is associated with perimeter safety screens/shutter then an Intermediate Scaffolding (SI) HRWL is required. If the prefabricated modular scaffold is to be hung from a supporting structure, then an Advanced Scaffolding (SA) HRWL is required.

There is no maximum height limit for any class of scaffold licence.

> *Note, a basic scaffolder may use tube and coupler components to tie a prefabricated scaffold to a support structure. However, an intermediate or advanced scaffolding HRWL is required to erect a tube and coupler scaffold.*

Only licenced workers can undertake scaffolding work. An unlicensed worker cannot:

- Erect or dismantle the scaffold where a person or object could fall more than 4m
- Alter or modify the scaffold in any way, including removing ties, planks, hop-up or other components
- Access the scaffold while it is being erected, altered or dismantled
- Access the scaffold while it is incomplete

> *Note, there are two exceptions where unlicenced scaffolding work is allowed:*
>
> 1. *The worker is enrolled in an accredited HRWL scaffolding course with a registered training organisation and working under direct supervision from a person who holds the appropriate class of scaffolding HRWL, or*
> 2. *The worker has obtained notice of satisfactory assessment from the registered training organisation within the last 60 days (but is yet to receive the HRWL)*

Common examples of unlicenced workers are:

- Laborers
- Other trades on site
- Scaffolders who do not hold the class of license appropriate for the type of work

Scaffolders can only undertake work that is allowed under the particular class of license they hold. For example, there is no allowable ratio of ‘advanced’ to ‘basic’ licenced scaffolders.

- A scaffolder holding an SB licence cannot undertake scaffolding work requiring an SI or SA licence
- A scaffolder holding an SI licence cannot undertake scaffolding work requiring an SA licence

Use of laborers and other unlicensed workers

Only licenced workers can undertake scaffolding work. There is no allowable ‘ratio’ of licenced to unlicenced workers.

Unlicensed workers may pass components and equipment to licenced scaffolders from the ground or an adjacent structure if safe to do so, but must not access the scaffold until construction is complete and it has a handover certificate (written confirmation).

5. Management of Scaffolders and Scaffolding Work

5.1 Overview

Both the scaffold contractor and the principal contractors are responsible for managing scaffolding work on site. The broad objective should be to have licensed scaffolders using safe systems of work to erect, modify or dismantle scaffolding that is compliant with the suppliers/manufacturer's instructions and Australian Standards.

Additionally, there are WHS legislative requirements regarding safe work method statements and handover certificates that must be met.

This chapter provides practical guidance for the management of scaffolders who are undertaking scaffolding work. Scaffolding work includes initial erection, subsequent additions, alterations, rectifications, repairs and final dismantle of a scaffold.

5.2 Supervision/management of scaffolders and scaffolding work

Both the scaffolding contractor and the principal contractor are responsible for managing scaffolders and ensuring they are working safely.

Scaffold contractors

Scaffolder contractors must:

- Plan work prior to starting each scaffold erection (See Chapter 3)
- Have SWMS in place for high risk construction work (see Chapter 5.3)
- Have safe methods for erecting, modifying and dismantling of scaffold (see Chapter 5.4)
- Have a system of work for checking serviceability of scaffold components prior to erection
- Ensure erected scaffolds meet the performance and operational requirements of AS/NZS 1576.1, including:
  - complying with suppliers/manufacturer's instructions
  - obtaining engineering signoffs for non-standard scaffold configurations
- Ensure all workers are appropriately trained, including correct use of the specific scaffold system being supplied(See Chapter 4.2)
- Ensure all workers are appropriately licensed (See Chapter 4.3)
- Ensure there is sufficient expertise/qualification within scaffold crews to undertake the particular licence class or type of scaffolding work
- Provide supervision for less experienced workers
- Identify/nominate a senior scaffolder/leading hand for each work site
- Have a system for identifying and rectifying unplanned or emergent on-site issues, including recording and reporting issues to the principal contractor
- Notify the principal contractor when scaffold work is complete and provide confirmation the scaffold is constructed in accordance with the supplied design

Principal contractors

Before scaffolding work begins principal contractors must:

- Ensure scaffold contractor has undertaken planning as per Chapter 3
- Obtain copies of:
  - scaffold design/layout plan
  - engineer's sign-offs for non-standard scaffold features
  - SWMS for scaffolding work
- Check scaffolders have appropriate class of licence
- Have site prepared for scaffold work (supporting surface cleared, access for scaffolders and equipment)
- Induct scaffolders onto site
- Facilitate consultation, cooperation and coordination between trades interacting with scaffolding work
- Maintain exclusion zones for scaffolding work
- Ensure effective traffic management

While scaffolding work is occurring the principal contractor must work with scaffolders to prevent other workers accessing incomplete scaffolds (See Chapter 6.3).

The principal contractor must halt the scaffolding work if they observe or are otherwise made aware of unsafe work practices. Examples may include:

- Climbing outside of scaffold
- Climbing or standing on star/rosette, ledgers etc. to gain additional height
- Not having edge protection installed
- Using single planks as temporary work platforms
- Not installing ties as scaffold is topped up
- Dropping or throwing scaffold components

Once scaffolding work is complete, the principal contractor must:

- Obtain handover certificate before allowing access by other trades (see Chapter 5.5)
- Arrange scaffold inspection at suitable intervals and keep records of inspections (see Chapter 6.7).
- Address issues identified by scaffolders regarding safety of the scaffold and scaffolding work

For higher complexity scaffolds the principal contractor should also arrange an independent inspection to confirm the erected scaffold conforms to the detailed scaffold design. Any non-conformity identified must be assessed and, if necessary, rectified (see Chapter 5.6).

5.3 Safe work method statements

Scaffolding work where a person could fall more than 2m is high risk construction work under WHS legislation. This requires a safe work method statement to be prepared prior to starting work.

The scaffolder should prepare a SWMS that:

- Identifies the scaffolding work as high risk construction work
- Identifies the hazards relating to the scaffolding work
- Describes the control measures used and how they are implemented
- Describes how control measures are to be monitored and reviewed

The SWMS should as a minimum consider the following scaffold-specific hazards and include suitable control measures for:

- Risk of falls when erecting, altering or dismantling scaffolds (See Chapter 5.4)
- Falling objects
- Inadequate worker training or licencing
- Inadequate supporting surfaces or structures
- Use of damaged (worn, deformed, cracked, corroded etc), incompatible or unsuitable components
- Erected scaffold not compliant to scaffold design, Australian Standards etc
- Unauthorised access to scaffolds

A SWMS may contain generic information, as many scaffolding risks and control measures will be common to all sites. However, SWMS must also include any site-specific risks and controls. Examples may include:

- Site-specific hazards, e.g. work near water, powerlines, unstable ground, cliffs, trenches, pits, extreme weather, high winds, adjacent cranes, plant or vehicle movements, difficult access, exclusion zones etc
- Emergency contact details
- Information on how to raise issues on-site
- Atypical work methods or sequencing

It may be beneficial to have more than one SWMS, for example generic SWMS that cover standard company policies and work methods (e.g. erection methodology, manual handling, worker training, outdoor work/sun protection etc), with a site-specific SWMS to address site-specific issues.

5.4 Safe method for erecting and dismantling scaffolds

Falls are a significant risk to scaffolders undertaking scaffolding work. Scaffolders must erect and dismantle scaffolds using a methodology/erection sequence that minimises the risk of falls.

Scaffolders must comply with (or achieve an equivalent level of safety to) the method given in the SafeWork NSW guide Erecting altering and dismantling scaffolding Part 1: Prefabricated steel modular scaffolding.

This method requires the scaffolders to:

- work from behind edge protection at all times*
- work from below, using a temporary installation platform (min. 450mm wide) to install the edge protection and platforms for the next lift above (see Figure 5.1)

(*Harness-based systems must not be used as the primary control measure for risk of falls unless edge protection is not achievable).

Additionally, scaffold platforms must be fully planked at each lift, and the platforms must remain in-situ until the scaffold is dismantled. The vertical distance should not exceed 2m except where required by specific site or operational reasons (e.g. to align a hoist landing with a floor slab), and must not exceed 3m.

Using this method both ensures the safety of scaffolders and provides increased fall protection to users once scaffold is erected and in service, particularly in cases of un-authorised removal of decking components by non-scaffolders (see Chapter 6.4).

Scaffolds will typically be dismantled using the reverse order of the erection method.

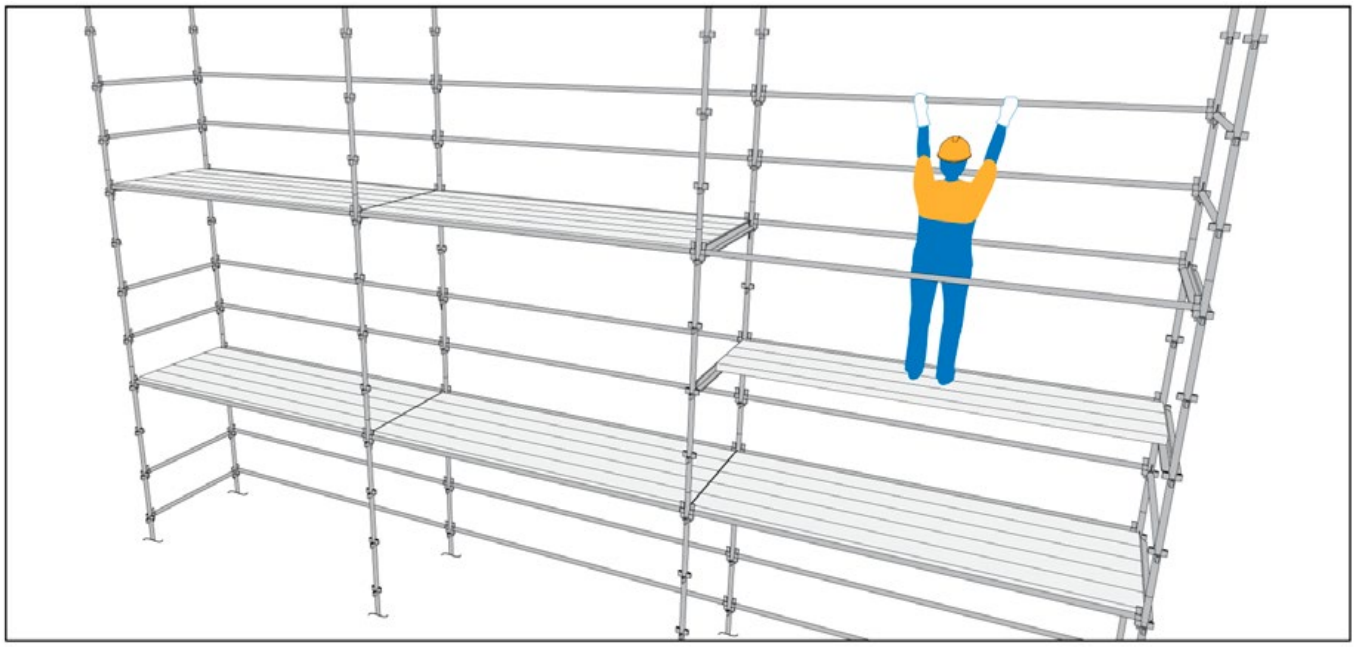


Figure 5.1. Showing one of the installation methods given in the SafeWork NSW *Guide Erecting, altering and dismantling scaffolding - Part 1: Prefabricated steel modular scaffolding*.

With the lower platform already installed, a temporary platform is being used to install the standards, ledgers, transoms, mid-rails and guardrails for the next platform above.

Once these are in place, the planks from the temporary platform will be moved up to become part of the upper platform. (Toe boards and adjacent building structure omitted for clarity)

5.5 Handover certificates (written confirmation)

General

Where a person or object could fall more than 4m from a scaffold, WHS legislation requires the person with management or control of the scaffold to ensure it is not used until written confirmation is received. The written confirmation must come from a competent person, who has inspected the scaffold, and state that construction of the scaffold is complete.

Common industry term for this written confirmation is a handover certificate.

Inspections and handover certificates should be undertaken as per the Safe Work Australia Guide to scaffold inspection and maintenance

> *Note: a written confirmation alone does not satisfy the scaffolders duty to provide the principal contractor with sufficient information to ensure correct use of the scaffold.*

When must handover certificate be issued:

A handover certificate must be provided before first use of the scaffold after scaffolders have completed their scaffolding work i.e. after a new scaffold has been erected, or an existing scaffold has been repaired or altered. Examples of alterations requiring an inspection and new handover certificate include:

- Adding/removing additional bays or lifts
- Changing ties or tie locations
- Changing platforms, hop-ups and decking component locations
- Changing edge protection or containment
- Partial disassembly or removing components (e.g. create an access opening)

> *Note, documented inspections of erected scaffolds is also required at certain intervals, as detailed in Chapter 6.7. For simplicity, and consistency across documentation, it may be beneficial to issue a new handover certificate following these inspections.*

When a new inspection and handover certificate is to be provided for an altered scaffold, the inspection must ensure any new/altered portions of the scaffold are adequately supported. This will typically require inspection of lower bays, ties and supporting surface.

Principal contractor and scaffolder responsibilities

The principal contractor and the scaffold contractor must not direct, require or facilitate work, other than scaffolding work, on a scaffold that does not have a valid handover certificate.

Generally, while a scaffold is being erected both the principal contractor and scaffolder must prevent unauthorised access (see Chapter 6.3). Then, once a scaffold is erected the principal contractor is the person with management or control and must ensure the scaffold has been inspected and has a valid handover certificate before allowing access by other trades.

A copy of each handover certificate should be available on site for the duration of the project. Electronic copies and QR coded records may be beneficial when managing sites with numerous scaffolds or long construction timeframes.

Who can inspect scaffolds and provide a handover certificate?

A scaffolder that has a licence appropriate for the type of scaffold is usually competent to inspect it and provide a handover certificate. Preferably, the inspection and handover certificate will come from the scaffold contractor that has erected the scaffold, however this is not a legal requirement and it may instead be done by a competent third party.

Whilst complicated or non-standard scaffold designs may require design assessment by a temporary works engineer, a scaffolder can still be competent to inspect and provide confirmation a scaffold has been erected in accordance with the engineers documented design.

A handover certificate must only be provided once construction of the scaffold is complete. A scaffold may be signed off in stages (see below), however partial, conditional or forward dated handover certificates must not be provided.

Staged handover certificates

Scaffolds are often erected in stages; thus, it may be impractical for a single handover certificate to apply to an entire scaffold. For example:

- A perimeter scaffold may have a handover certificate for each building face, thus allowing work on one building face to commence while scaffolding for the other faces is still being erected
- The stair tower of a scaffold may be intended for site emergency access/egress, thus general access is still required while other portions of the scaffold are being altered

In such circumstances it may be appropriate to handover the scaffold in stages. However:

- Handover certificates must contain sufficient information to clearly identify which stages of the scaffold have been handed over
- The principal contractor must have systems in place to ensure workers know which stages of scaffold do and don't have valid handover certificates
- Non-licenced workers must not be allowed to access incomplete stages or stages that do not have a valid handover certificate
- Non-scaffolders must not be allowed on any part of the scaffold if it will cause risk from, or interfere with, nearby scaffolding work (e.g. falling objects from above)
- The inspection prior to handing over a stage must include any existing scaffold, supporting structure or foundation that influences the integrity of that stage

Scaffolding tags

Information that should be provided on a handover certificate should be as per the SafeWork NSW template Scaffold Handover Certificate.

Scaffoldingtags can be a useful indicator at the entry point to the scaffold as to when the scaffold was last inspected. However, they typically do not include the minimum amount of information required for a valid handover certificate, and thus cannot be used as such.

5.6 Independent verifications of higher complexity scaffolds

Most scaffolds are constructed in conventional configurations using typical scaffold erection methodologies. However, some scaffolds have additional design or erection complexities associated with them that may benefit from additional inspection and assessment. Such higher complexity scaffolds would include:

- Scaffold supporting/intended to support formwork
- Scaffolds erected over public vehicular or pedestrian traffic
- Scaffolds that exceed parameters specified by the original system manufacturer (e.g. extra height)
- Loading bays greater than 9m or duty rating exceeding 2 tonne
- Scaffolds with significant non-uniformity e.g. numerous changes in lift height and bay width, multiple spurs or cantilevers
- Scaffolds requiring unusual or sequence critical erection methodologies e.g. crane lifted sub-assemblies

For higher complexity scaffolds, the design should be assessed by a third party that was not engaged in the original design process. The purpose is to identify any potential structural and stability issues with the design; however, consideration should also be given to the constructability of the design. The results of this assessment should be documented, and any issued identified should be addressed before work begins erecting the scaffold.

After a higher complexity scaffold is erected and a handover certificate obtained it can be put into service and accessed/used by approved workers. However, the principal contractor should also engage a competent person who is independent of the scaffold contractor to undertake inspection and verify:

- The erected scaffold conforms to the detailed design
- Scaffolding work has been competently performed
- The scaffold is appropriate for intended use

Where this independent assessment identifies issues, these should be documented and passed on to the scaffold contractor and/or scaffold designer as appropriate for rectification.

For higher complexity scaffolds that are to be erected in stages, the principal contractor should consider whether independent inspection is required at the completion of each stage. The independent verification is an additional control measure to the detailed design, erection and handover process, thus the frequency of independent inspections should be based on level of risk and the principal contractors assessment of risk. Ongoing independent inspections may also be considered when complying with the requirements given in Chapter 6.7.

6. Management of Erected Scaffolds

6.1 Overview

Once erected, use of a scaffold needs to be managed. The principal contractor is primarily responsible for ensuring scaffolds are used correctly. Broadly, this requires making sure all workers on site are aware of how the scaffold can be used and having means for identifying and rectifying issues.

This requires effective communication of scaffold-related information, adequate supervision of scaffold users and regular inspections of scaffolds to ensure they are not compromised and remain effective for the work being undertaken.

This chapter provides practical control measures to prevent common scaffolding issues, including unauthorised access, unauthorised modification, overloading and inadequate inspections.

6.2 Communication, co-ordination and ongoing consultation

The principal contractor has a legal requirement to facilitate and provide effective communication and ongoing consultation regarding scaffolding activity onsite to workers and other relevant parties.

Beyond the legal requirement, it is important to establish and maintain clear communication paths between the principal contractor, other contractors and workers involved in scaffold activity onsite to maintain best productivity, while ensuring all required safety standards are met or exceeded.

Clear communication among all parties has been proven to provide earlier indicators of circumstances or potential problems with scaffold activities, which may then be resolved before they evolve into more serious issues potentially threatening the safety of workers and others.

For information transfer to be effective, it must be provided in a form accessible and understandable to the workers and others.

Consideration must be given to potential communication barriers such as Language Literacy and Numeracy (LLN) issues, cultural backgrounds and oftentimes, a limited understanding of scaffold terminology and construction.

Further detailed guidance may be found in the NSW Code of practice Work Health And Safety Consultation, Cooperation and Coordination August 2019.

The principal contractor must ensure sufficient and understandable information is passed on to workers and others. Some examples of how this may be achieved are:

- Have consultation arrangements with all trades on site (See Chapter 3.2)
- Facilitate communication between trades
- Have site inductions
- Toolbox talks
- Plan of the day (POD) meetings
- Provide site posters e.g., pictures/pictographs of scaffolding tags, do not enter zone signs etc
- Employ translators or provide translations of information for English Second Language workers

There are well known and established communication pathways in construction, which, when conducted regularly, provide clear communication transfer, co-ordination of activities and facilitate ongoing consultation between parties. These are toolbox talks and plan of the day (POD) meetings.

Plan of the day (POD) meetings

Plan of the day (POD) group meetings should be considered. These are daily meetings, typically attended by foremen/leading hands/senior workers of the various trades on site to discuss short term plan of work and:

- Identify where trades will interact
- Determine work sequencing
- Identify who requires access to scaffolds, and where
- Identify what loads will be placed on scaffold and by who
- Generally, facilitate a more effective communication flow between all parties

Toolbox talks

Toolbox talks may occur for numerous reasons but are often used by the principal contractor to pass on relevant information to workers on site, or by a subcontractor to pass on information to their specific workers.

Toolbox talks may usefully include items such as:

- Construction schedule and work sequence
- Notify and describe scaffold installation and dismantling schedule
- Introduce critical scaffold matters to other trades present on site
- Include scaffold drawings to indicate working areas and appropriate duty ratings or loading restrictions
- Issue resolution, contacts for scaffold issues
- How to communicate any scaffold safety concerns e.g., report forms

Toolbox talks should be conducted frequently enough to address issues before they arise.

Useful information on clear communication may be found here: Communicate Clearly A Guide to Plain English.

Scaffold Co-ordinator

The principal contractor should consider assigning a scaffold co-ordinator. This is a person who is responsible for ensuring information relating to the correct use of the scaffold is effectively communicated to all relevant contractors and workers, and ensuring scaffold-related activities are effectively coordinated. They are also the designated on-site point of contact for raising scaffold related issues.

6.3 Preventing unauthorised access to scaffolds

Both principal contractors and scaffolders have obligations to prevent access to:

- Incomplete scaffolds*
- Scaffolds that do not have valid handover certificates
- Scaffolds that have not been inspected
- Scaffolds that have not been repaired/rectified following an incident
- Scaffolds that have not been repaired/rectified following unauthorised modifications
- Closed scaffold platforms (see Chapter 6.5)

Unless the person(s) accessing the scaffold holds a scaffold HRWL.

(*Incomplete may refer to both initial construction of a scaffold and when an existing scaffold is being altered/modified).

Principal contractor

The principal contractor is usually the person with management or control of the scaffold on site, and must not allow work (other than scaffolding work) to occur on a scaffold that does not have a valid handover certificate (see Chapter 5.4), or requires inspection or repair (see Chapter 6.7).

They can do this by:

- Having means to communicate to relevant workers on site which scaffolds are open/closed
- Having means to communicate to relevant workers on site which platforms/areas of a particular scaffold are open/closed
- Having means to communicate to workers on site which scaffolds are currently under construction
- Allowing sufficient time in the construction schedule to complete scaffolding work
- Not directing or allowing work on incomplete or closed scaffolds
- Providing other suitable means of access to work areas to discourage need to access through closed/incomplete scaffolds
- Having site rules around misuse of incomplete or closed scaffolds
- Directing scaffolders to block access to incomplete or closed scaffolds and add signage.
- Preventing unauthorised access to the construction site

Scaffolders

Whilst scaffolders are not typically responsible for day-to-day management of completed scaffolds, they still have duties relating to scaffolds they are erecting or working on.

Scaffolding contractors must ensure their workers only access incomplete scaffolds if they hold the appropriate class of scaffold high risk work licence.

While erecting or altering a scaffold, scaffolders should ensure other workers are not using or accessing the scaffold. This includes situations where the scaffolders are topping up or otherwise modifying an existing scaffold, unless this has been specifically planned and appropriate control measures are in place to ensure safety of all workers (see Chapter 6.6).

They can do this by:

- Physically blocking access points
- Adding signage
- Ensuring the principal contractor is aware of the scaffolding work and where it is occurring
- Ensuring the principal contractor has site rules regarding scaffold access
- Ensuring the principal contractor has notified other trades of off-limit areas

Where incomplete scaffolds are to be left unattended (e.g. end of day), scaffolders should physically block off the access points and hang signage until construction is completed and a handover certificate provided. Signage must clearly indicate that access is not allowed and include phone contact details of the responsible scaffold company or authorised person for enquiries.

6.4 Preventing unapproved modifications

Only appropriately licenced scaffolders can erect, alter, repair or dismantle scaffolds, and this should only occur with the approval of the principal contractor and scaffold contractor.

A common issue on sites is unlicenced workers modifying scaffolds. Another is scaffolds being modified without approval from the principal contractor.

Examples of unlicenced or unapproved modifications may include:

- Removing/moving ties or other components that are obstructing access to a work area
- Removing planks from hop-ups to provide clearer access for façade work
- Moving planks to create temporary work platforms in other locations
- Removing adjustable bases to undertake work on the supporting foundation
- Removing/moving ledgers, transoms, braces or other components to create unobstructed pathways through the scaffold structure

Unlicenced or unapproved scaffold modifications often result from a need/desire to complete work at a given location within a given timeframe. Thus, scheduling and sequencing construction work correctly can reduce the likelihood of this occurring.

Principal contractor

The principal contractor can prevent unlicenced or unapproved modifications by:

- Preferencing engineering controls (e.g. new technologies see Chapter 2.8) over administrative controls during tender and scaffold design phases
- Sequencing work so that scaffolds are appropriately configured before other trades are assigned to work in these areas
- Not directing work in areas where the scaffold requires modification to prevent interference with the work (e.g. façade work where ties are still installed)
- Identifying areas in future where scaffold will need altering so the schedule of work can be updated and scaffolders engaged prior to other trades
- Having regular inspections to identify where unauthorised modifications are occurring
- Having site rules around unauthorised modifications of scaffolds
- Having a review process when unauthorised modifications are observed that identifies and addresses the root cause

Scaffolders

Scaffolders can assist with preventing unapproved modifications by:

- Consulting with the principal contractor on preferred scaffold configuration during design phase (see Chapter 3.2)
- Consulting with principal contractor regarding anti-tamper devices
- Providing documentation containing sufficient detail, such that 30-day inspections can determine whether the scaffold has been modified
- Documenting scaffolding work performed/completed (e.g. photographs)
- Notifying principal contractor if unapproved modifications are observed, or are requested by other trades

6.5 Preventing unapproved loading or overloading

Scaffold overloading is a known risk, and typically occurs either due to placing an excessively heavy load onto a deck/platform or loading multiple platform levels within the same bay simultaneously.

To prevent overloading, workers using and/or loading materials onto the scaffold must understand and be able to identify what the duty rating is for a particular platform.

Scaffold designer

The scaffold designer must provide specific information to the principal contractor regarding:

- What load each platform in the scaffold can support, and
- How many platform levels within a bay can be loaded simultaneously

Principal contractor

The principal contractor must use the information provided by the scaffold designer to ensure the scaffold is not overloaded. They must, as a minimum:

- Consult during the scaffold design phase to ensure the scaffold will be appropriate for the planned work (e.g. light duty for hand tools work only)
- Obtain detailed loading information from the scaffold designer
- Ensure workers using scaffolds receive information on duty ratings and what platforms can be loaded, e.g. through site inductions, toolbox talks, signage etc.
- Not schedule work on unsuitable scaffolds (e.g. bricklaying from a light duty scaffold)
- Conduct effective site inductions and toolbox talks
- Conduct regular inspections that include, but is not limited to, identifying:
    - improper loads stored on scaffold (e.g. palletised scaffolding components, bricks etc)
    - obvious signs of overload (e.g. standards buckling, bent transoms or planks)
    - settling or compromise of supporting surface
    - unapproved loads applied to scaffold (e.g. supporting formwork)
    - unapproved loading of multiple levels simultaneously

Scaffold users

Workers using the scaffold must not make any assumptions regarding the duty rating of a scaffold platform. If the duty rating is not known they must consult the principal contractor before loading the scaffold.

Loading multiple platforms simultaneously

Duty rating is the maximum load that can be placed onto a scaffold platform. The most common duty ratings are Light (225 kg), Medium (450 kg), Heavy (675 kg) and Special (specified by the designer).

It is important to understand the duty rating only indicates the maximum load that can be placed on a platform. It does not indicate how many platforms on the scaffold can be loaded at any one time- this information must come from the scaffold designer.

Preventing overloading of a single platform is relatively easy to manage, for example by limiting the types of equipment/material that can be stored on that platform. However, as most bays have multiple platform levels spaced at 2-3m vertical intervals this introduces a risk of overloading if the multiple platform levels are loaded simultaneously.

Loading multiple platform levels simultaneously must not occur unless the scaffold was specifically designed for such use and the scaffold designer has provided clear instructions as to how such loading can be done.

Where simultaneous loading is to occur, the loads must be managed to ensure they do not exceed that allowed by the scaffold designer. Methods to manage loads are given in the SafeWork NSW guide Erecting altering and dismantling scaffolding Part 1: Prefabricated steel modular scaffolding.

Essentially, this requires keeping track of every platform level in every bay, and specifying whether it can be loaded to a particular duty rating, or is closed and thus cannot be loaded. For example, the top platform level in each bay may have a heavy duty rating, whilst every platform level below is closed.

Platforms may be re-categorised as the project progresses. Continuing the previous example, the top platform level may be subsequently closed to allow a lower platform level to be re-categorised heavy duty. Or, the top platform may be re-categorised light duty to allow a second platform level below to also be re-categorised light duty and loaded simultaneously, provided such use is allowed by the scaffold designer.

6.6 Managing planned alterations (topping up, altering tie patterns etc)

Scaffolds will usually require alteration as the project progresses, and this should be identified during consultation and planned for in the detailed design phase.

Principal contractors can manage planned alterations by:

- Obtaining scaffold design and erection plan from the scaffold contractor
- Incorporating sufficient time for scaffold alterations into the construction schedule
- Regularly reviewing the construction schedule to identify potential issues
- Discussing planned changes to the construction schedule with scaffolders
- Not scheduling work for other trades in areas where the scaffolding is inadequate
- Preventing use of scaffold by other trades whilst it is being altered

Scaffold contractors can manage planned alterations by:

- Ensuring the detailed design aligns the scaffold erection sequence with the building construction sequence
- Providing the principal contractor with list/sequence/stages for alterations, to incorporate into the construction schedule
- Consulting regularly with the principal contractor regarding construction progress and scheduling
- Revising the detailed scaffold design if changes are required
- Ensuring scaffolders are available when alterations are planned to occur
- Ensuring scaffolders have appropriate licence for the work to be undertaken

Ideally, alterations will be identified during consultation, planned in advance, and then undertaken as per plan. However, construction projects are never fixed. Flexibility and the ability to react and adapt should also be included in consultation and scaffold management processes as per Chapter 3.2.

All alterations to scaffold must be appropriately planned, in accordance with Chapters 3.3 to 3.5. The urgency of an alteration does not diminish the duty to provide safe scaffold and a safe workplace.

6.7 Ongoing inspection requirements

In addition to inspections required prior to issuing a handover certificate (see Chapter 5.5), scaffolds must be inspected:

- At least every 30 days
- After an incident that may reasonably be expected to affect the stability of the scaffold, e.g.
  - weather event
  - impact by plant/vehicle
  - unapproved modification
  - damage to supporting surface or supporting structure

The principal contractor must ensure scaffolds on their site are inspected by a competent person. This responsibility cannot be transferred. Typically, these inspections will be done by the scaffold contractor, however, this is not a requirement.

Scaffold inspections should be in accordance with the Safe Work Australia Guide to scaffold inspection and maintenance.

Results of inspections should be documented, with the document clearly identifying:

- The date of the inspection
- Scaffold or area of the scaffold inspected
- Person who conducted the inspection
- Result of the inspection

Where the inspection identifies issues that require scaffold rectification, general access to the scaffold (or the clearly identified and delineated section of the scaffold) should be prevented until rectification work has been completed and a new handover certificate provided as per Chapter 5.5. Rectification work must only be undertaken by suitably licenced scaffolders.

Principal contractors should monitor inspection results to look for trends or repeating issues. If any are identified they should be addressed in accordance with Chapter 7.2.

7. Issue Resolution, Emergency and Incident Response

7.1 Overview

Scaffold planning, design and management in accordance with the previous chapters should result in safe scaffold for the life of the project. However, due to the complexity and length of most construction projects the risk of a scaffolding issue occurring may not be eliminated completely.

This chapter provides guidance for responding to common scaffolding incidents such as unapproved modifications, overloading and damage. Such incidents may be notifiable to the workplace regulator. This chapter is intended to provide guidance for rectification where the scaffold components can still be assembled and dismantled by hand. In extreme cases, e.g. total collapse, rectification may not be possible and demolition of all or part of the scaffold may be necessary.

7.2 Issue rectification process

Where a scaffolding issue has been identified it is important to rectify the issue without placing workers or others at risk. Examples of how this might be done for specific issues are given in the following chapters, however, depending on the situation the principal contractor may need to:

- Prevent or limit access to the scaffold
- Establish exclusion zones around potential fall or collapse zones
- Arrange for independent inspection of the scaffold
- Coordinate Person Conducting a Business or Undertakings (PCBU) involved in planning rectification or demolition work
- Coordinate and support PCBUs while undertaking rectification or demolition work

Furthermore, once an issue has been identified, the principal contractor should investigate to determine what underlying condition has led to it occurring. Attention should be given to:

- The construction schedule, for example:
  - what trade has done the unapproved modification or caused overloading or damage
  - was work sequenced correctly for that trade
  - was scaffold design appropriate for the work
  - were scaffold modifications planned but not yet undertaken by scaffolders
  - is the situation likely to repeat
- Planning and consultation, for example:
  - were issues missed during regular inspections
  - were issues missed during POD meetings/toolbox talks
  - were relevant trades consulted
  - were issued covered in site safety rules/inductions
- Training of workers, for example, whether workers:
  - had site induction
  - attended POD/toolbox talks
  - were aware of site rules
  - were directed not to alter scaffold
  - were appropriately supervised/managed

Consideration should be given to removing repeat offenders from site.

Where repeat incidents are occurring new or additional control measure will likely be necessary. These should be determined through the risk management process.

7.3 Identifying and responding to unapproved modifications

Unapproved modifications are when components have been removed or the scaffold altered without approval of the scaffold designer or competent person. Usually this is done by other trades, although it may be done by scaffolders, for example, working out of sequence or making a modification that is not included in the detailed scaffold design.

Common unapproved alterations include:

- Moving location of planks/platforms
- Removing edge protection to access façade
- Moving/removing hop-ups
- Changes to adjustable bases or supporting surface
- Adding ladders or making other changes to access
- Adding containment sheeting or signage
- Removing components to create unobstructed access though the scaffold
- Incorrect work sequencing when removing ties

If unauthorised modification has been identified the scaffold must be closed until a scaffolder or other suitably competent person can inspect the scaffold and determine the extent of the issue and how it can be rectified.

The inspection should be documented and, as a minimum, determine whether the unapproved modification:

- Is affecting the entire scaffold, or specific location(s)
- Has created a risk of structural instability
- Has created a risk of falls or falling objects
- Makes all or any part of the scaffold unsafe for access by scaffolders
- Makes all or any part of the scaffold unsafe for general access by others

Note, as a guide, modifying bases, supporting surface, ties and bracing can cause scaffold structural issues, whereas removing planks, hop-ups and edge protection may lead to risk of falls.

The inspection should determine whether the scaffold can be rectified with minimal risk using typical scaffolding techniques or will involve higher complexity work requiring detailed planning before proceeding.

Typical rectification work

Typical scaffold rectification work is where the scaffold can be safely accessed by scaffolders and repaired using typical scaffold erection and dismantling methods. Examples would be reinstalling components such as mid-rails or hop-ups, where there are no structural issues with the scaffold in its current state and any falls risks are comparable to those encountered by scaffolders during normal scaffolding work.

Scaffolders may undertake typical scaffold rectifications immediately after inspection without any additional planning.

> *Note, only appropriately licenced scaffolders should undertake repairs. Removed components must not be reinstated by non-scaffolders regardless of how trivial the task may seem, as incorrectly installed components can dislodge unexpectedly when people put weight on them.*

If safe to do so, unaffected sections of the scaffold may be opened for general access while repairs are completed provided this does not create a risk to the workers or scaffolders undertaking repairs, and a staged handover certificate is first issued in accordance with Chapter 5.5 identifying what areas are to be opened.

Once repairs are complete the scaffold should be reinspected, and a new handover certificate issued in accordance with Chapter 5.5. In addition, the principal contractor should investigate in accordance with Chapter 7.2 to determine what underlying condition has led to the unapproved modifications and take action to prevent the issue recurring.

Higher complexity rectification work

Higher complexity scaffold rectification work would include any work requiring:

- Additional support or strengthening of the scaffold prior to being safe to access
- Design change of the scaffold
- Dismantle and re-erection of the affected area of the scaffold
- Specialist height safety equipment, such as harness-based restraint or fall arrest
- Provision of access by other plant, such as crane lifted workboxes or elevating work platforms (EWP)
- Demolition or partial demolition of the scaffold e.g. using oxy-acetylene torches, hydraulic shears etc

Higher complexity scaffold rectification work is usually required where the unapproved modification is extensive, has resulted in an increased risk of falls, resulted in risk of catastrophic failure to the scaffold, or requires unusual erection/dismantling methods.

In such cases the scaffold must remain closed while a more detailed assessment is undertaken and a comprehensive rectification plan is made. It may be necessary to engage a competent scaffold designer or engineer to assist, and may also involve other trades such as crane contractors, demolition contractors, height access specialists etc.

All relevant parties should be consulted in developing the rectification plan, and the scaffold must remain closed while the repairs are being carried out.

Once repairs are complete the scaffold should be reinspected, and a new handover certificate issued in accordance with Chapter 5.5. In addition, the principal contractor should investigate in accordance with Chapter 7.2 to determine what underlying condition has led to the unapproved modifications and take action to prevent the issue recurring.

7.4 Identifying and responding to overloading

Overloading can occur by placing excessive load onto the scaffold. The results of overloading can be relatively minor and easy to correct, or significant and result in risk of catastrophic failure.

> *Note, the appearance of overloading can also occur due to removing components (e.g. bracing, double legging) thereby reducing the scaffolds load-carrying capacity to below the original duty rating. In such cases the scaffold should be rectified in accordance with Chapter 7.3.*

Minor overload event

In some cases, overloading may be minor or result in damage to the scaffold that is localised. Examples include:

- Damage to an individual plank from an excessive point load (e.g. stillage leg)
- Loads not adequately distributed over a platform (e.g. bricks stored on one or two planks)
- Minor overload of a single platform (less than 10 per cent over the duty rating)

In such cases the affected area of the scaffold should be closed until scaffolders can assess. If still safe to access the loads should be removed from the scaffold, and any damaged components should be replaced.

The principal contractor should investigate the cause of the overloading in the manner described in Chapter 7.2.

Significant overload event

In other cases, the overloading may result in damage to the scaffold that makes it unsafe to access or is at risk of catastrophic failure. Obvious indicators this has occurred include:

- Partial collapse
- Bowing/buckling of standards, ladder beams, needles etc
- Slipping of tie tubes through anchorages or couplers
- Movement at, or damage to, the supporting surface
- Scaffolders assessing a suspected minor overload had determined the scaffold is no longer safe to access
- Degradation of scaffold components e.g. corrosion

In these cases, the scaffold should be closed and access by any worker prevented, including scaffolders. An exclusion zone should be established around the potential fall zone where the scaffold could collapse. An engineer must then be engaged to inspect the scaffold and determine a safe method to either rectify or demolish the affected areas of the scaffold.

The preferred sequence for rectification work is to:

- Establish exclusion zones
- Secure the scaffold from further damage or movement
- Remove the excessive load
- Identify and replace any damaged components
- Reinspect the repaired/altered scaffold and document findings

This may require things such as adding additional ties, ladder beams or needles to transfer load back to the supporting structure before allowing access onto the scaffold. Any method for installing additional components should not put the scaffolders at risk and undergo a risk assessment prior to proceeding.

Once the scaffold is secured the load can then be removed and the scaffold reinspected. Any damage identified should be rectified before returning the scaffold to service.

The principal contractor should investigate the cause of the overloading in the manner described in Chapter 7.1. This should include consulting with the engineer and scaffold designer to assess whether any deign alterations or rectifications are necessary for the scaffold to be suitable for the intended use.

7.5 Identifying and responding to damage to scaffolding

Damage to scaffolding can occur from construction related activities on site. Examples include:

- Impact damage from moving plant, such as cranes, excavators, telehandlers etc
- Impact damage from falling objects
- Impact damage from motor vehicles
- Excavation works near scaffold support surfaces

Natural events may also cause damage to erected scaffolds, for example:

- Storms
- High winds
- Water erosion of foundation
- Subsidence, sinking into supporting surface
- Corrosion/deterioration of components

Some scaffolds may be more susceptible to weather damage e.g. wind loads on scaffolds with containment sheeting. Damage to scaffolds can also occur when controls for managing weather events are not being followed e.g. not adding additional ties at the top lift as required by the designer

If damage has been identified the scaffold must be closed until a scaffolder or other suitably competent person can inspect the damage to determine how it has affected the scaffold.

Often damage will appear to be localised. However, the potential for load transfer though the scaffold structure means the inspection should include the damaged areas as well as checking for signs of movement at the scaffold base and slipping/loosening of ties and tie anchorages.

Depending on scaffold design, and the particular components damaged, the structural performance of the scaffold can be significantly impacted (e.g. damage to load bearing components such as standards, ladder beams).

In the same manner as Chapter 7.4 previously, if the inspection determines the damage is minor and the scaffold is still safe to access the scaffolder may undertake repairs.

However, if the damage means the scaffold could be at risk of catastrophic failure an exclusion zone should be implemented and an engineer engaged to inspect the scaffold and determine a safe method for scaffolders to:

- Secure the scaffold from further damage or movement
- Remove load from the scaffold if required
- Identify and replace any damaged components
- Reinspect the repaired/altered scaffold

Once repairs are complete the affected areas of the scaffold should be re-inspected in accordance with Chapter 6.7. The principal contractor should not allow general access to the scaffold until they have received written confirmation from the scaffolder that the repairs are complete.

In the case of damage due to construction activities the principal contractor should investigate to determine what underlying condition has led to it and take action to prevent the issue recurring.

7.6 What is notifiable and how to notify

What is notifiable

A 'notifiable incident' is an incident resulting in the death, serious injury or serious illness to a person or a 'dangerous incident'. Detailed information regarding what constitutes a serious injury or serious illness is available on the SafeWork NSW website.

A dangerous incident that is notifiable and specific to prefabricated steel modular scaffolding would include:

- Collapse or partial collapse of the scaffold
- Dislodgement and fall of any scaffold component outside an effective exclusion zone
- Fall from the scaffold of any stored material outside an effective exclusion zone
- Fall from the scaffold by any worker
- Failure of any scaffold component in normal use
- Damage to the scaffold requiring repair, e.g. but not limited to:
  - impact by vehicle traffic
  - impact by cranes or other plant
  - environmental actions (strong wind etc)

When or how to notify

Any Person Conducting a Business or Undertaking (PCBU) from which the notifiable incident arises must ensure the regulator is notified immediately after becoming aware it has happened. Procedures should be put into place to ensure work health and safety incidents are promptly notified to the people responsible for responding to them, for example a manager and then notified to the regulator, if required.

In NSW, an incident may be notified by contacting SafeWork NSW on 13 10 50.

An incident site must not be disturbed until a SafeWork NSW inspector arrives at the site or directs otherwise (whichever is earlier). However, a site may be disturbed without direction from an inspector if it is to:

- Assist an injured person
- Make the site safe
- Prevent further notifiable incidents occurring, or
- Facilitate police investigation

The person with management or control of the workplace is responsible for preserving the incident site, so far as is reasonably practicable.

8. Further Information

SafeWork NSW documents:

- Erecting, altering and dismantling scaffolds
- Pocket guide to construction safety
- Scaffold safety checklist

Safe Work Australia documents:

- Safe Work Australia Scaffolds and scaffolding work general guide
- Safe Work Australia Guide for scaffold inspection and maintenance

Australian Standards:

AS/NZS 1576.1 Scaffolding, general requirements

AS/NZS 1576.2 Scaffolding, couplers and accessories

AS/NZS 1576.3 Scaffolding, prefabricated and tube and coupler scaffolding

AS/NZS 1576.4 Scaffolding, suspended scaffolding

AS/NZS 1576.5 Prefabricated splitheads and trestles

AS/NZS 1576.6 Metal tube and coupler scaffolding deemed to conform to AS/NZS 1576.1

AS/NZS 1577 Scaffold decking components

AS/NZS 4576 Guidelines for scaffolding

Appendix A – Influence of Construction Processes on Scaffold Design

Scaffolding is used on most construction projects to provide access, edge protection and a platform to work from or store materials on.

The scaffold is usually designed to suit the construction techniques and processes that will be used in the project, thus the proposed construction methods will heavily impact the scaffold design. Equally, the need to ensure the scaffold remains serviceable throughout the project can affect the construction project, particularly sequencing of work.

The following are some real-word examples:

- The scaffold may be used as landing platform for a materials hoist. The need to transfer material from the hoist to the slab at each level means the scaffold platforms must be the same height as the slab. This will affect the lift height of the scaffold, which in turn may affect the erection procedures and equipment necessary to erect the scaffold. The scaffold may also need to have a special duty rating equivalent to the capacity of the hoist to prevent overloading.
- The scaffold may be used for containment of falling objects, with the external faces fully sheeted. This will require more ties than an un-sheeted scaffold. However, the distance between each slab level of the building may exceed the maximum vertical spacing required for the ties, requiring the scaffold design to incorporate ladder beams, additional bracing or other structural elements to ensure the sheeted scaffold can withstand the additional wind loads.
- The scaffold may be intended as perimeter edge protection when constructing falsework/formwork decks. This will require the scaffold to extend above the height of the adjacent supporting structure. This may require the use of raker ties, which need to be replaced with more effective horizontal ties once slab cures. This introduces sequencing issues. For example:
  - rakers may interfere with falsework
  - scaffold can't be topped up until horizontal anchorages are installed
  - horizontal tie anchorages can't be installed in the slab edge or soffit until the formwork has been stripped
- The scaffold may be used as a platform for landing crane lifted loads. This means there must be clear space above the platform, so this affects when the scaffold can be topped up. If loads are still to be landed it won't be possible to top the scaffold, for example to be used as edge protection during formwork erection.
- The scaffold is to be used as a work platform to complete bricklaying façade work. The bricklaying needs to be undertaken from the ground up, however, ties can only be removed as the scaffold is dismantled from the top down. This will require the scaffold to either incorporate a tie design that does not impede the façade work, or to develop a sequence of work to ensure ties are not affected e.g. bricking around the ties then returning to patch in as the scaffold is being dismantled.
- Horizontal ties may be used, anchored to the concrete slab. In the area where workers access the slab directly from the scaffold the anchorages may be fixed to the soffit to prevent trip hazards. However, after the scaffold is dismantled other trades now need to return to patch and paint the anchorage holes. This now requires working from ladders close to the slab edge, creating the risk of falling over the edge protection.

Appendix B – Example Contractor Pre-qualification Checklist

Contractor Pre-qualification Checklist			
Contractor Name			
Services provided			
Date to commence			
Job title			
Department			
Supervisor			
As part of the contractor approval process all contractors are required to answer the following questions and provide copies of relevant documents where applicable.			
		Yes	No
OHS/WHS Policy and Management			
1. Company OHS/WHS policy			
2. OHS/WHS management systems manual or plan [table of contents page to be provided as evidence]			
3. OHS/WHS certification e.g. AS/ NZS ISO 45001:2018			
Safe Work Practices and Procedures		Yes	No
4. OHS/WHS procedures or specific safety instructions relevant to its operations and this contract			
5. Procedures for maintaining, inspecting and assessing the hazards of plant operated/owned by the company			
6. Safe operating procedures for plant and equipment			
7. Procedure for electrical testing and tagging system [evidence/statement]			
8. Procedure for tagging or lock out of faulty equipment			
9. Procedure for storing and handling hazardous substances			
10. Proceudres for identifying, assessing and controlling risks associated with manual handling/manual kits			
11. Competencies as required e.g. forklift, confined spaces			
12. Emergency response planning for the job/work on site			
13. Personal Protective Equipment [PPE] used [please list]			

Hazard Identification and Incident Investigation	Yes	No
14. Procedure for workplace equipment inspection		
15. Procedure for hazard and incident reporting including reporting of near misses and notifiable incidents		
16. Procedure for incident investigation		
Documentation and Records	**Yes**	**No**
17. Safe Work Method Statements/Job Safety Analyses		
18. Safety Data Sheets (SDS) for hazardous substances to be brough on-site		
19. Records of safety training conducted		
20. Plan & equipment maintenance schedule		
21. Inspection checklists for worksites/equipment		
22. Records of toolbox talks/OHS/WHS committee meetings		
23. Evidence of current workers compensation policy (copy of current certificate)		
24. Details of public liability insurance (copy of certificate)		
The information provided is true and accurate at the time of submission.		

Completed by:			*Position:*
Signature:			*Date:*
Office use only:			
Approved	*Yes*	*No*	*Review Date:*
Approved by [Name]			*Position:*
Signature			

For an approved contractor, that had NO answer, provide details on exemption/s:

If not approved, explain:

Further requirements to be re-considered as an Approved Contractor

Appendix C – Scaffold Ties

A scaffold is often a tall, slender structure that needs to be tied to a supporting structure to prevent it toppling over. Ties are used to connect the scaffold to a supporting structure. Ties provide the scaffold with stability and may also increase the stiffness of the scaffold improving structural performance.

Ties are usually made from scaffold tube, connected at one end to the scaffold and at the other end to an anchorage fixed to a supporting structure or surface.

Commonly, tie anchorages comprise a bracket incorporating a coupler to connect to the tie tube and a hole for a fixing to connect the bracket to the supporting structure. Less commonly, ties may be made by boxing scaffold tube around columns, wall openings, parapets.

Scaffold ties may connect to any part of a scaffold but are most typically connected to a standard (vertical member) near a node (the junction where the transom and ledger connect to the standard).

Ties are typically horizontal, however may be angled (known as a rakers).

The type of tie, and position of ties, can vary considerably from job to job. The selection and design of the tie layout is heavily affected by the available support structure and proposed construction processes.

The tie design must be determined by the scaffold installation designer and should not be improvised as the scaffold is being erected. Tie design must include:

- Anchorage type
  - bracket type
  - fixing type
  - substrate
- Tie angle (for rakers)
- Number
- Pattern/location on scaffolder

(i.e. sufficient info that it can be followed on site without interpretation).

Influence of scaffold design

- Sheeted scaffolds require more ties than unsheeted scaffold
- Scaffolds erected in high wind areas may require additional ties
- Scaffolds supporting higher loads or loads from other plant/structure may require additional ties
- Birdcage scaffolds often require less ties
- Raker ties may be less effective than horizontal ties (unless properly triangulated)
- Tie locations may hinder clear access or clear head space along working decks
- Design of the supporting structure may limit where ties can be located, requiring the scaffold design to incorporate additional bracing

Influence of supporting structure

Ties may be anchored to the supporting structure in many ways.

Most common method is to fix directly to columns walls or slabs using masonry anchors (e.g. concrete screws, expansion anchors, chemical anchors). Other methods may include boxing around or clamping to structural columns, parapets, window voids etc.

An assessment of the supporting structure may be required to ensure it can withstand loading imposed by the scaffold. Proof testing of tie anchorages may also be necessary. Tie pattern must align with locations on the supporting structure that are structurally capable of withstanding the imposed loads.

Sufficient clearance/access is required to areas of the structure for installation, alteration and removal of ties.

Examples of typical scaffold ties are shown below:

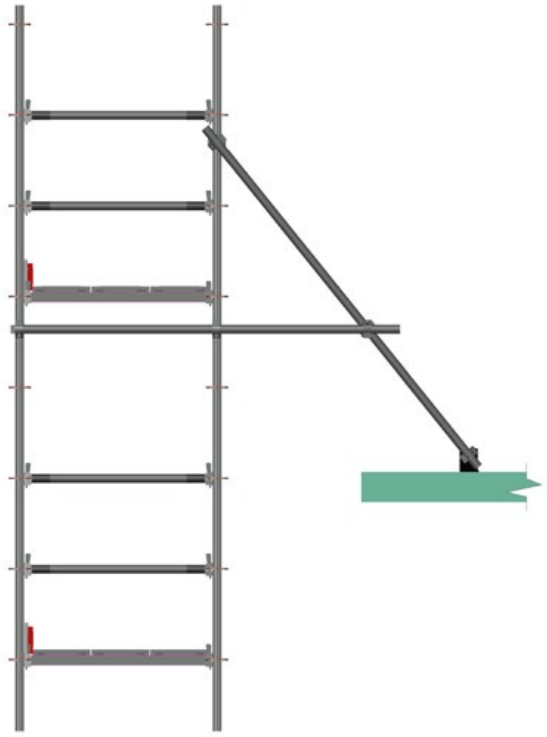


Figure C1. Example of a raker tie

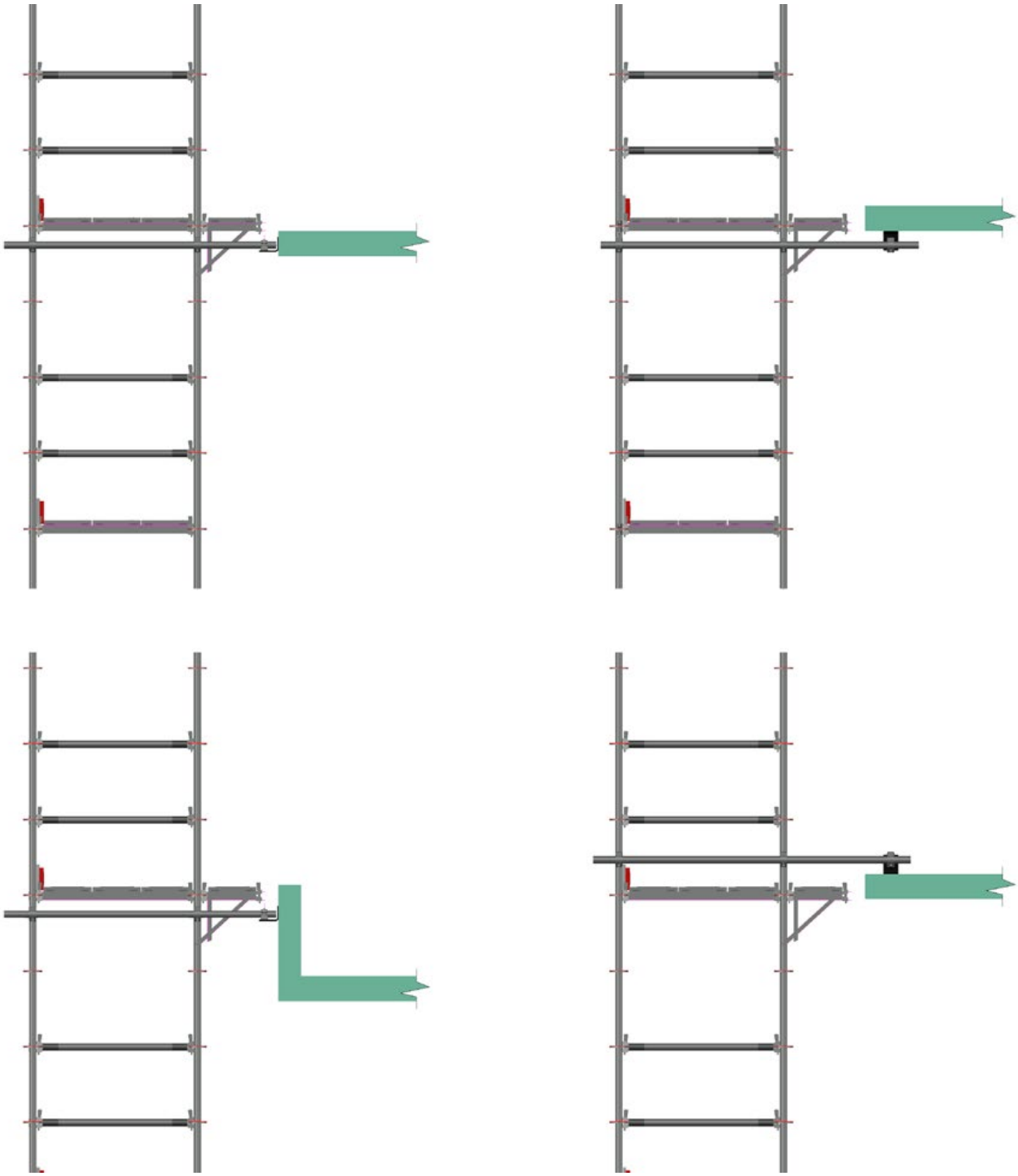
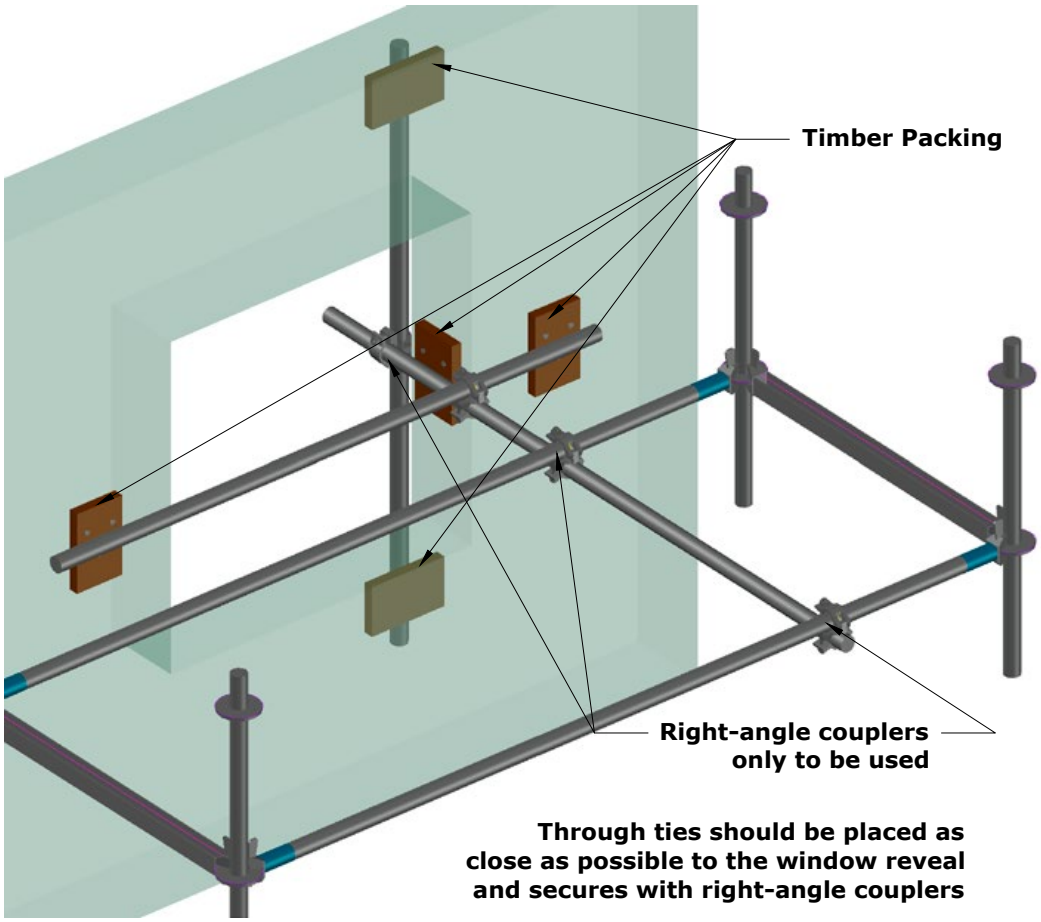


Figure C2. Examples of horizontal ties anchored to concrete slabs/walls. The configurations on the left show edge/face ties, on the right show soffit/floor ties



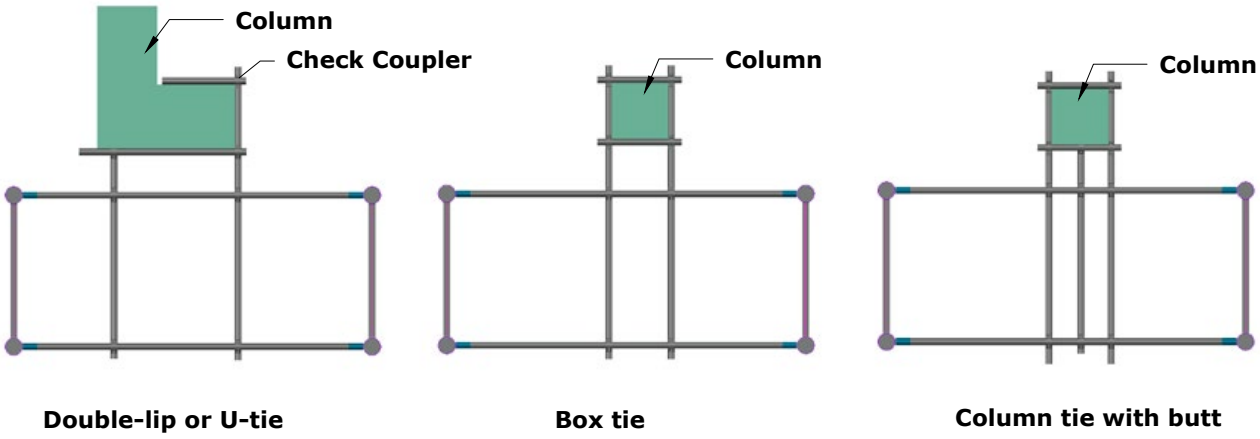


Figure C3. Examples of though tie, U-tie and box/column ties

Appendix D – Scaffolding Terminology

D1 Scaffold components

A scaffold is a temporary structure used to support a platform (or platforms) which may be used by workers for access or place of work, or to store equipment and materials.

A 'modular' scaffold is essentially a scaffold that is constructed from prefabricated components that are not adjustable, thus the geometry of the scaffold is determined by the size or length of these components.

The main components of a prefabricated modular scaffold are:

- **Adjustable base plates**, which are the part of the scaffold that contacts the supporting surface, and can be adjusted to ensure the scaffold is level.
- **Standards**, which are the vertical tubes that slip onto the adjustable baseplates. Usually arranged in a grid like pattern. They are the main structural part of the scaffold.
- **Ledgers**, which connect horizontally between the standards in the longitudinal direction. They are often also used for guardrails and mid-rails.
- **Transoms**, which connect horizontally between the standards in the transverse direction. They are usually used to support scaffold planks.
- **Putlogs**, which connect horizontally between ledgers. Uncommon on modular scaffolds but may also be used to support scaffold planks.
- **Planks**, which are used to form a platform that can support persons or materials. They can also be used for toe boards to prevent small objects being kicked off a platform.
- **Bracing**, which is used to stiffen the scaffold. A scaffold is three-dimensional, so this can be installed in three planes: face bracing (same plane as ledgers), end bracing (same plane as transoms) or plan bracing (same plane as planks/platforms).

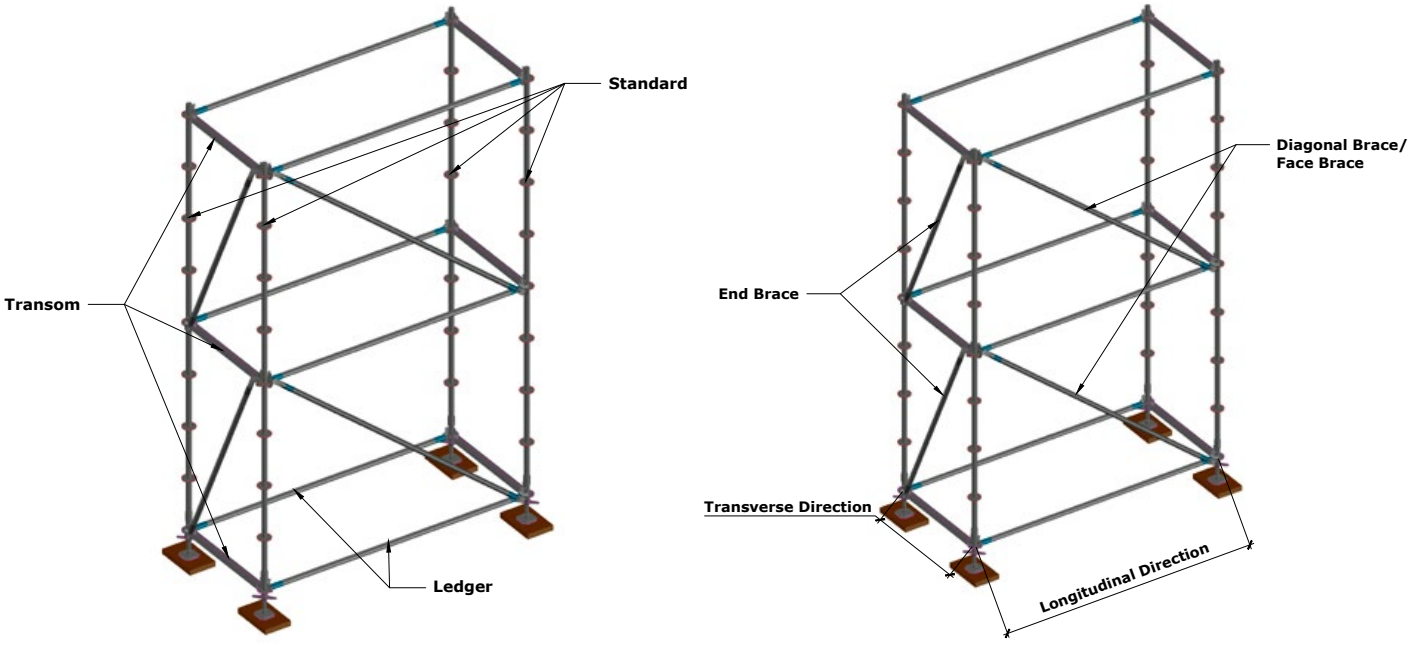


Figure D1. The main components of a prefabricated modular scaffold. Planks have been omitted for clarity. There are also many other ancillary components that may be used.

D2 Scaffold bays

Modular scaffolds are essentially configured into square or rectangular modules known as **bays**.

A bay is the area bound by four standards and includes everything within those four standards from the bottom to the top of the scaffold, as shown in Figure D2. The bay length is measured in the longitudinal direction, the bay width is measured in the transverse direction.

Scaffolds may be a single bay (called a **tower**), or numerous bays adjacent to each other in the longitudinal direction (called a **run**). Where a scaffold also has bays adjacent to each other in the transverse direction it is called a **birdcage** (see Figure D3).

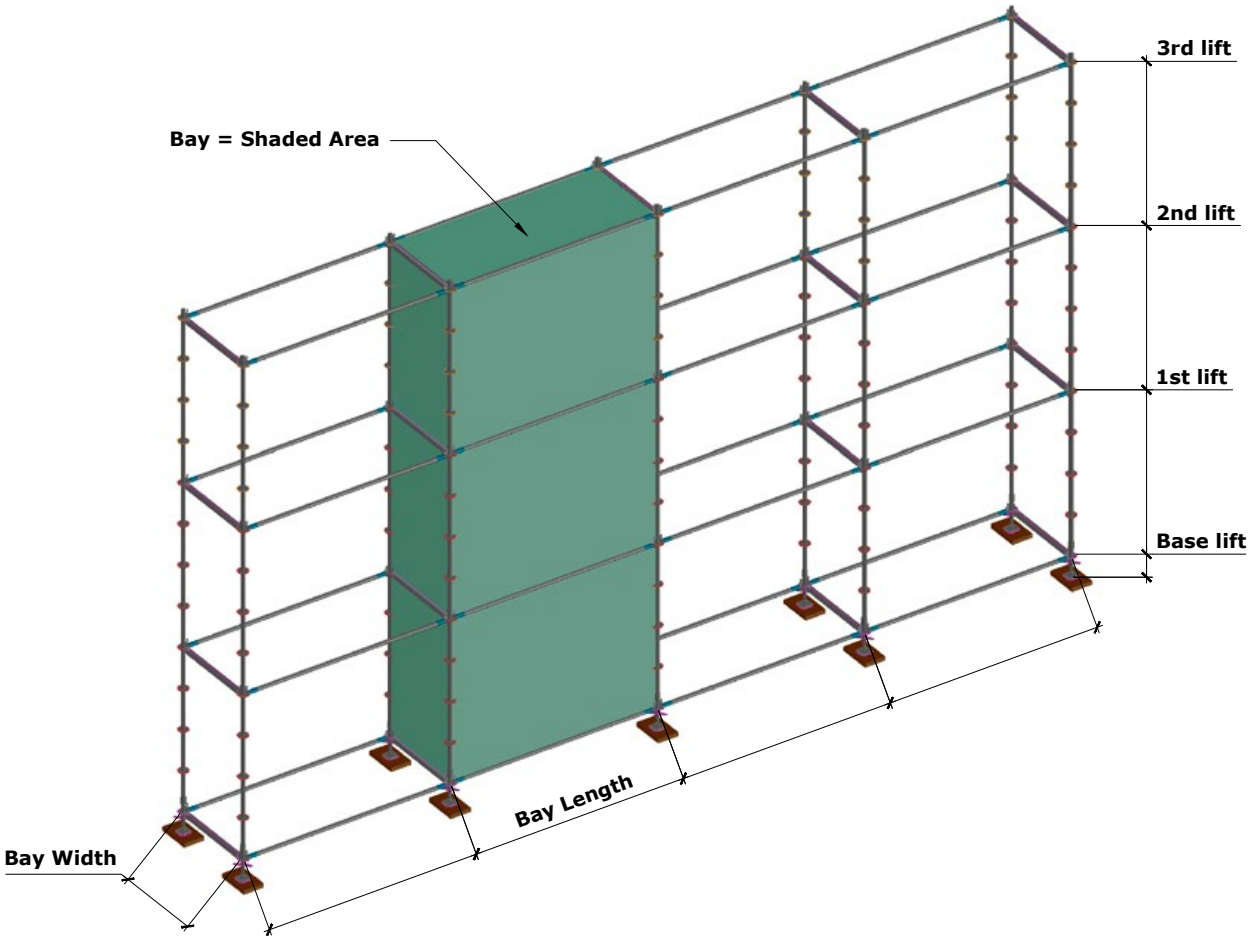


Figure D2. A simple scaffold layout demonstrating a bay. This scaffold is a run of four bays in the longitudinal direction. Lifts are indicated by the green measure on the right. Note, in NSW fully planked platform levels are usually 2-3m apart

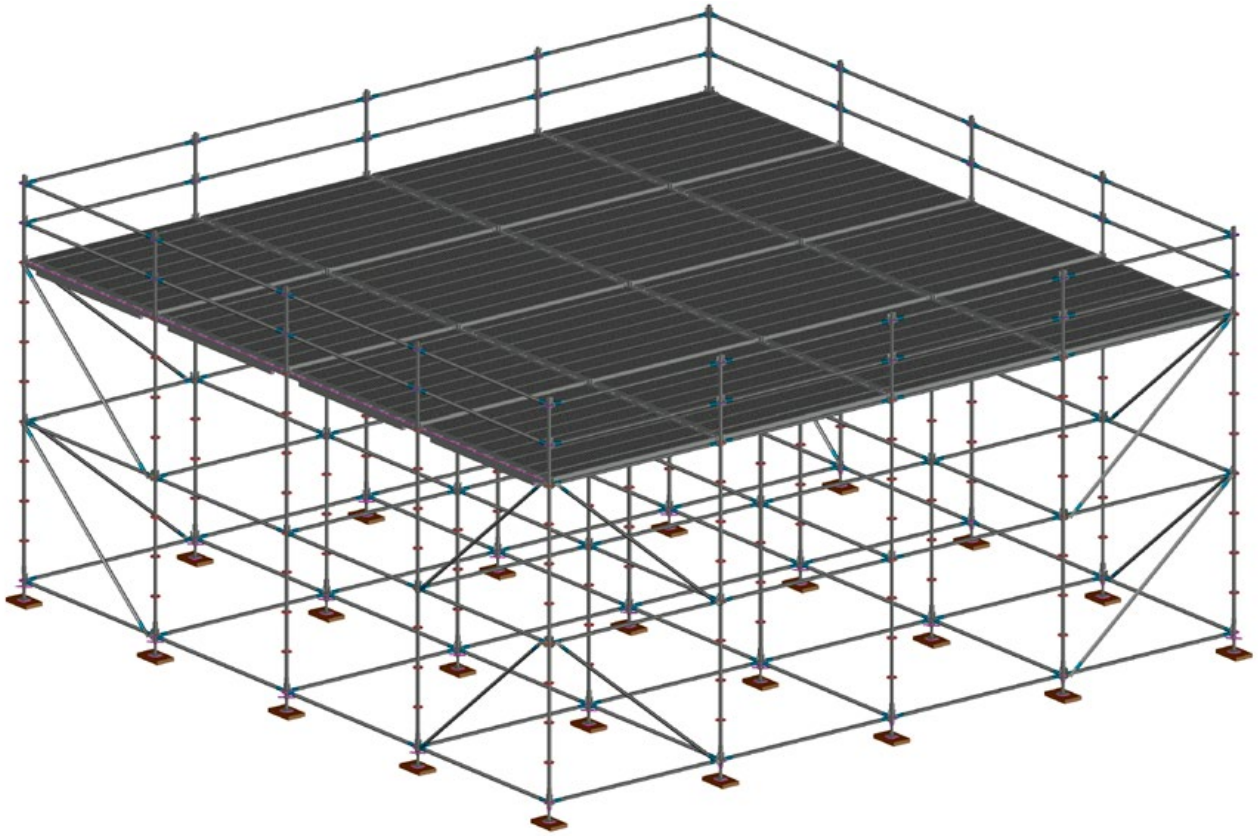


Figure D3. Example of a birdcage scaffold, which has multiple bays in both the longitudinal and transverse direction.

Within a bay, **platforms** are constructed, usually by installing planks onto the transoms.

There may be one only platform in a bay, but typically there will be multiple platforms positioned at different vertical levels within a bay.

A **lift** is a level where ledgers and transoms are installed. **Lift height** is the distance between successive lifts.

Scaffold height is often specified in metres but may also be referred to by the **lift** or reference to some other feature such as the level of an adjacent building.

D3 Scaffold platforms

Within a bay, **platforms** are constructed, usually by installing planks onto the transoms. A platform is a surface on a scaffold intended to support persons, materials or both.

Platforms are typically described by their use, e.g.:

- *Working platforms* provide a work area for persons and their equipment/materials
- *Access platforms* are primarily intended to provide access to/from work areas
- *Loading platforms* are primarily intended for storing equipment/materials
- *Catch platforms* are intended to contain debris falling from another platform
- *Closed platforms* are not intended to support any live load

There may only be one platform in a bay. For example, each bay of the birdcage scaffold shown in Figure D3 has a single platform. These are all at the same height and thus create a continuous platform level across the entire scaffold.

Typically, however, there will be multiple platforms within a bay, positioned at vertical spacings of 2-3m. This is usually because the scaffold was erected in accordance with the SafeWork NSW guide Erecting, altering and dismantling scaffolding - Part 1: Prefabricated steel modular scaffolding.

A platform may protrude/extend beyond the line between standards. This a bay extension platform, however, it is more commonly referred to by industry as a **hop-up platform** or simply a **hop-up**. An example of a hop-up is shown in Figure D4. Hop-ups are often used to fill in the gap between the scaffold and the adjacent building.

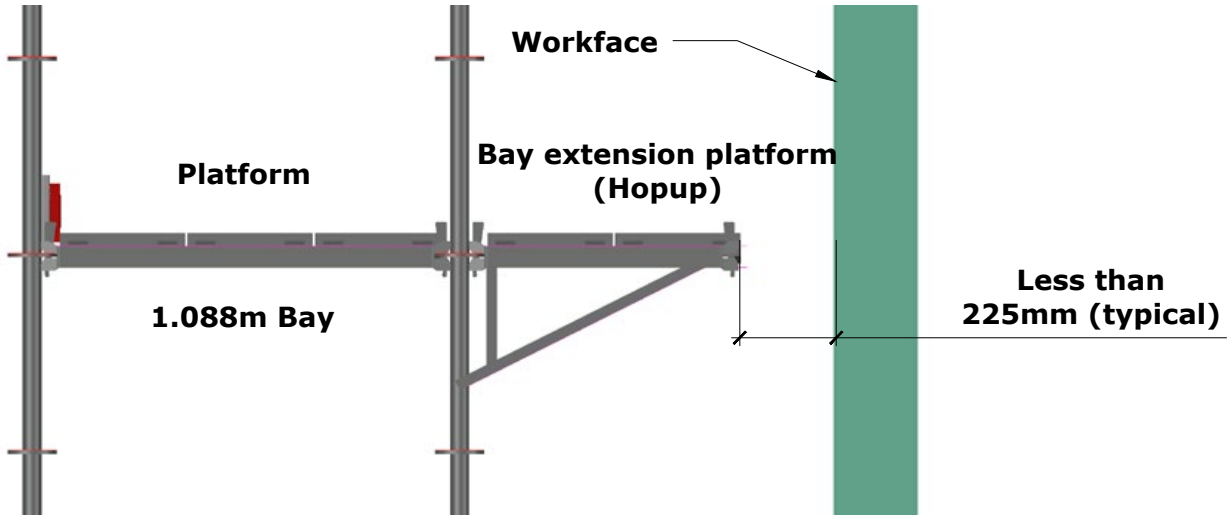


Figure D4. A simple scaffold layout, showing a 5-plank wide bay with a 3-plank wide bay extension 'hop-up' platform. Hop-ups may be level with the platform, or up to 1m above or below the platform depending on the configuration of the scaffold (as per AS/NZS 1576.1:2010 Clause 3.6)

Edge protection is required where a person could fall from the sides or ends of a scaffold platform. For modular scaffolds, this will typically take the form of ledgers or transoms being used for mid-rails and guardrails, and a scaffold plank lying on its long edge for a toe board. If further containment is required, chain mesh or synthetic encapsulation material (or a combination of both) may be used to line the inside of the edge protection.

D4 Dead and live loads

A scaffold is broadly subjected to two load conditions in service:

- **dead load** is the self-weight of the scaffold, and does not change until the scaffold is modified
- **live load** is the combined load resulting from the weight of all people, materials and equipment on the scaffold plus any environmental actions e.g. wind. (Essentially, live loads are loads that may fluctuate/change during use.)

Wind and other environmental loads generally cannot be changed once in service at site, so must be factored into the scaffold design.

However, the magnitude and position of loads that are placed onto platforms is frequently changed once the scaffold is put into service and accessed by people or used to store materials and equipment.

It is therefore important to know what is the maximum allowable live load that can be placed on a platform, known as the **duty category**. Loading of the scaffold must be managed on site to prevent the live load on any given platform exceeding its duty category, and to prevent bays from being overloaded.

D5 Duty ratings and loading scaffolds

Understanding the duty rating

A duty rating is the maximum live load a scaffold platform can support.

Duty rating is usually categorised as Light duty, Medium duty, Heavy duty or Special duty, and is dependent on both the strength and width of the platform. For example, a 'heavy duty' working platform must be:

- At least 900mm wide
- Capable of supporting a total live load of at least 6.6 kN, that is comprised of
  - at least 2 kN concentrated at any point, and
  - the remaining load distributed over the platform surface

It is important to know that the **duty rating relates to individual platform levels, not the scaffold as a whole**.

Whilst it is common to colloquially refer to a scaffold as 'heavy duty' this only means it has platforms that are capable of supporting a heavy duty load. It does not indicate how many of these platform levels can be loaded simultaneously before the scaffold becomes overloaded.

Loading scaffolds

The most common causes of scaffold overloading are

- Too much load on a single platform
- Loading multiple platform levels in the same bay simultaneously

The risk of this occurring can be minimised by ensuring, before the scaffold is first loaded, you know:

- What the duty rating of every platform is
- Whether this duty rating is fixed, or can vary depending on how the rest of the scaffold is being loaded
- How many platform levels within a single bay can be loaded simultaneously

Appendix E – Example Provision of Scaffold Design and Engineering Signoff

Design information should have sufficient detail to show how the scaffold is to be configured, braced, tied and loaded, and should include any sign-offs for non-standard design features. Examples of how this may be done are given in this Appendix.

Report No:

Date: 23/12/2019

Client: AE&J
Project: Trinity Glade
Address: 212 Blasse Road, Girraween

Scaffold: Building 4, North Facade. Access & Loading bay

Details:

Facade scaffold, with three bay access opening. Stretcher access at eastern end, 2000kg 4-bay loading platform towards western end.

Drawings:
1. B4N-01 (23/12/19)
2. B4N-02 (23/12/19)
3. B4N-03 (23/12/19)
4. B4N-04 (23/12/19)

Certification:

The scaffold design has been assessed using strand 7 and complies with the strength and operational requirements of AS/NZS 1576.1:2010.

Signed,

BE MIE CPEng

Figure E1. Example scaffold design – engineers certificate

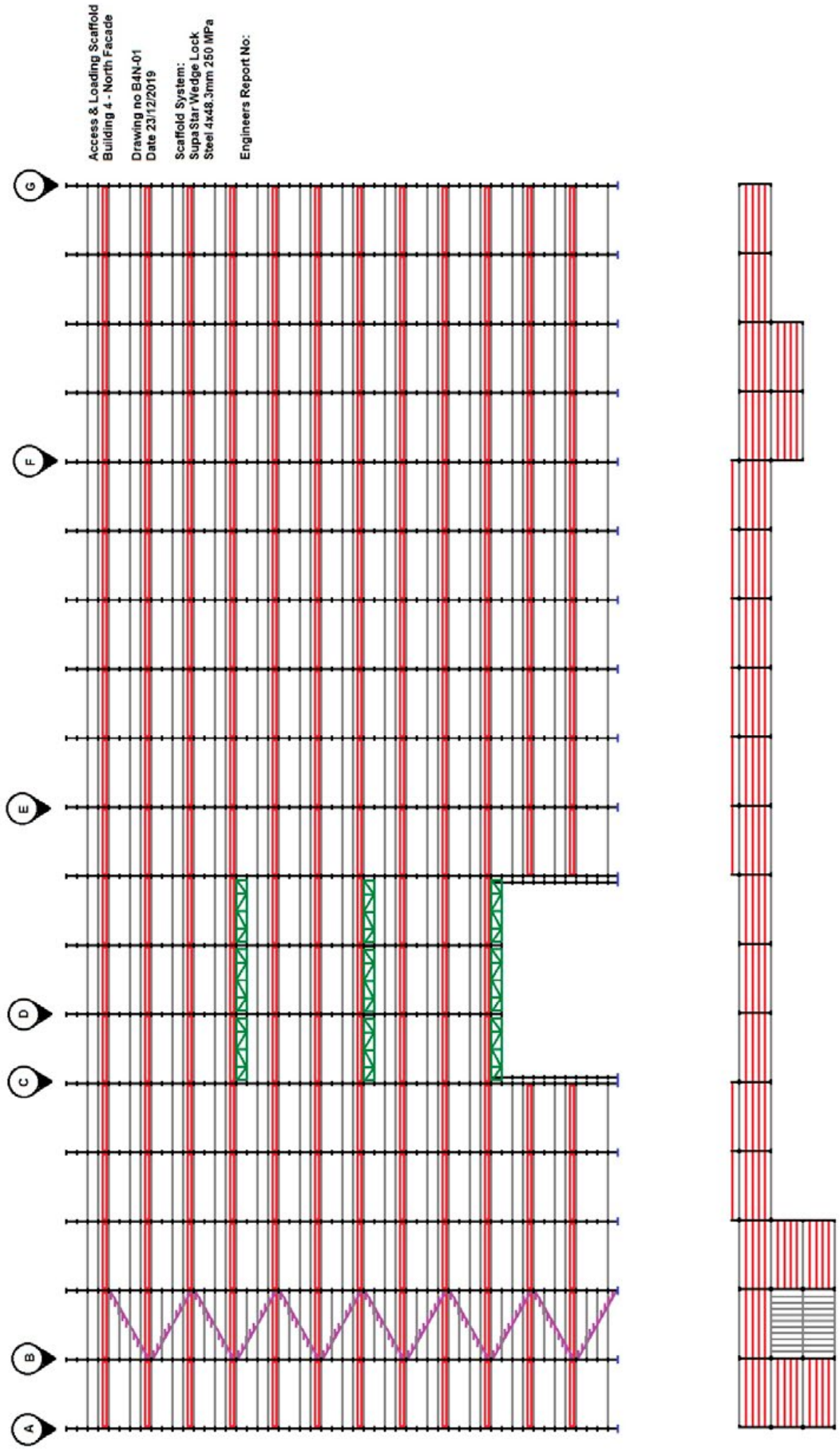


Figure E2. Example scaffold design – plan and front elevation

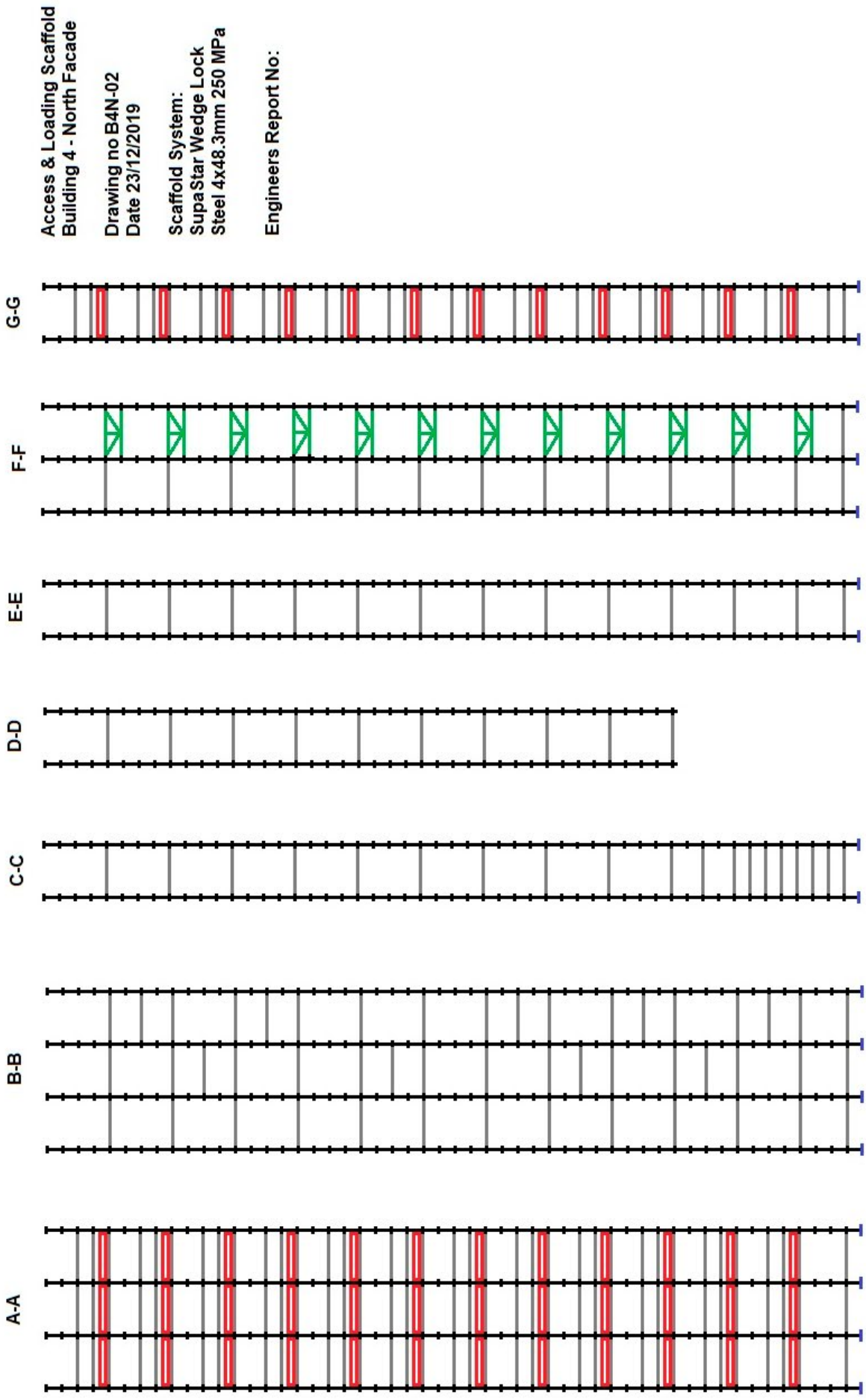


Figure E3. Example scaffold design – end elevation

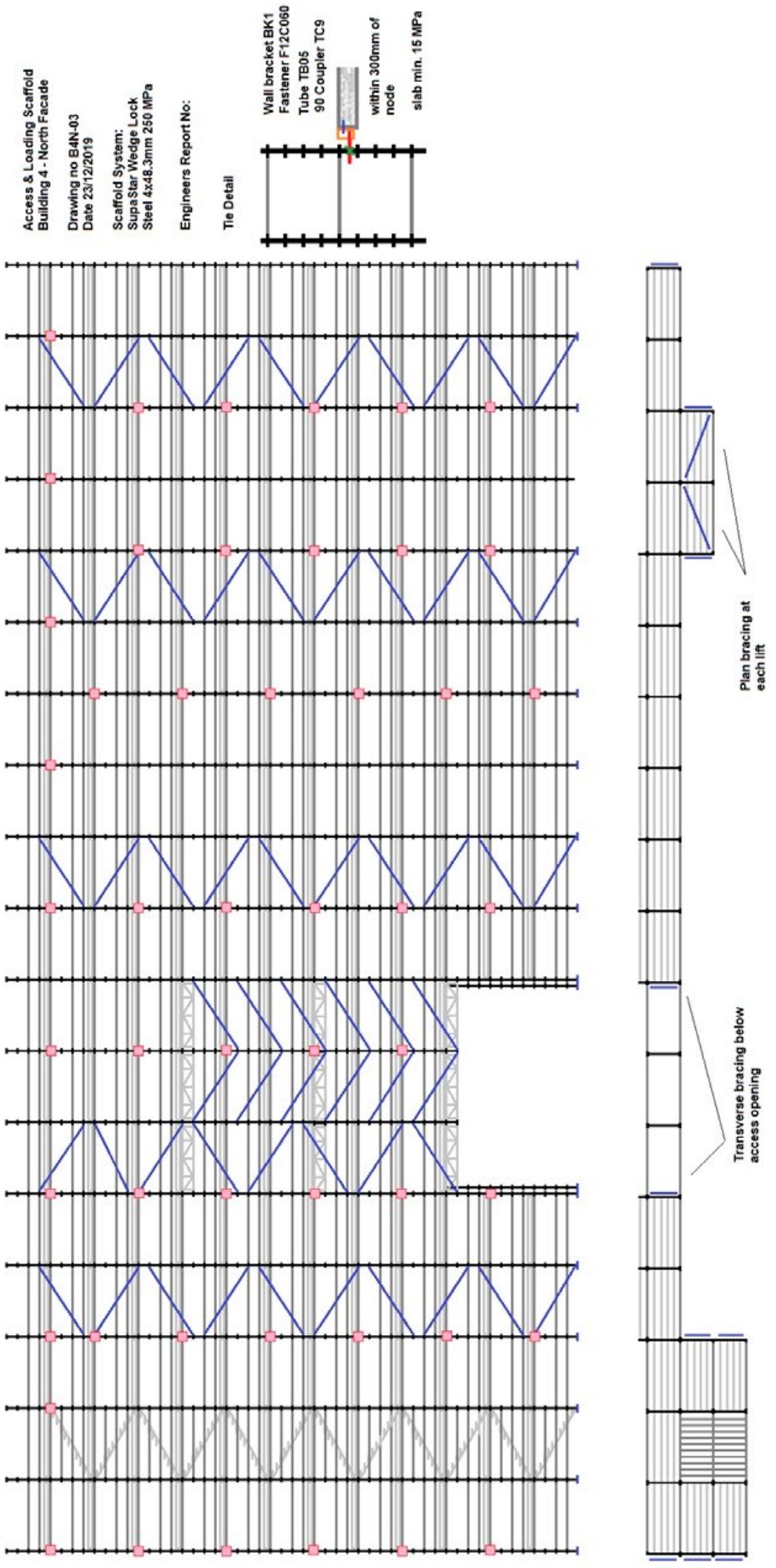


Figure E4. Example scaffold design – bracing and tie layout

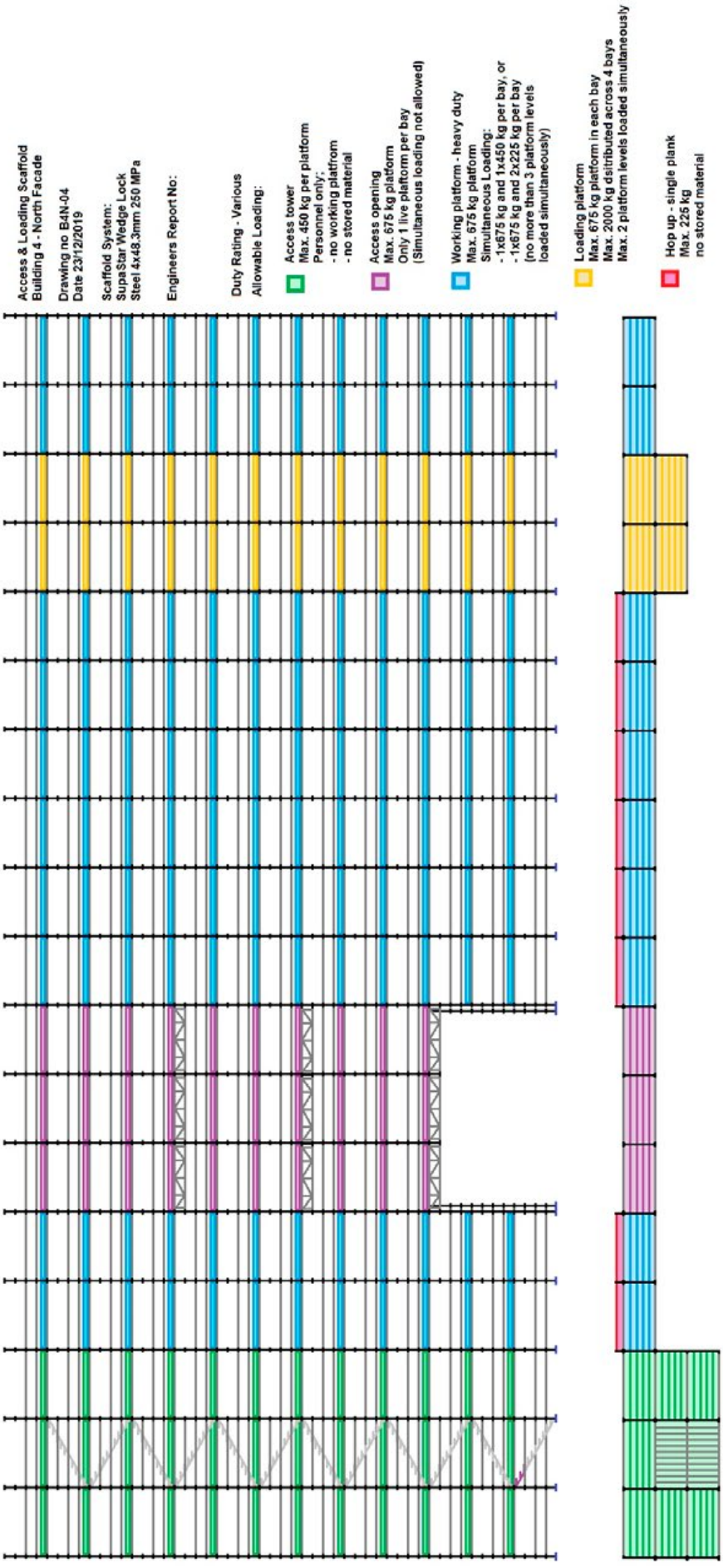


Figure E5. Example scaffold design – design loading

Appendix F – Managing Loads on Scaffolds

Scaffolds are designed to a support load e.g. the weight of people, materials and equipment on it. To prevent overloading there are typically three limiting load cases for the scaffold designer to consider:

- Maximum concentrated load
- Maximum platform load
- Maximum bay load

Exceeding the maximum concentrated or platform load may cause scaffold planks to fail or connections between individual components on the scaffold to fail. Examples of loads that may cause this include heavy loads or loads that sit on legs/wheels.

Exceeding the maximum bay load may cause the standards to buckle. Examples of how this may occur are excessive loads placed on a platform or loading multiple platforms in the same bay simultaneously.

It is important to know the maximum allowable load and where it can be placed on the scaffold as overloading can lead to structural failure or stability issues. If this information is unknown it must be obtained from the scaffold designer.

Once the loading information is known the daily use of the scaffold will need to be managed to ensure it is not overloaded. This can be done by prescribing a maximum allowable load to every platform in every bay, and clearly indicating which platforms are closed and aren't to be loaded. An example of how to do this is given in Figure F1.

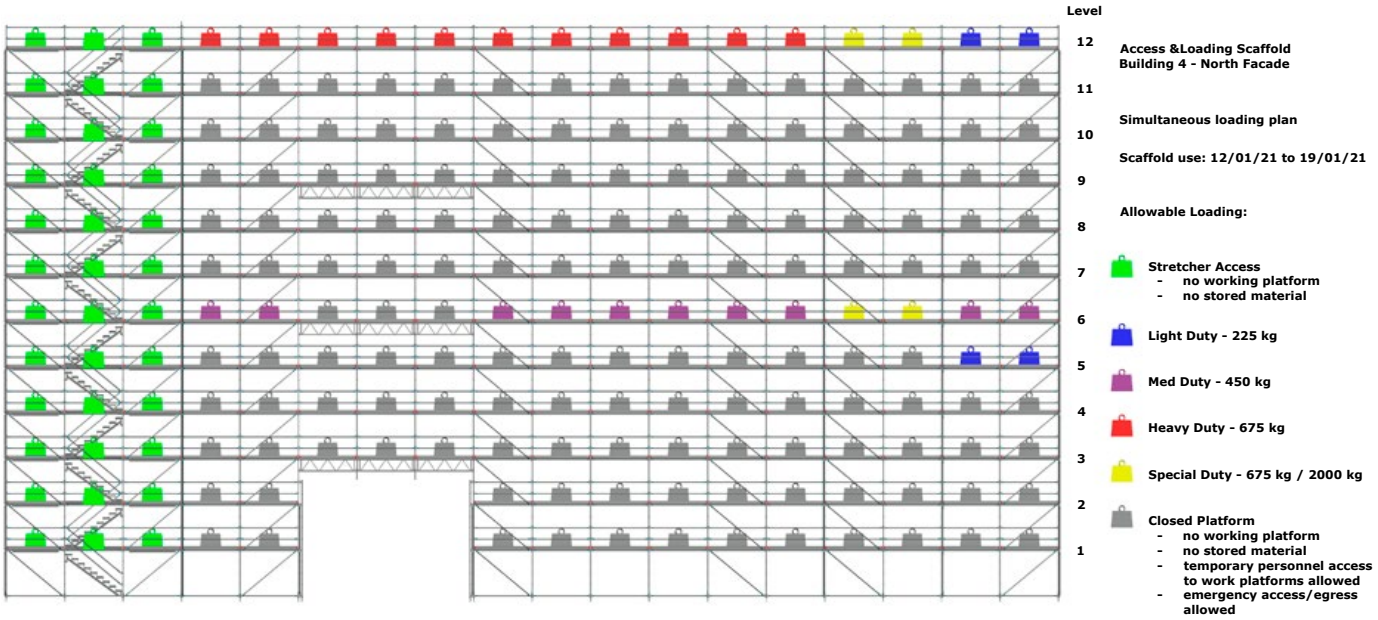


Figure F1. Example of a method for documenting closed/duty rated platforms when platforms are installed at multiple levels