CONSTRUCTION WORK – STEEL ERECTION
INFORMATION SHEET

This Information Sheet provides advice on managing risks associated with carrying out steel erection work including:

- design and planning, and
- hazards such as working at height, falling objects, steel structure collapse and operating powered plant.

What is steel erection work?

Steel erection work includes constructing, altering, repairing, maintaining, demolishing and dismantling a steel structure.

Steel erection work includes erecting metal structures by joining together steel beams, columns and surfaces to create a metal skeleton.

Further information is in the Cranes guidance material.

When does steel erection become high risk construction work?

Steel erection work can be high risk construction work when it involves any of the following, for example:

- a risk of a person falling more than two metres[1]
- structural alterations or repairs requiring temporary support to prevent collapse
- work carried out in or near a shaft or trench deeper than 1.5 metres
- work carried out on or near energised electrical installations or services, or
- an area where there is any movement of powered mobile plant.

A safe work method statement (SWMS) must be prepared for high risk construction work.

Further information on SWMS is in the Code of Practice: Construction work and the Information Sheet: SWMS for high risk construction work.

Steel erection work requires specialised skills and qualifications such as dogging, rigging and crane operation. Workers must be trained and competent including holding the appropriate high risk work licence and instructed in the use of control measures to manage the hazards and risks of steel erection work.

Further information is in the Information Sheet: High risk work licensing for dogging and Information sheet: Workplace induction for construction workplaces.

What do I need to do?

The work health and safety laws require that workers be consulted and given the necessary information, training, instruction and supervision to minimise the risks of steel erection work.

A focus on planning and completing detailed designs will help to ensure safety for workers at each stage of the steel erection process.

Design and planning

Time spent at the design stage will minimise work involving potentially dangerous onsite remedial work. It can also help to prevent structural instability including progressive collapse and other hazards during erection.

There are two distinct phases of design—structural design and the design for handling, transportation and erection of the individual members and the structure.

[1] In South Australia the fall height limit for high risk construction work is three metres.

Table 1 Roles and responsibilities

Roles	Responsibility
Structural design engineer	Ensures shop drawings comply with the structural design before steel members are fabricated. Documents the erection sequence and provides it to the client. During the design considers: ■ the effect of the erection sequence on the stability of the structure

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Roles	Responsibility
	■ safe access and working places including anchorage points for fall arrest systems ■ the ease of connections for components such as landing cleats ■ safe handling storing and transport of components including providing details of lifting points, and ■ all materials, for example grades of steel and welding comply with standards specified in the design.
Fabricator	Ensures the accurate detailing and manufacture of the steelwork according to the shop drawings. Ensures steel members: ■ are identifiable for the sequence of erection and fit together correctly, and ■ will be supported and tied to prevent movement during loading or unloading and transport.
Erector	Obtains the erection sequence documentation. Prepares the method of erection according to the drawings. Provides a site plan with detailed information on the location and coverage of cranes, workers, unloading points and storage areas, access to work areas and criteria for safety. Considers the stability requirements of all items of the structure. Considers the suitability of ground conditions for the safe movement of mobile plant.

Consultation

Consulting workers throughout the construction process about the hazards, risks and control measures will help prevent injuries.

Planning should also include consultation between the structural design engineer, fabricator and erector on:

- the structural design of the building
- plant and equipment to be used
- training and qualification of workers
- an emergency management plan, and
- access to the structure.

The person conducting a business or undertaking should provide information to contractors and sub-contractors on project planning and the erection sequence including risk management procedures. The method of erection should be regularly reviewed and updated to maintain safety by the structural design engineer.

Further information is in the Code of Practice: Safe design of structures.

What are the main hazards and their control measures?

Instability and collapse of the steel structure can be a major hazard causing workers to fall or be struck or crushed by steel beams or the steel structure.

Other hazards include:

- falling from heights
- being hit by falling objects
- eye injuries from flying metal splinters
- back and spinal column injury from lifting and moving heavy loads
- exposure to very high noise levels, and
- electric shock from touching live electric wires or from working with portable power tools.

Falls

The risk of falls must be managed using the most effective control measures that are reasonably practicable, in accordance with the hierarchy of control. If a single control measure is not enough, use a combination of control measures.

Avoid the need to work at height by constructing as much of the steelwork as possible (such as modules or frames) at ground level or from erected floor slabs or decks in the structure.

Alternatively, reducing the amount of time spent on working on the steel structure is the best means of minimising falls. For example:

- where possible release the lifting sling or device from floor level by using long slings, remote release shackles or other suitable devices, and
- inspect and test as much as possible at ground level.

If working at height cannot be avoided, then the risk of falls can be minimised by using work platforms and elevating work platforms (EWPs) to prevent falls.

Further information on falls is in the Code of Practice: Managing the risk of falls at workplaces and the Code of Practice: Preventing falls in housing construction.

Falling objects

Control measures to prevent injuries or death caused from being struck by falling objects include, for example:

- passing bolts and other equipment
- using lifting beams to position members to ensure the stability of the member
- limiting access to overhead work by setting up exclusion zones
- preventing loads from being lifted or transported over people or amenities
- ensuring only a rigger or dogger slings loads and where appropriate fix taglines
- using perimeter screens, guardrails including toe-boards and wire mesh, safety nets, cantilever work platforms, scaffolding with protective material and lanyards to secure tools and equipment
- using approved bolt bags or baskets at all times to prevent loose bolts or tools injuring workers below, and to prevent slips and trips on loose bolts and tools left on the steel work, and
- setting up a fully decked platform under all rigging work.

Collapse of the structure

In addition to planning at the design stage, control measures to avoid the collapse of the steel structure during erection include:

- making sure all beams are secured before releasing slings and all bolted connections are effective to stabilise the structure
- adhering to design specifications, or where this is not possible seeking further advice from the designer
- starting erection in a nominated braced bay so the building can be plumbed and made self-supporting to further support the erected steelwork. If this is not possible, ensure the erection engineer is consulted on developing an alternative site-specific sequential erection procedure
- verifying the footing concrete has reached the specified strength before erecting columns and checking fittings for supporting columns are adequate for the structural capacity of the erection conditions
- verifying the stability of the structure at the end of each work day, when fastenings may be incomplete, and during strong winds
- seeking approval from the erection designer to stop work at unscheduled points when the structure has not been completed to the specifications of the erection design, and
- obtaining written approval from the erection engineer before loads are placed on the structure.

Plant

Plant used in steel erection such as cranes used to lift loads and vehicles used to load, unload and transport steel require specific control measures.

Examples of control measures to prevent injuries from vehicles include:

- clearly sequencing the loading and marking every steel member before loading
- keeping the vehicle still until the steel is secured
- preventing movement of steel by supporting and securing it until it is ready to lift
- inspecting the load to ensure the steel has not shifted and could destabilise the vehicle
- monitoring the stability of the load regularly during unloading and if there is instability, ensuring the steel is individually restrained and the loading configuration checked to avoid the vehicle becoming unstable

- lifting loads in a level manner rather than vertically or on an angle
- securing loads to prevent inside lengths of steel from falling out of the load, and
- using fall protection for workers and doggers on the truck.

To avoid being struck by cranes or other powered mobile plant the erector should:

- ensure exclusion zones are in place
- check the location of any excavations, underground services and the proximity of overhead electric lines
- check the ground capacity for supporting loads
- have emergency procedures in place
- check weather conditions, and
- avoid lifting loads over people.

Further information is in the Code of Practice: Managing the risks of plant in the workplace.

Crane operations

Cranes require safe systems and methods of work, with different cranes being fit for different purposes. For example, use articulating truck type cranes for positioning smaller or lighter pieces of steel, larger mobile cranes to position heavier components requiring further reach, and tower cranes for high rise steel construction.

Further guidance is in Cranes guidance material.

Erecting steel components

To ensure the safe erection of steel components, the person conducting a business or undertaking should comply with the manufacturer's or designer's instructions.

Electricity

Working at heights and near electricity is a hazard for workers. It may be appropriate to have the electricity supply to the site isolated.

Exclusion zones for working near incoming service lines and overhead power lines must be maintained at all times.

Further information is in the General guide for working in the vicinity of overhead and underground electric lines.

Further information

For further information see the Code of Practice: Construction work and the Safe Work Australia website www.swa.gov.au.