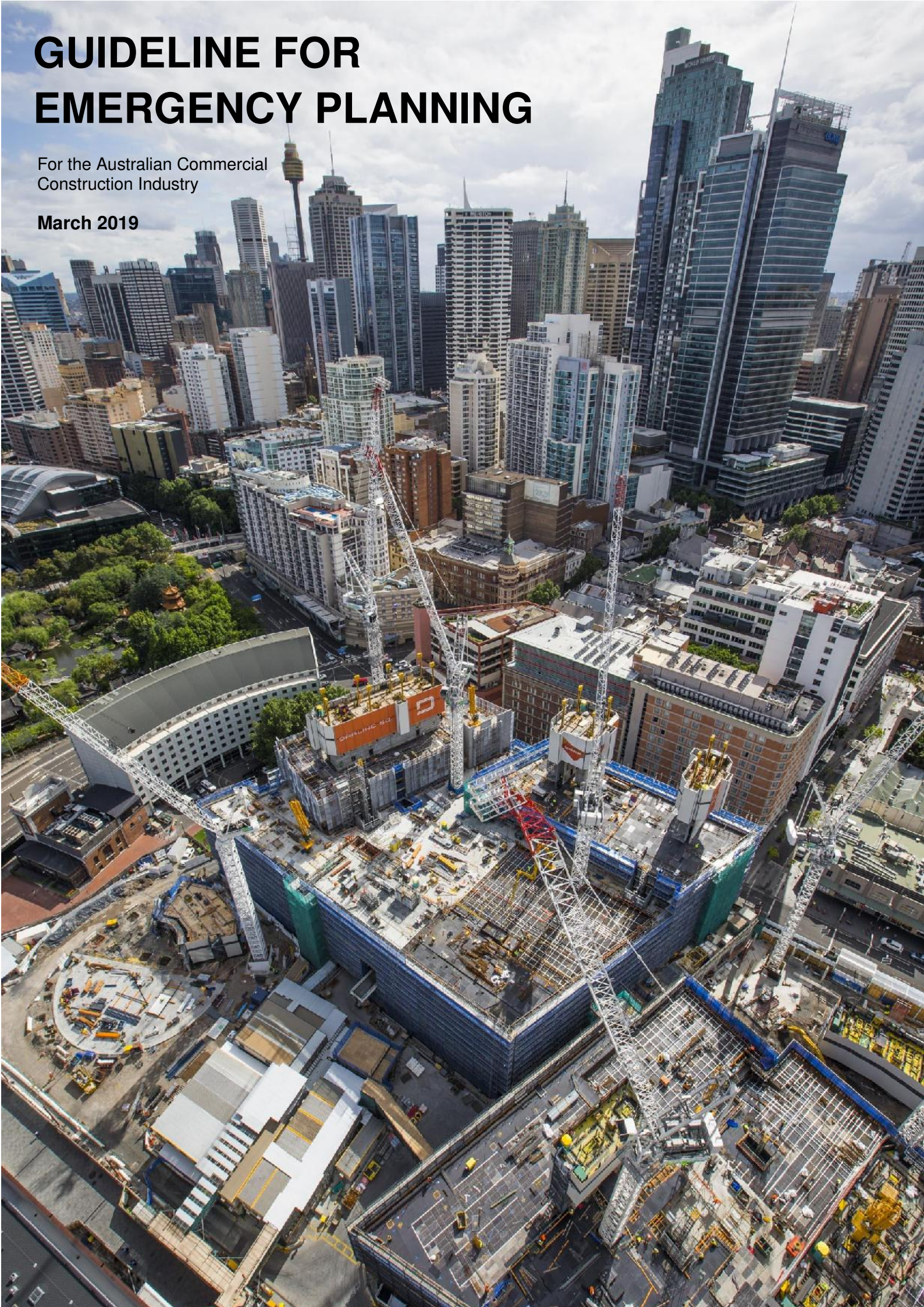


GUIDELINE FOR EMERGENCY PLANNING

For the Australian Commercial
Construction Industry

March 2019



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Overview

This Guideline has been developed to assist the Australian Commercial Construction Industry in the management of emergency planning, fire preparedness and emergency response. The Guideline has been developed pursuant to an Enforceable Undertaking between Lendlease Building Pty Limited, ACN 000 098 162 and SafeWork New South Wales (NSW) dated 8th of August 2017.

The Enforceable Undertaking is an outcome of a major fire event, which occurred without injury, on the 12th of March 2014 at the Barangaroo South 1A Construction Project Tower 3. At the time of the fire, steel reinforcement installation works, including hot works were being undertaken at the ground floor level around column C3. The resulting fire caused extensive damage to the ground floor and basement levels of the multistorey commercial construction project including formwork, steel reinforcement and the concrete substructure; along with disruption to the surrounding business district and road network. A *Case Study* has been developed as part of the tools and materials developed with this Guideline, which are listed in Appendix 1.

Fire & Rescue NSW attended the scene. The subsequent investigation and report by the Fire Investigation & Research Unit NSW concluded that “carrying out hot work in proximity to the volume and configuration of combustible material at the point of origin (i.e. column C3) has resulted in an accidental fire”.

As a result of the fire, SafeWork NSW and Lendlease agreed the need to increase awareness of Emergency Planning, fire preparedness and emergency response on commercial construction projects. This Guideline along with other tools and materials developed as part of the Enforceable Undertaking; and referenced throughout this Guideline enables the Commercial Construction Industry and related construction projects, principal contractors and subcontractors (i.e. persons conducting a business or undertaking) to improve emergency planning. That is, compliance with obligations under the Work Health & Safety Act, National Construction Code - Building Code of Australia Volume 1 (NCC-BCA) and relevant standards and codes; such as AS3745 Planning for Emergencies In Facilities.

In addition, applicable industry leading practices related to emergency planning, fire preparedness and emergency evacuation are identified within the Guideline for consideration by the commercial construction industry; with focus directed to multistorey commercial construction. The Guideline along with its related tools and materials referenced in Appendix 1 are available electronically free of copyright or other restrictions from the Australian Constructors Association [website](#).

1.0 Legal Requirements

Work health and safety laws require a person conducting a business or undertaking (PCBU) to prepare, maintain and implement an Emergency Plan for a workplace. In addition, a person with management or control of a workplace must ensure, so far as is reasonably practicable, the means of entering and exiting the workplace and anything arising from the workplace are without risks to the health and safety of any person.

In preparing and maintaining an Emergency Plan, a PCBU or other person(s) with management or control of a workplace must have regard to the nature of the work being carried out; the hazards at the workplace; the size and location of the workplace; and the number and composition of workers and others at the workplace.

PCBU(s) or other person(s) with management or control of a workplace must identify and plan for possible credible emergency scenarios based on the criteria identified above; from which an emergency event could arise. Emergency events on a construction project could result from vehicle/pedestrian interaction; hot works, escape of hazardous substances or hazardous materials, a worker's medical condition, work at height, a bomb threat, heat stress, lightning strike, heavy rain and natural disasters. *Appendix B* provides some further examples of potential credible emergency scenarios for concrete frame construction trades determined during focus groups with these trades.

The National Construction Code Guide to the Building Code of Australia Volume 1 (NCC-BCA) identifies a fire in a building under construction as representing a significant public safety, health and amenity risk. Therefore, a fire event is likely to be a credible emergency scenario which should be included in an Emergency Plan developed for a construction project. Further, the NCC-BCA identifies the need for firefighting in buildings under construction as a significant number of fires occur in buildings during their construction or during major refurbishment.

According to the NCC-BCA statistics indicate that a number of fires have been started by sparks and the fire has spread because services, like smoke detectors and sprinklers were turned off for construction purposes. As such the NCC-BCA Volume 1 outlines requirements for suitable fire extinguishers in all buildings under construction and the installation of fire hydrants, fire hose reels and booster connections once a building reaches a height of 12 metres; as firefighting in a building under construction beyond this height becomes increasingly difficult.

Work health and safety laws also require similar planning to that outlined above for hazardous chemicals that are used, handled, generated or stored at a workplace in

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quantities that would require licensing. A copy of the Emergency Plan must be given to Fire & Rescue or the equivalent Authority in other states or territories.

A PCBU or other person(s) with management or control of a workplace is also required to ensure that the workplace has appropriate fire protection and firefighting equipment that is always available for use in an emergency. The equipment must be designed and built for the types and quantities of chemicals at the workplace, as well as the conditions under which they are used, handled, generated or stored, having regard to the potential fire load of the chemicals; the fire load from other combustible sources such as timber formwork; and the compatibility of the chemicals with other substances and mixtures that may be in use at the workplace. It must also be compatible with equipment used by Fire & Rescue, or the equivalent Authority in other states or territories; and be properly installed, tested and maintained.

2.0 Developing an Emergency Plan

In accordance with work health and safety laws, the development of an Emergency Plan for a construction workplace must provide for the following:

(a) Emergency procedures, including:

- an effective response to each of those credible emergency scenarios identified in the development of the Plan is dependent on an assessment of the nature of the work carried out; the hazards related to this work and those hazards at the workplace; the size and location of the workplace; and the number and composition of workers and others at the workplace; This could also include construction industry analysis trends relating to emergency events; and
- An evacuation procedure. This could include practical information for workers such as dedicated paths of egress, evacuation diagrams (to the requirements of AS3745) at each required floor exit, and an emergency assembly point depending on the size and layout of the construction project; and.
- Emergency contact numbers including notification to emergency services at the earliest opportunity; and



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- Medical treatment and assistance including trained first aid personnel and first aid equipment; and
- A method of effective communication between the person(s) authorised to coordinate an emergency response, e.g. the Head Warden; and other emergency response members and all persons at the workplace, e.g. two-way radio and workplace siren, public address system, alarm or other emergency warning information system (EWIS).

(b) Hazard Evaluation:

- Hazards must be identified and evaluated for specific construction projects. However, external factors, including 'industry indicators' can also be used to help identify construction industry trends and current protocols at construction projects. With the use of industry knowledge and past events, specific hazards can be better identified and evaluated; and
- Contractors and other persons conducting a business or undertaking can use this industry information to help evaluate their own specific hazards and develop protocols which correctly mitigate and manage the hazards, i.e. to prevent the potential for an emergency event.

(c) Testing of the emergency procedures, including the frequency of testing.

Leading industry practice in the Australian commercial construction sector promotes testing of credible emergency scenarios identified in the Plan (i.e. skills retention training activities) at routine intervals and testing of the effectiveness of Emergency Planning and response at the workplace at 6 month intervals instead of 12 month intervals as prescribed by AS3745.

Leading industry practice in the Australian commercial construction sector promotes testing of the emergency evacuation siren, or other emergency information warning system, at maximum monthly intervals, providing for battery backup in the event of a power failure and testing immediately after any relocation of site amenities to determine the operational effectiveness of the emergency information warning system.

- (d) Information, training and instruction to relevant workers that are member soft h
Emergency Control Organisation that will direct and control the implementation of emergency response procedures including back-up personnel if some team members happen to be absent from the workplace on the day of an emergency event.
- (e) Under work health and safety laws, a PCBU is also required to consult with Health & Safety Representatives in relation to identifying hazards and assessing risks and providing information and training to workers. Consultation with Health & Safety Committee members on Emergency Planning and implementation is also important.

- (f) Maintaining the Emergency Plan so that it remains effective and current to the work activities and related credible emergency scenarios at the construction project and its stages e.g. any changes to emergency paths of egress or other impacts to emergency planning raised in toolbox talks or pre-start briefings; or changes to emergency response personnel so that workers are aware of such changes.

The Emergency Plan should be distributed to members of any emergency response team and emergency control organisation established at the construction project, the construction site Health & Safety Representative(s); and any related Health & Safety Committee at the workplace. This distribution should also include subcontractor companies or other PCBU and their employees or workers to explain the actions they are required to take with regard to any emergency related to their works. Under work health and safety laws, PCBU are required to consult, cooperate and coordinate activities where they share a duty in relation to the same matter. It is also industry practice for the evacuation procedure at a construction project, including the location of the evacuation assembly point, to be included in the construction site induction program provided to all workers when they first attend a construction project.

AS3745 provides further detailed information on the structure of an Emergency Plan including items such as purpose and scope; identification of the construction site location, hours of operation and layout; the emergency identified outcomes (i.e. credible emergency scenarios); emergency response procedures, the evacuation diagram and its required configuration; nominated emergency response personnel; training arrangements; emergency response exercises, the process for review; distribution list, validity period and the date of issue and last update.

Under AS3745 a facility is defined as a building, structure or workplace that is, or may be, occupied by people, or workers and includes construction sites. Therefore, AS3745 outlines the minimum requirements for a construction project. However, construction projects in addition to applying the requirements of AS3745 must also consider their specific construction workplace, personnel and working conditions to further develop an Emergency Plan, which is specific to their project.

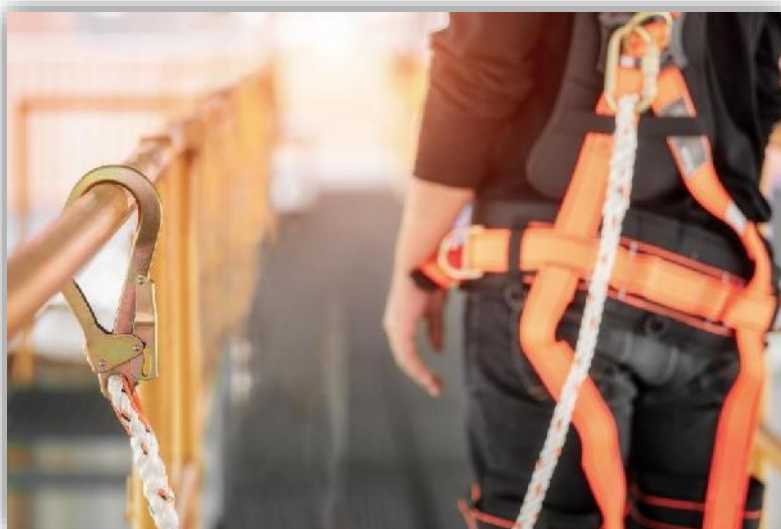
3.0 Emergency Procedures

As outlined previously emergency procedures are a requirement under work, health and safety laws as part of any workplace related Emergency Plan. This means that for those credible emergency scenarios identified for a construction project an emergency response procedure should be developed for each scenario.

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As discussed previously these scenarios must have regard to the nature of the work carried out; the hazards at the workplace; the size and location of the workplace and the number and composition of workers and others at the workplace. Examples could include rescue of a worker from a fall arrest event where a safety harness is to be used as a primary means of fall prevention; adequate means of fire suppression at the location where hot works is to be carried out; and the provision of trained first aid personnel and first aid equipment in the event of an incident of injury at a workplace or other medical emergency.

Emergency procedures should be developed in consultation with PCBU that are carrying out their trade specific works and the hazards associated with those works. This means that the Principal Contractor for a construction project must coordinate its site based emergency planning in consultation with those PCBU carrying out works that could trigger an emergency response event, specific to their trade activity or location.



Under work, health and safety laws all PCBU, including the Principal Contractor appointed for a construction project, have responsibility for an Emergency Plan being prepared for a workplace. For trade contractors, an Emergency Plan could include emergency procedures specific to their work activity included within a Safe Work Method Statement or other procedure. This would enable those workers carrying out the specific works to become familiar with planning in the event of an identified credible emergency scenario related to their specific work; or work location, triggering an emergency response event.

For a Principal Contractor emergency response planning should encompass broader whole of site emergency response scenarios in consultation and coordination with trade contractors and their identified credible emergency scenario events. It is important that emergency response procedures developed to respond to these emergency scenario events outlined as a minimum:

- responsibilities and duties of dedicated emergency response personnel and the actions they are to take during an emergency;

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- the responsibility of construction workers and actions they are to take during an emergency;
- the arrangements for emergency preparedness and response to the credible emergency scenario event;
- the arrangements for evacuation of the construction site in the event that the Head Warden determines this action as necessary; and
- the current emergency contact details.

Appendix 2 contains some examples of potential credible emergency scenario events that should be considered for concrete framed construction trades on a commercial construction project. In addition, key preventative controls related to each scenario, emergency equipment required in the event of this emergency arising and first response information is also provided. This information was derived from a series of focus groups convened with concrete frame construction trades from which a *Hazard Profile* was developed as part of the tools and materials developed with this Guideline and is listed in *Appendix 1*.

3.1 Hazard Identification

During the design planning of a construction project work, health and safety laws require hazards to be identified and eliminated through design so far as reasonably practicable.

This means that

products, materials and construction methods should be considered and those hazards and risks with the potential to trigger an emergency scenario eliminated through design, where reasonably practicable to do so.



Examples could include bolted structural steel connections instead of welded connections and related hot works on site, which could result in a fire related emergency scenario event; specification and procurement of fire retardant containment mesh for shrouding a construction project's multistorey facade envelope; use of a safety harness as a secondary means of fall prevention only, not as a primary means of fall prevention; and independent

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engineering review of temporary structures, such as a modular scaffold tower or a jump form, to minimise the risk of structural collapse.

Other hazards and related credible emergency scenarios requiring emergency planning could include:

- the nature of the hazards at the workplace including cranes and lifting operations; basements and limited access or egress, enclosed areas and air quality; multistorey construction and over and under works; open multistorey slab edges and internal slab or floor penetrations; and worker interaction with moving plant and equipment.
- hazards related to the size and location of the workplace including multistorey construction emergency egress paths and the time taken to evacuate a tall structure; external hazards such as bush fire prone areas; or a water body adjacent to an excavation; or localities affected by flooding or severe storm events such as cyclones.
- hazards related to the number and composition of workers or other persons at the workplace and workers' ability to read, understand and comprehend emergency response information or evacuation procedures.

All of the above hazard types plus others should be considered in the process of emergency planning.

3.2 Change Management

Is it important to recognise that the nature of construction projects and their delivery type, generally means that things can and do change regularly throughout a typical project and its duration. Such changes could relate to items such as the project program, the layout of the project and its site areas, the scope of works, and the design and materials specified.

Therefore, it is important that any change management process includes an assessment of the health and safety implications of the change to determine if additional risks are created by the proposed change. An

example could include a specified product certified under the National Construction Code and inadvertent selection of an alternative product through design change, which does not comply with the Code and therefore could create



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potential for adverse impacts to the health and safety of construction workers; end users, maintenance personnel or the public. For example, a design or specified product change could result in a product or fixture failure or installation of an inadequate product with inferior fire retardant or other properties.

Other change management examples that could affect emergency planning on a construction project include:

- Changes to the layout of the building creating additional risks during an unexpected evacuation.
- Design changes which affect construction sequencing and potential for over and under works.
- Schedule changes creating unrealistic time frames for delivery and potential interfacing trade activities and hazards, which were not planned;
- Changes in methodology impacting the normal sequence of construction and how things are built.
- Changes to materials during construction that were originally specified in the design; inadvertently creating additional significant risks to health and safety, e.g. hazardous or combustible materials or products.
- Lessons learned from incidents or emergency exercises or evacuation drills that have not been updated in the Emergency Plan and related emergency procedures.
- External changes such as a new construction site next door or other changes such as delivery or storage of materials that could affect the required egress routes in the event of an emergency.
- Relocation of evacuation and emergency signage / routes as a project develops or changes.

3.3 Hierarchy of Control

The requirements for managing risks to health and safety in work health and safety laws are underpinned by the concept of the Hierarchy Of Control. The Hierarchy Of Control requires a PCBU to eliminate risks to health and safety so far as is reasonably practicable. If elimination of the risk is not reasonably practicable, then the PCBU must minimise the risk by substituting the hazard, isolating the hazard or implementing engineering controls. If the risk remains, the PCBU must minimise the risk by implementing administrative controls including the provision of suitable personal protective equipment.

The Hierarchy Of Control should be used to identify control measures to eliminate or minimise hazards and risks in the workplace that could result in emergency scenario events.

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For example, the use of a pneumatic nibbler could eliminate oxy/acetylene cutting of steel reinforcement as outlined in the *Case Study* referred to in *Appendix 1* of this Guideline; or the prohibition of cigarette smoking in a workplace would eliminate the risk of a discarded cigarette butt starting a fire.

Use of bolted connections related to structural steel erection on a construction project would eliminate the need for site based welding. Substitution of diesel powered equipment operating in an enclosed basement area (causing buildup of diesel fumes) for electric powered equipment would eliminate the diesel fumes. This substitution would create an additional electrical hazard, but may be regarded as an acceptable manageable substitution, when compared with the original hazard within the enclosed basement area.

The risk of a collapse of a temporary structure like a modular scaffold tower, a jump form or other temporary structure or temporary works is a credible emergency scenario in commercial multistorey construction.

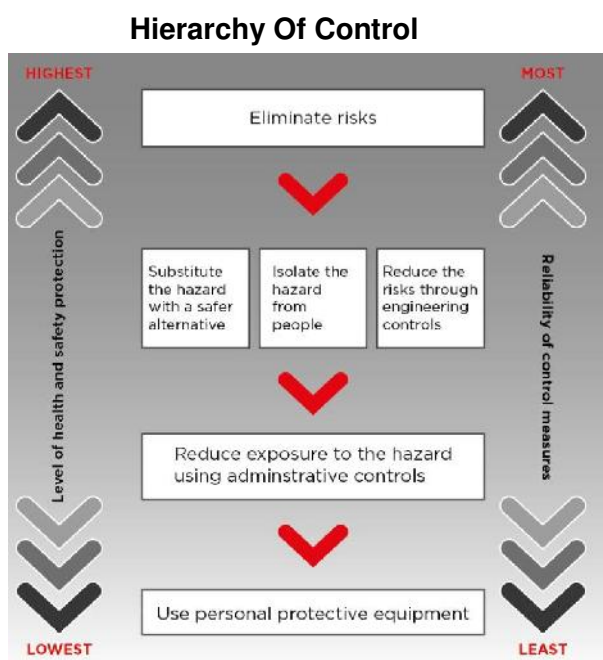
Leading industry practice in the Australian commercial construction sector promotes review and approval by an independent engineer to verify conformance of a temporary structure or temporary works to applicable Australian standards or other requirements (Level 2 engineering control).

It is important to note that the highest level health and safety protection and reliability of control measures is to eliminate the risk as displayed in the adjacent diagram.

Therefore, the development of control measures in emergency planning should aim to achieve this level or the next level to substitute, isolate or reduce risks through engineering controls.

Control measures that rely on administrative controls are heavily reliant on human behaviour to implement these measures.

That is, workers are to follow a procedure or wear personal protective equipment, which is less reliable and open to error or abuse.



4.0 Fire Preparedness

As outlined in section 1 of this Guideline the National Construction Code - Building Code of Australia (NCC-BCA) identifies a fire in buildings under construction as representing a significant public safety, health and amenity risk. The NCC-BCA statistics indicate that a number of fires have been started by sparks and the fire has not been detected or suppressed because services, like smoke detectors and sprinklers were turned off for construction purposes.

Multistorey commercial construction projects present further fire risks due to the height of the structure and the ability for firefighting appliances to reach such heights becomes increasingly difficult. Therefore, a fire on a construction site is a credible emergency scenario to be included in any Emergency Plan developed for such a workplace.

The NCC-BCA Volume 1 requires suitable fire extinguishers in all buildings under construction and the installation of fire hydrants, fire hose reels and booster connections once a building reaches a height of 12 metres. Fire hydrants and fire hose reels must be operational in at least every storey under construction that is covered by a roof or floor structure above, except the upper two floors because services such as the fire hydrant riser may not yet be installed. Also, if there is a fire on these two partly completed floors, e.g. a formwork structure in readiness for a concrete pour; it could be fought from the floors below.



Leading industry practice in the Australian commercial construction sector promotes the installation of an alarm monitoring system (e.g. text message, visible strobe alarm or other) fitted to hydrant risers and hose reel systems to detect any drop in water pressure within the system; that may impact on the ability of the hydrant system for firefighting.

For construction, suitable fire extinguishers are defined by the NCC-BCA as not less than one fire extinguisher to suit a Class A (combustible materials, e.g. wood, paper and fabric); Class B (flammable liquids, e.g. petrol or paint); and Class C fires (flammable gases, e.g.

hydrogen, butane or methane); and electrical fires. The extinguishers must be provided at all times on each storey and adjacent to each required exit or temporary stairway or exit.

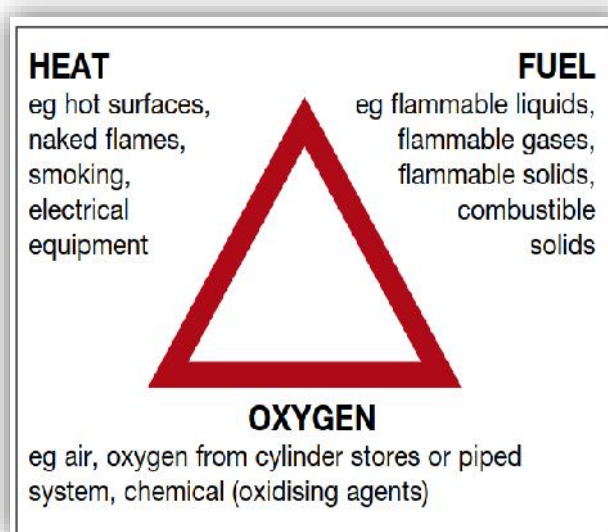
Leading industry practice in the Australian commercial construction sector promotes a review of the size and layout of the floor plates on commercial construction projects and implementing the above fire extinguisher requirement every 500m² on a floor plate in addition to that defined by the NCC-BCA Volume 1 E1.9.

It is important to highlight that the priority and focus must be to identify potential fire hazards through assessment of the nature of the work carried out; the hazards at the workplace; and the size and location of the workplace and to control the risk of fire by implementing control measures consistent with the Hierarchy Of Control.

4.1 Fire Safety in Construction United Kingdom

The Fire Safety In Construction guidance booklet issued by the Health & Safety Executive in the United Kingdom (UK), provides information for those that have a role in the development, management and application of fire safety standards on construction sites, i.e. clients, designers, contractors and construction design and management coordinators.

Fire safety laws in the UK and other health and safety laws covering process fire precaution requirements outline that a risk assessment is to be carried out to determine that fire safety precautions provided are adequate to ensure, so far as is reasonably practicable, the safety of those on the construction site and any other persons who may be affected by a fire or explosion arising from the construction work.



Source – Fire Safety in Construction Guidance (HSE – UK)

The guidance provides information on how to carry out a structured approach to an overarching fire safety risk assessment for a construction project to meet the requirements of UK fire safety laws and health and safety laws. The aim of the fire safety risk assessment is to help identify risks related to activities which generate heat,

fuel and oxygen, which can be removed or reduced and to decide the nature and extent of the fire precautions those with responsibilities for construction work need to take.

4.2 Fire Precautions on a Construction Project

Once potential fire hazards, ignition, fuel and oxygen sources have been identified, control measures need to be identified and implemented consistent with the Hierarchy Of Control and legal requirements as mentioned previously. These control measures will also need to be continually reviewed throughout all stages of a construction project, including fit out, where some internal fire systems may not yet be active.

The following options for fire prevention controls on a commercial construction project should be considered in addition to those already outlined above and be consistent with the Hierarchy Of Control:

- Potential ignition sources should be identified and eliminated or substituted with safer alternatives where reasonably practicable.
- Implement design reviews in the concept and detailed design stages of a project should identify opportunities to design out hot works, e.g. bolted structural steel connections instead of welded connections on site.
- Seek to deploy alternative tools and equipment such as a pneumatic nibbler or cold cut saw to eliminate hot works.
- Where combustible materials like timber formwork are located in the vicinity of proposed hot works they should be closely managed using a Permit To Work System to ensure appropriate control measures are implemented and supervisory personnel for the hot works are trained in first attack firefighting.

Note that the tools and materials associated with this Guideline include a training package titled Permit to Work System Training for Supervisors Managing Hot Works & Other Permits (see *Appendix 1* for the link to this training package).



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- Minimise stockpiling of combustible materials on the project by scheduling materials as they are needed (i.e. planning for deliveries on a just in time basis or with minimal time stored on site).
- Products and materials sourced for the project should comply with the National Construction Code, which includes fire retardant/fire resistant properties and implement quality assurance checks to identify non-conforming product or material substitutes.
- Review temporary works designs such as external multistorey containment fabric, mesh or other similar shroud or net type products to ensure products are fire retardant.

Leading industry practice in the Australian commercial construction sector promotes containment mesh/fabric installed to progressive multistorey construction including scaffold stairs or other temporary multistorey structures to be fire retardant and have a flammability index of less than or equal to 5 (AS1530.2).

- Implement good housekeeping practices and timely removal of rubbish / construction waste materials and waste bins / skips as they become full to avoid stockpiling of rubbish and debris or other combustibles throughout the project.
- Store flammable gases or chemicals/substances used on site in dedicated bulk storage areas which are well ventilated, display warning signage and are located away from potential ignition sources.
- Store flammable gases or chemicals/substances in accordance with the Safety Data Sheet and implement required separation distances for those gases or chemical/substances



Leading industry practice in the Australian commercial construction sector promotes the development of a Manifest for flammable gases or chemicals/substances or corrosive or other similar products stored on a site, the quantities and location of the storage area(s) including relevant external signage to the construction site perimeter to inform firefighters in the event of a fire event on a construction project.

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that cannot be stored together; and keep quantities stored as low as possible, having regard to the fire load of the gases or chemical/substances.

- Fit flashback arrestors to oxy/acetylene equipment.
- Prohibit cigarette smoking on site or implement a dedicated smoking area(s) away from enclosed and semi enclosed structures and combustible materials; and equip the area with firefighting measures.
- Where plant or equipment (requiring refuelling), will be in use, the project should develop and implement refuelling procedures in designated locations (away from access or egress routes) and away from any ignition sources.

5.0 Implementing an Emergency Response

As outlined work health and safety laws require a PCBU to prepare, maintain and implement an Emergency Plan for a workplace. To implement a planned response to any of those credible emergency scenarios outlined in the Emergency Plan prepared and maintained for a construction project; or an unforeseen and unplanned emergency; personnel must be appointed to manage and participate in an emergency response and be trained in emergency response procedures.

Emergency response procedures and the effectiveness of their implementation should also consider:

- Control and coordination of the emergency and duties as defined for emergency response personnel and their selection criteria.
- Two points of egress from construction areas where reasonably practicable.
- Emergency services coordination and access to the construction project including a nominated person to meet emergency services on arrival at the construction project.
- The availability of emergency services and any related response and its timing.
- The availability of appointed emergency response personnel in the



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event of appointed person(s) being absent from work during an emergency.

- Maintenance of emergency response equipment.
- Communication of an emergency, i.e. emergency warning information systems such as a Nurse Call System commonly used on commercial construction projects and other whole of site warning systems.
- The continuity of communications equipment, e.g. mobile phone or two-way radio battery life.
- Multi modal communication systems to alert workers on the project or alert workers before they arrive at the workplace, not to come to work.
- Preservation of any incident scene to assist with investigation by Authorities or others.
- After hours work where applicable and emergency response capability including emergency contact numbers.
- Adjoining neighbours or surrounding properties and tenants, residents or other occupants.
- Trained first aid persons and first aid response equipment.
- External stakeholder engagement; e.g. the client, regulatory authorities or others.
- Occupants or workers with a disability and the development of a personal emergency evacuation plan (PEEP).
- Shelter in place in the event of an emergency caused by an internal or external threat to a construction project.
- Central Business District, e.g. Sydney, authority alert systems advising of CBD located potential threats to a CBD located construction project.
- Lifts, hoists or other vertical transportation on the construction project and the potential for power failure and trapped workers.
- Visitors to the project and their knowledge of emergency response procedures.
- Vehicle entry points to the construction project and restriction of entry.
- Evacuation including a check to determine whether all workers have been evacuated and accounted for and report back to the Chief Warden or other appointed person(s).



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- Emergency egress routes and the capacity of the routes and the evacuation assembly area to receive large numbers of workers including any requirement to cross public roadways to walk to the assembly area and how this interface with traffic will be managed.
- The absence of fire doors to egress routes on partly completed construction stairwell cores.
- Accounting for workers or others at the assembly area.
- Communication of the 'all clear'; signal at the end of an emergency.
- Post emergency evaluation and lessons learned.

The effectiveness of a construction project's specific emergency response is heavily dependent on the detail outlined in the Emergency Plan and related emergency procedures based on identified credible emergency scenarios, those items outlined immediately above that are applicable; ongoing scenario testing and training; and that the processes remain up to date and current.

Emergency response on construction projects should evolve with practice drills, evacuations, scenario testing of the emergency response processes; in addition to the inclusion of findings from inspections, audits and incidents to provide ongoing assessment of the effectiveness of a construction project's preparedness in the event of an emergency.

Appendix 1 outlines the tools and materials associated with this Guideline. The *Emergency Planning Meter* listed has been developed for the commercial construction industry as a positive performance measurement tool for use in assessing and scoring Emergency Planning preparedness observed on a multistorey commercial construction project.

5.1 Emergency Response Equipment

As indicated in the example of credible emergency scenarios listed in *Appendix 2* of this Guideline, an emergency response will likely involve dedicated equipment such as a fall arrest height rescue retrieval kit; specialised first aid equipment or firefighting equipment.

The availability, location and servicing of emergency equipment should be regularly reviewed by the project team at maximum monthly intervals and anyone who



is likely to use them in an emergency. Emergency equipment may consist of the following and the type of equipment and its quantity should be considered for each credible emergency scenario outlined in the Emergency Plan or emergency procedures including equipment items such as:

- firefighting equipment (e.g. charged risers, hydrants, hose reels, suppression systems, extinguishers, fire blankets);
- crane assisted first aid cage/workbox;
- height rescue kit;
- first aid equipment;
- flashback arrestors fitted to oxy/acetylene equipment;
- stretcher and stretcher access;
- nurse call system;
- emergency warning information system;
- emergency back-up lighting;
- electrical rescue kits – low or high voltage;
- spill containment equipment such as booms, sandbags, vermiculite or sand;
- protective clothing e.g. overalls, chemical splash suits, gloves; and
- specialist equipment e.g. weather and environmental monitoring equipment, gas detectors, or emergency power.

5.2 Emergency Response Training

The effectiveness of emergency response is heavily dependent on the training of emergency response personnel and periodic training to enable skills retention.

AS3745 outlines minimum training requirements for a variety of personnel, which depending on the nature of the business or undertaking and its construction project(s) should include training of:

- any members of an *Emergency Planning committee* (EPC); i.e. those persons responsible for the documentation and maintenance of an Emergency Plan.
- any members of an *emergency control organisation* (ECO), i.e. those persons appointed by the EPC to direct and control the implementation of the emergency response procedures at a construction project; e.g. head warden and deputy warden trained in taking control of the workplace emergencies in the early stages prior to the arrival of emergency services or specialist response teams, effective actions to take control of workplace emergencies, pre-emergency planning, reacting safely to emergencies and other skills as determined by AS3745 and approved and adopted by the Australian Fire Authorities Council, www.afac.com.au;
- any members of an emergency response team (ERT); i.e. those persons appointed to attend specific incidents, to contain, control or eliminate the emergency using emergency response equipment. On a commercial multistorey construction project, a common example is trained first aid personnel that respond to a medical emergency with specialised first aid equipment, which could include a first aid kit; bleed kit; defibrillator or an Oxy Viva. Other examples include those tasked with first attack firefighting, e.g. supervisors of hot works and the permit to work implementation; and
- skills retention training of emergency response personnel at intervals not greater than 6 months.



6.0 Monitoring and Review

The Emergency Plan and emergency response procedures should be monitored, reviewed and tested at regular intervals to ensure their continued suitability and effectiveness. This is particularly important in a multistorey commercial construction environment where dynamic changes to work layout, access/egress, construction floor heights, personnel, trade activities; and other significant changes occur on a frequent basis over the life of a construction project. Reviews could also be initiated by:

- a change in legislation;
- advances in technology and equipment;
- changes in organisational direction;
- changes in site layout;
- staff changes;
- changes in products and goods specified for the construction project;
- changes to work activities and the related risk impacts of such changes;
- lessons learned from internal or external emergency or other incidents;
- lessons learned from scenario based emergency response exercises and evacuation drills;
- changes to the external environment surrounding the construction project; and
- findings from audits, reporting and communication.



6.1 Assurance of Emergency Planning and Response

In addition to monitoring and review activities previously discussed, inspection, audit or other assurances processes typically undertaken on commercial construction projects should include an element of appraisal of emergency planning, fire preparedness and emergency response readiness. An *Emergency Planning & Preparedness Audit Tool* has been developed as part of the tools and materials listed in *Appendix 1*, which is associated with this Guideline and for use by the commercial construction industry to assess emergency response preparedness and identify opportunities for improvement.

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It follows, that to adequately plan for an emergency; procedures and processes must be developed and implemented by those in control of work activities and work areas and more broadly by the Principal Contractor with management and control of a construction project. Assurance of these procedures and projects is recommended to ensure they continue to remain current and up to date with the construction project's stages of construction.

Key Definitions

- **Credible Emergency Scenario:** A hazard and related risk event which may arise and create an emergency at a workplace having regard to the nature of the work carried out and the hazards at the workplace; the size and location of the workplace; and the number and composition of workers and others at the workplace.
- **Emergency:** Any event involving the need for or presence of trained emergency services such as ambulance, police or fire brigade.
- **Emergency Response Team (ERT):** Personnel appointed to attend specific incidents, to contain, control or eliminate the emergency using emergency response equipment.
- **Emergency Control Organisation (ECO):** A Person or Persons appointed by the Emergency Planning committee to direct and control the implementation of the facility's emergency response procedures.
- **Emergency Planning Committee (EPC):** Persons Responsible for the documentation and maintenance of an Emergency Plan.
- **Hazard** - A source or a situation with a potential for harm in terms of human injury or ill-health, damage to property, damage to the environment or a combination of these, i.e. anything that can cause harm to people, plant, equipment and property.
- **Hazardous Substance** - Substances that are classified as hazardous to human health by the manufacturer or importer in accordance with the Approved Criteria for Classifying Hazardous Substances [NOHSC:1008], e.g. cleaning chemicals. They can be gases, liquids or solids, and can be either pure substances or mixtures.
- **Hierarchy of Control** - A system used to minimise or eliminate exposure to hazards which includes a sequence of options to assist in implementing the best possible measures to control hazards in the workplace. The hazard controls in the hierarchy are, in order of decreasing effectiveness:
Elimination/Substitution/Isolation/Engineering/Administration/Personal protective equipment
- **Person Conducting a Business or Undertaking:** A PCBU conducts a business or undertaking alone or with others and is a specific duty holder under work health and safety laws.
- **Risk:** understanding the nature of the harm that could be caused by a hazard, how serious the harm could be and the likelihood of it happening.

Related Documents

- Work Health and Safety ACT 2011 (NSW)
- Workplace Health and Safety Regulation 2017 NSW
- AS3745 Planning for Emergencies in Facilities - 2010
- AS1851 Maintenance of Fire Protection Systems & Equipment 2005
- AS1319 Safety Signs for the Occupational Environment -1994
- AS1530.2 Methods for fire tests on building materials, components and structures - Test for flammability of materials - 1993
- National Construction Code 2016 Building Code of Australia Volume 1 Part E1
- National Construction Code 2016 Guide to the Building Code of Australia Volume 1
- Fire Safety In Construction 2010 Health & Safety Executive Books United Kingdom
- Safety Meter Positive Performance Measure Tool WorkCover NSW 2001
- First Aid in the Workplace – Code Of Practice Safe Work Australia 2016

Appendix 1: Tools & Materials Developed for the Commercial Construction Industry

- **Case Study** – Barangaroo Fire [ACA Website](#)
 - The case study draws on the circumstances related to a major fire incident at the Lendlease Barangaroo South 1A Construction Project in March 2014. It outlines lessons for industry in response to the outcomes of the incident.
- **Hazard Profile** – Fire Preparedness Planning [ACA Website](#)
 - Developed with the assistance of concrete frame construction trades to provide insight on the activities or conditions related to each trade activity that could cause an incident significant enough to trigger an emergency response or a potential evacuation of a construction project.
- **Permit to Work System Training for Supervisors Managing Hot Works & Other Permits** [ACA Website](#)
 - A training package for supervisors managing hot works and other permits.
- **Emergency Planning Meter**
 - A positive performance measurement tool used to assess the emergency planning and preparedness of an operational commercial construction site by walking around the project and observing items from a pre-determined list.
- **Emergency Planning & Preparedness Audit Tool**
 - An audit tool that can be used to verify documented emergency response requirements are in place on an operational construction site based on legal and other requirements of Australian standards.

Appendix 2: Example of Credible Emergency Scenarios Commercial Construction Project

Potential credible emergency scenario examples to consider and assess based on the work activity, location of the workplace/project and work activities being undertaken. These are examples only determined in Focus Groups with concrete frame construction trades.

Credible Emergency Scenario	Preventative Control Measure	Equipment required including the following	First Response
Contact with overhead services	<ul style="list-style-type: none"> Isolate overhead services Fixed barriers to avoid interaction within the space. 	<ul style="list-style-type: none"> Non-conductive rescue equipment First Aid Personnel & equipment. LV or HV rescue kit Barriers for exclusion zone. Emergency Warning Information System (EWIS) 	<ul style="list-style-type: none"> Isolate power supply Isolate the area. Implement Emergency Procedure. Contact first aid personnel Call emergency services Preserve the Scene
Contact with in-ground services (electrical or gas)	<ul style="list-style-type: none"> Isolation of in-ground services Positive identification of the services, e.g. pot holing, to ensure location before digging. 	<ul style="list-style-type: none"> Non-conductive rescue equipment. First Aid Personnel & equipment. LV or HV rescue kit Barriers for exclusion zone EWIS 	<ul style="list-style-type: none"> Isolate power/gas supply Isolate the area. Implement Emergency Procedure. Contact the Utility Owner Contact first aid personnel Call emergency services Preserve the Scene
Fire and explosion caused by dangerous goods or hazardous substances	<ul style="list-style-type: none"> Substitute or minimise use of dangerous/hazardous goods Eliminate or minimise hot works or other ignition sources. 	<ul style="list-style-type: none"> Suitable firefighting equipment First Aid Personnel & equipment. EWIS 	<ul style="list-style-type: none"> Raise the alarm. Alert emergency response team members. Implement Emergency Procedure. Call emergency services

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Credible Emergency Scenario	Preventative Control Measure	Equipment required including the following	First Response
	<ul style="list-style-type: none"> • Suitable storage of liquids and gases outdoors away from ignition sources. 		<ul style="list-style-type: none"> • Evacuate the area/site as determined by the Head Warden. • Preserve the Scene
Excavation failure	<ul style="list-style-type: none"> • Benching/shoring of the excavation as determined by a qualified engineer. • Materials/equipment/plant kept away from edge of excavation and out of the zone of influence. 	<ul style="list-style-type: none"> • Rescue cage/stretchers to lift injured person. • Excavator to assist recovery if safe to do so. • First Aid Personnel & equipment. • EWIS 	<ul style="list-style-type: none"> • Contact first aid personnel. • Contact emergency rescue team. • Implement Emergency Procedure. • Isolate the area. • Call emergency services. • Preserve the Scene
Fall from height	<ul style="list-style-type: none"> • Implement fall prevention measures e.g. edge protection or perimeter screens. • Independent engineer review of temporary structure design and installation. 	<ul style="list-style-type: none"> • First-Aid Personnel and equipment. • EWIS 	<ul style="list-style-type: none"> • Isolate the area • Contact first aid personnel. • Implement Emergency Procedure. • Call emergency services. • Preserve the Scene
Fall of materials – struck by materials	<ul style="list-style-type: none"> • Eliminate storage of materials at height near edges. • Implement fall of materials prevention measures e.g. edge protection or perimeter screens, debris catch nets or fabric containment screening. • Eliminate over and under works. 	<ul style="list-style-type: none"> • First Aid Personnel & equipment. • EWIS 	<ul style="list-style-type: none"> • Isolate the area. • Contact first aid personnel. • Implement Emergency Procedure. • Call emergency services. • Preserve the Scene

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Credible Emergency Scenario	Preventative Control Measure	Equipment required including the following	First Response
Safety harness fall arrest.	<ul style="list-style-type: none"> • Eliminate use of safety harness as primary fall prevention. • Implement fall preventative measures e.g. edge protection and work platforms to eliminate harness use. • Prioritise fall restraint harness over fall arrest. 	<ul style="list-style-type: none"> • Crane assisted Workbox or other height access equipment. • Height rescue kit. • First Aid Personnel & equipment. • EWIS 	<ul style="list-style-type: none"> • Isolate the area • Contact first aid personnel • Implement Emergency Procedure. • Call emergency services. • Preserve the Scene
Immersion of a person(s) in water or water body	<ul style="list-style-type: none"> • Eliminate work over or near water • Workers wear self-inflating Buoyancy Control Device (BCD) • Design enables self-rescue ladders or another exit ability. 	<ul style="list-style-type: none"> • Floatation device, boat or other rescue equipment. • First Aid Personnel & equipment. • EWIS 	<ul style="list-style-type: none"> • Contact first aid personnel. • Implement Emergency Procedure. • Call emergency services. • Preserve the Scene.
Medical emergency (pre-existing condition)	<ul style="list-style-type: none"> • Request workers to declare pre-existing health conditions at induction. 	<ul style="list-style-type: none"> • First Aid Personnel & equipment. • Emergency Communications device (nurse call, mobile device, radio or other) 	<ul style="list-style-type: none"> • Contact first aid personnel. • Isolate area if needed • Call emergency services if unable to fully treat.
Natural disaster/weather event	<ul style="list-style-type: none"> • Weather warnings/forecast (subscribe to the early warning weather network). • Design to consider anticipated weather extremities. 	<ul style="list-style-type: none"> • Secure site against disaster/weather event. • Close site and maintain contact with site personnel resident in the community. 	<ul style="list-style-type: none"> • Implement Emergency Procedure for natural disaster weather event.

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Credible Emergency Scenario	Preventative Control Measure	Equipment required including the following	First Response
	<ul style="list-style-type: none"> On declaration of an emergency, close site and prevent access to the site/location. 		
Height Rescue	<ul style="list-style-type: none"> Eliminate work from height Design and maintain suitable access and egress routes, which enable rescue by conventional means. 	<ul style="list-style-type: none"> Height rescue kit. First Aid Personnel & equipment. Crane assisted ambulance cage Crane assisted Workbox. EWIS 	<ul style="list-style-type: none"> Contact first aid personnel. Isolate below area. Implement Emergency Procedure. Call emergency services. Preserve the Scene.
Roll over of plant or equipment	<ul style="list-style-type: none"> Formed and adequate roads suitable for heavy vehicles (flat access routes). Roll Over Protective Structure 	<ul style="list-style-type: none"> EWIS Plant vehicle recovery. 	<ul style="list-style-type: none"> Alert first aider Isolate the area Call specialist recovery company to assist Call emergency services
Structural collapse (temporary structure)	<ul style="list-style-type: none"> Temporary Structure designed by a competent structural engineer (considerations to include location, ground condition, weather conditions) Temporary Structure installed by competent person(s) and verification that it is installed as per the design. 	<ul style="list-style-type: none"> First Aid Personnel & equipment. Recovery Equipment 	<ul style="list-style-type: none"> Contact first aid personnel. Implement Emergency Procedure. Call emergency services Evacuate the area/site Preserve the Scene.