

EXCAVATION, CONCRETE PENETRATION AND SERVICES

PURPOSE AND SCOPE

The intent of this document is to eliminate or minimise the risks of fatalities, injuries and incidents when conducting all work in connection with excavations, concrete cutting, drilling, and coring and working in and around live services (underground and overhead) at Gamuda Australia (GA) projects / workplaces. It applies to the planning and execution of Excavation activities such as:

- Potholing
- Excavation and trenching, for manholes, pits, drainage, boreholes, foundations, footings, bulk, and detailed excavations
- Excavation support systems, shoring, open excavations, rock cuts, dewatering.
- Installation of star pickets or posts
- Piling
- Topsoil stripping
- Concrete slab preparation
- Concrete coring, cutting, and drilling into suspended slabs, wall and columns and slabs on ground

CRITICAL CONTROLS

- Excavation and service hazards to be risk assessed and recorded against the Project Risk Assessment.
- All excavations have a work methodology that prevents collapse of the excavation.
- Design / redesign activities are carried out, so the overhead or underground services interface is eliminated or reduced so far as is reasonably practicable.
- A permit to manage excavations is in place prior to work commencing.
- A permit to manage concrete coring and cutting is in place prior to work commencing.
- Services are positively identified, marked, and verified using non-destructive means of potholing.
- Live services are de-energised wherever possible and verified as such.
- Underground and overhead service exclusion distances are identified and adhered to.
- Excavations are controlled to effectively manage access and egress, stability, and traffic interaction.
- Exclusion zones for material, spoil and plant surrounding excavations are clearly delineated / maintained.
- Perimeter hoarding and/or hard barricading (secure fencing at least 900mm in height) and/or covers in place to restrict access to excavation, including inadvertent entry and falls into the excavation.
- A SWMS must be in place for all excavations greater than 1.5m depth and/or where services are identified.
- Regular inspections of excavation works are completed and recorded.

Note: The above controls are to be read in conjunction with the Regulations, Standards and Codes listed below.

EXCAVATION, CONCRETE PENETRATION AND SERVICES**EXCAVATION RISK ASSESSMENT AND CONTROLS**

Excavation risks are assessed, and geotechnical reports obtained wherever a risk of collapse is identified. All excavation and trenching operations shall be suitably benched, battered and/or shored to ensure that there are systems in place to prevent and control the following risks:

- Falling or dislodgement of earth and rock within the excavation
- Instability of the excavation or adjacent structures
- Exposure to airborne contaminants such as those heavier than air gases including exhaust fumes
- In-rush of water into the excavation
- Placement of spoil and materials impacting or falling into the excavation
- Instability due to persons or plant working adjacent to the excavation
- Emergency rescue procedures are in place for working in and around underground and overhead services where specific risks are identified within the Emergency Response Plans and Permit to Excavate (**Annexure 02**)

A Safe Work Method Statement will be completed in consultation with workers prior to any excavation being conducted such that all hazards are identified, and control measure implemented and a **GA-FRM-HSE-132 Permit to Excavate** is issued, approved, and recorded.

EXCAVATION AND TRENCHING

All excavations and trenches over 1.5m deep that require worker entry will require a collapse control to be implemented. Excavation and Trenching collapse controls include:

- **Benching** – to horizontally step the face, side, or wall of an excavation.
- **Battering** – to form the face, side, or wall of an excavation to an angle to prevent earth slippage.
- **Shoring** – to use timber, steel, or other structural material to support an excavation in order to prevent collapse.
- **Engineering endorsement** – to use a geotechnical engineer to formally review the excavation and confirm in writing that it is safe for worker entry:
 - without one of the above preventative collapse controls as it is self-supporting; or
 - where benching / battering is applied at an effective angle of greater than 45 degrees to the horizontal.

Excavation and Trenching collapse controls may also be applied to excavations and trenches at a lesser depth due to factors including:

- Soil type being prone to slippage.
- The area having been previously excavated or not well compacted.
- Adjacent plant and vehicle movement.

Where **shoring** systems are used, they will be:

- Designed by a qualified engineer (i.e., civil, structural, or geotechnical engineer)
- Detailed on an up-to-date drawing or plan of the area.

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- Installed by competent persons and verified as correctly installed prior to use in accordance with the drawing or plan.
- Authorised and signed-off by a qualified engineer where changes to the design or installed system are made (i.e., civil, structural, or geotechnical engineer).

EXCAVATION COMPETENCY AND INSPECTION

Personnel are considered competent if they hold the minimum competency to install shoring systems and other similar ground collapse system as follows.

- Statement of Attainment for RIICCM210E – Install trench support; OR Certificate III in Civil Construction; OR, a specialist shoring installation supervisor who is familiar with the shoring type, specification, and instructed on its safe use;
- Specific training provided by the manufacturer / supplier; and
- Has at least 3-years on-site experience.

Formal inspections of benching, battering and/or shoring controls will be checked and recorded daily (pre-work) using **GA-FRM-HSE-160 Daily Excavations Inspection** by a competent person as follows.

- Excavation or trench is 1.5 metre in depth (or deeper) requiring worker entry; OR,
- Excavation or trench is immediately adjacent to an existing structure and below the depth of the footing / foundation of the structure.

Personnel are considered competent to undertake excavation inspections to monitor the effectiveness of controls in accordance with the design/drawing/plan/permit if they hold the minimum competency requirements.

- Qualified Civil / Structural Engineer, OR, Geotechnical Engineer, OR, Certificate III in Civil Construction, OR, personnel internally trained, consistent with the excavation code of practice; and
- Has at least 3 years on-site experience.

CONCRETE CORING, DRILLING AND CUTTING

Cutting, drilling, or coring into concrete must have a permit completed prior to undertaking activities that require penetration into concrete. The purpose of the permit is to identify structural elements and live services in the vicinity of the intended core, cut of drill located are identified, positively located and a safe work methodology is deemed appropriate for the works.

When coring into concrete, a pilot drill hole must be undertaken in the centre of the core hole to confirm the location of the core, appropriate barricading can then be established, dependent on the height of drop, a spotter and services isolation.

UNDERGROUND SERVICES

Prior to undertaking any excavation activities, a dial before you dig (DBYD) search shall be conducted for areas where planned excavation activities are to be undertaken. All underground and overhead services are to be identified and locations marked onsite by appropriate means (i.e., marking paint, etc).

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Once services are identified and marked, underground services are to be positively identified and verified using non-destructive means of potholing with consideration of underground essential services information. (Refer to **GA-FRM-HSE-132 Permit to Excavate – Annexure 01** for information regarding specific Safe Approach Distances (S.A.D.) for plant and equipment). Mechanical excavation is not to occur within 1 metre of any gas or electrical service without physical protection of the service.

OVERHEAD SERVICES

Prior to undertaking any work near live electrical service or apparatus (i.e., powerlines, conductor, etc), it is essential that the height and voltage of the overhead power lines (and if applicable the horizontal safety clearance) is identified and assessed at the project / workplace. When assessing the risks associated with encountering live overhead services, the following hierarchy of controls should be considered:

- **Elimination** – Where there is a potential high risk of making contact with live overhead power lines through work activities, consult with the asset owner to assess the potential for undergrounding or isolating the service in advance.
 - Can the service be placed underground before work commences?
 - Can the service be electrically isolated?
- **Substitution** – Where elimination is not possible, a review must be undertaken of the design and construction methodology to assess potential for relocating activities to a safe distance from the live overhead power line. If substitution is not practicable, and there is still a requirement to work inside of SAD for the live overhead service, then works should not proceed.
 - Can an alternative access route or work site be chosen?
 - Can alternative methods or equipment be used?
- **Isolation** - Review the potential for the work to be conducted remotely, removing the need for personnel to be placed at risk.
 - Can personnel be removed from the risk?
- **Engineering Control** – Where there is a high likelihood that plant, equipment or personnel could encroach within SAD of live electrical service when performing normal activities, physical control measures need to be implemented.
 - Implement physical/mechanical means of ensuring that personnel and equipment are unable to encroach on Safe Approach Distances (SAD).
 - Where required, cranes / EWP's should engage mechanical slew/jib locks to restrict ability to encroach SAD.
- **Administrative Control** – Live electrical service is to be clearly identified when establishing a work site. Coloured demarcation flagging and/or signage should be deployed at ground level to highlight where the SAD for the overhead electrical service.
 - Apply safe systems of work to mitigate risk of contact with live overhead electrical service
 - Training to be undertaken for electrical spotters and operators
- **Personal Protection Equipment (PPE)**
 - Use of electrically insulated PPE and equipment

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SAFE APPROACH DISTANCES (SAD)

A safe approach distance, also referred to as “Approach distance”, “Exclusion Zone” and “No Go Zone” means the area around overhead power lines into which no part of a person or material or cranes or vehicles or items of mobile plant may encroach without the approval of the network operator.

When assessing the relevant approach distances for the work a number of factors must be taken into account including but not limited to the following (Refer to the figure notes below)

- Verification of overhead service locations (including clearance)
- Consideration shall be given to the extra sag of cables from temperature changes
- Due to possible conductor movement by wind or inadvertent contact with supports, measurement of the conductor sag shall be included when determining the Safe Approach Distances (SAD)
- Differences in voltages on lines attached to the same poles
- Increased clearance to be given where Crane and Lifting operations may impact upon clearance distances
- Potential arcing, static electricity build up or induced voltage and other inadvertent exposure that does not occur by direct contact with overhead services.

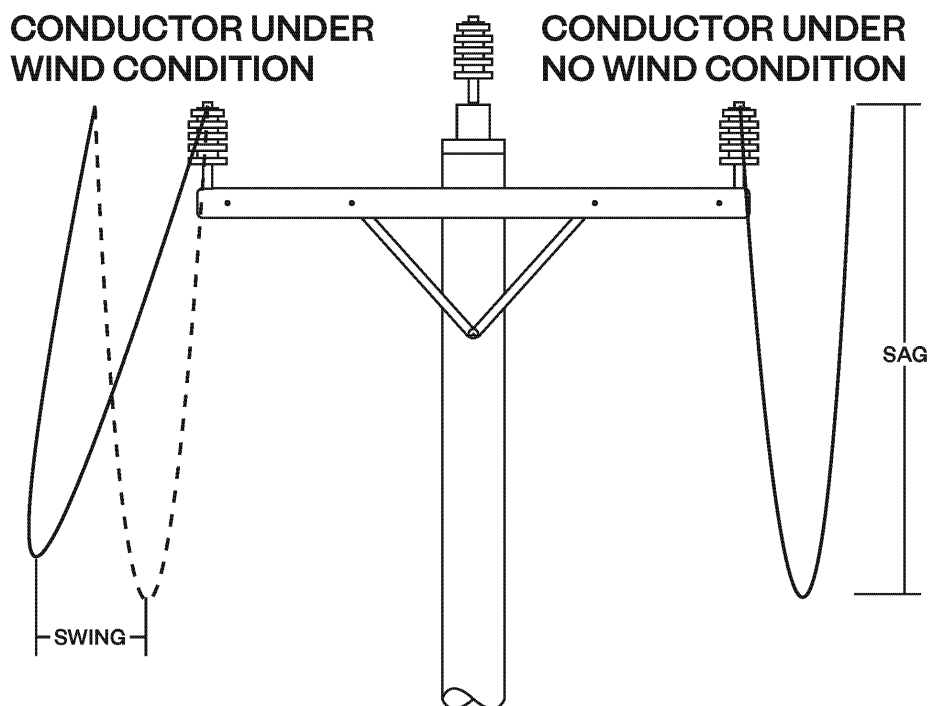
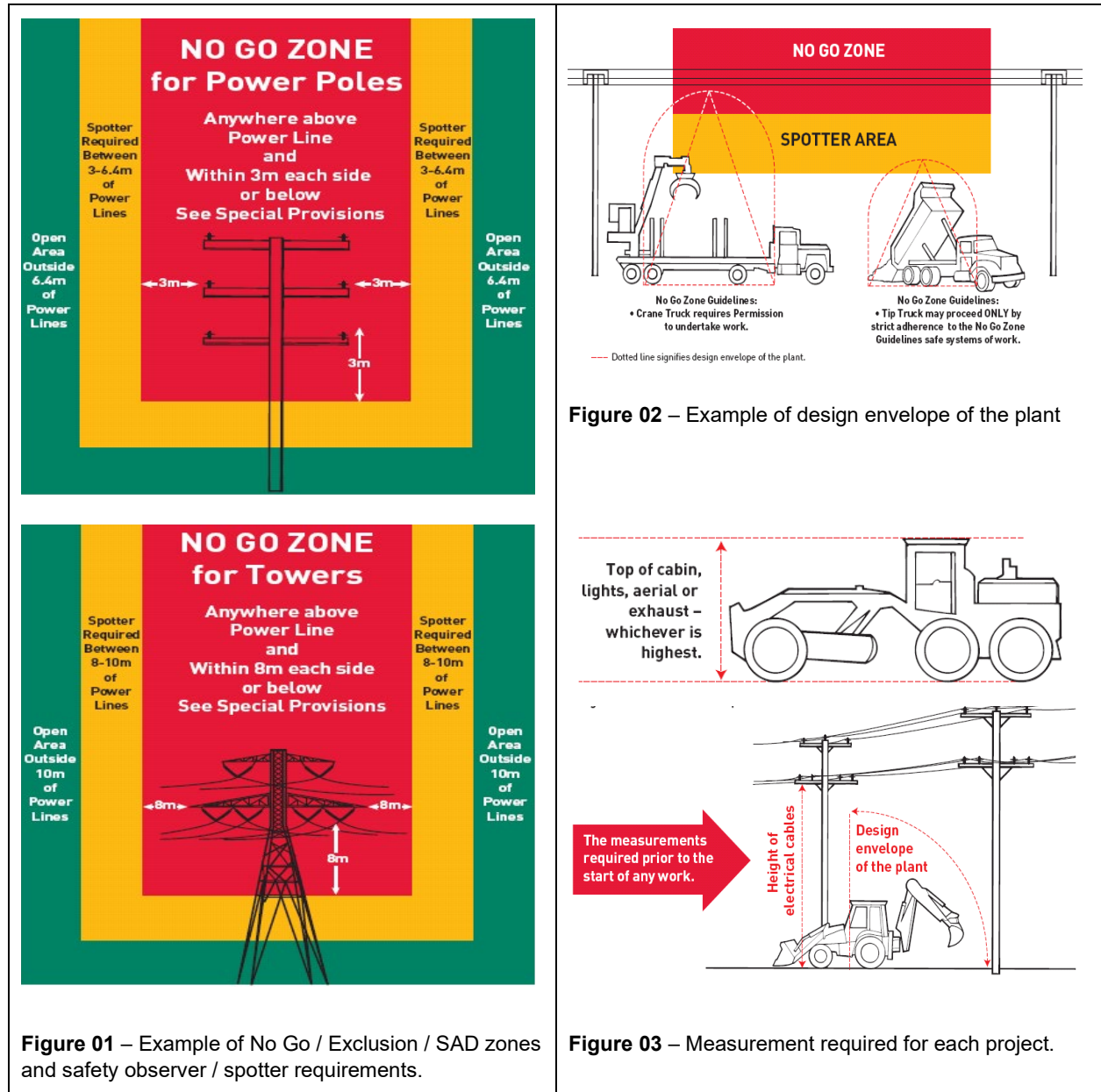


Figure 01 – Example of conductor sag affecting the Safe approach distance (SAD).

Note: Do not attempt to directly measure the height of overhead power lines. Do not use conductive metallic objects or measuring devices such as metal tape measures for estimating the height of overhead power lines.

Reference is to be made to individual asset owner regulations, but as a general guide, a minimum of 3m for Low Voltage (LV) (up to 1000vac) and 8m for High Voltage (above LV) clearance should be maintained to any live overhead electrical line when no form of isolation or authorisation being in place



Note: No work is permitted to be performed over any LV or HV uninsulated energised overhead conductors.

REGULATIONS, STANDARDS AND CODES

- Work Health & Safety Regulation 2011 (QLD, ACT), 2012 (SA), 2017 (NSW, NT) and 2022 (WA)
 - Part 3.1 Managing Risk to health and safety (regs 32 – 38)
 - Part 6.3 PCBU
 - Division 2 High Risk Construction Work – SWMS (Regs 299 – 302)
 - Division 3 Excavation Work (regs 304 – 306)
- Occupational Safety and Health Regulations 1996 (WA)
 - Subdivision 6 - Excavations and earthworks
- Occupational Health and Safety Regulations 2017 (VIC)
 - Chapter 5, Division 4 Notification of construction excavation work
- SafeWork Australia: Excavation Work Code of Practice
- SafeWork Australia Model Code of Practice; Managing Electrical Risks in the workplace
- Code of Practice – Excavation Work (QLD)
- Code of practice – Excavation (WA)
- Industry Standard - Piling work and foundation engineering sites (VIC)
- Overhead and underground assets, Framework for undertaking work near (VIC)

FORMS AND CHECKLISTS

- **GA-FRM-HSE-132** Permit to Excavate
- **GA-FRM-HSE-133** Permit to Cut and Core Concrete
- **GA-FRM-HSE-113** WHS Inspection