

2.17 Safe Approach Distances

Purpose

This instruction outlines the safe approach distances (SAD) for authorised Horizon Power Workers, Mobile Plant and Vehicles working near live electrical apparatus.

Scope

This instruction applies to any Horizon Power authorised Worker, including Workers operating, servicing, and/ or maintaining (SPS) Standalone Power Systems electrical equipment (inclusive of all generating methodologies) who performs work near live electrical apparatus.

- The safe approach distances apply to any competent person performing work on behalf of Horizon Power and must be identified during the job risk assessment.
- The safe approach distance must not be confused with the 'Danger Zone' as defined in the WA Occupational Safety and Health Regulations 1996 s3.64.

Exclusion

This instruction does not apply to:

- High voltage live line work.
- Apparatus covered by an Electrical Access Permit.

Safety

Before commencement of work, a risk assessment must be carried out using the Risk Analysis Procedure (OSH-3.6-1-02), to identify and document the hazards and risks associated with the task and ensure appropriate control measures are implemented.

It is important that, appropriate control measures must be identified, documented and implemented in order to control hazards to As Low as Reasonable Practicable (ALARP).

Safe Approach Distances

The SADs in this instruction are based on an exclusion zone principle. This principle defines an area around the electrical apparatus into which no part of a person, mobile plant or object (other than approved insulated objects) may encroach.

ENA NENS 04–2006 National Guidelines for Safe Approach Distances to Electrical Apparatus – Tables 1,2,3,4 and 5 (following) sets out the safe approach distances for an authorised person, mobile plant and vehicles working near live electrical apparatus.

These distances are to be maintained from:

- Any part of a person (body).
- Any conducting object, tool or equipment being held or carried.
- Mobile plant and/or its load.
- A vehicle and/or its load.

The safe approach distance for a person is based upon the maximum flashover distance plus an allowance of 600 mm for inadvertent movement.

The safe approach distance for uninsulated sections of mobile plant is based upon the maximum flashover distance plus an allowance of 1,000 mm for inadvertent movement.

Note: The SADs in this work practice are taken from ENA NENS 04 (National Guidelines for Safe Approach Distances to Electrical Apparatus).

Instruction

- Designate a competent safety observer who has been specifically instructed in the recognition of relevant workplace hazards.
- Earth elevated work platforms, vehicles, plant and cranes that operate near live overhead high voltage electrical apparatus.
- Ensure that all personnel comply with the minimum personal protective equipment (PPE) requirements FI 2.6 Worksite Clothing/Personal Protective Equipment Requirements.

Reducing Safe Approach Distances

For voltages between 6.6 kV to 33 kV, the safe approach distances listed in Table 1 may be reduced by half if approved insulating covers are placed between the person, mobile plant, vehicles and the live electrical apparatus.

Table 1 – Safe Approach Distances

Nominal phase-to-phase voltage (kV)	Persons (mm)	Mobile plant (mm)		Vehicles (mm)
		Uninsulated sections	Insulated sections	
				All directions
Up to 1	No uninsulated contact	1,000	Contact allowable	300 (low voltage insulated conductors including ABC) 600 (low voltage uninsulated conductors)
Up to 33	700	1,200	700	700
Up to 66	1,000	1,400	1,000	1,000
Up to 132	1,200	1,800	1,800	1,200
Up to 220	1,800	2,400	2,400	1,800

These represent nominal minimum personal clearances and are for an 'Authorised Person' (as defined in ENA NENS 04-2006 National Guidelines for Safe Approach Distances to Electrical Apparatus).

Safe Approach Tables for overhead lines

Table 2: SAD for authorised persons

Voltage	Distance (mm)
Up to 1,000	Avoid contact
6,600	700
11,000	700
22,000	700
33,000	700
66,000	1,000
132,000	1,200
220,000	1,800

Table 3: SAD for ordinary persons

Voltage	Distance (mm) ¹	Distance (mm)
	With Consultation from Horizon Power and under Direct / Constant Supervision by an Authorised Person	Without Consultation from Horizon Power
Up to 1,000	1000	1000
6,600	2000	3000
11,000	2000	3000
22,000	2000	3000
33,000	2000	3000
66,000	6000	Not Permitted
132,000	6000	Not Permitted
220,000	6000	Not Permitted

Note: ¹ After consultation with Horizon Power, a risk assessment, and under Direct (Constant) supervision of an Authorised person.

Table 4: SAD for mobile plant and vehicles operated by authorised persons with a safety observer

Voltage	Mobile Plant		Vehicles
	Insulated distance (mm)	Uninsulated distance (mm)	Distance (mm)
Up to 1,000	Contact allowed	1,000	600
6,600	700	1,200	700
11,000	700	1,200	700
22,000	700	1,200	700
33,000	700	1,200	700
66,000	1,000	1,400	1,000
132,000	Not applicable	1,800	1,200
220,000	Not applicable	2,400	1,800

Note: A safety observer must be used according to approved procedures when working with vehicles and mobile plant on or near electrical apparatus (Refer to AS 2067)

Note: For authorised live work refer to the clearances in Horizon Power's High Voltage Live Work Manual consistent with (AS 5804 parts 1 – 4, 1)

Table 5: SAD for mobile plant and vehicles by ordinary persons

	Mobile Plant	Vehicles
Voltage	Distance (mm)	Distance (mm)
Up to 1,000	1,000	600
6,600	3,000	900
11,000	3,000	900
22,000	3,000	900
33,000	3,000	900
66,000	6,000	2,100
132,000	6,000	2,100
220,000	6,000	2,900

The Danger Zone

A danger zone is a specific area surrounding live electrical apparatus that ordinary persons, equipment and materials must not enter. The size of the danger zone is determined by the voltage of the electrical apparatus, and whether the apparatus is insulated or not.

Shown below in **Table 6:** are the danger zone distances by voltage. The danger zone shall be considered anywhere within the distance specified for the voltage of the circuit.

Table 6

Voltage	Electrical Apparatus	
	Insulated Distance (mm)	Uninsulated Distance (mm)
Up to 1000 V	500	1000
1kV to 33kV	3000	3000
Above 33kV	6000	6000

Danger Zones by Voltage

The location and position of a danger zone is relevant to the position of the electrical apparatus. If an electrical apparatus, such as a live conductor, moves, the danger zone moves with it. This change of danger zone can place persons, tools, equipment, apparatus and other items at risk if not carefully planned for.

The normal danger zone distances for HV underground insulated conductors are generally not appropriate unless the cores are exposed due to the cable sheath or insulation being compromised.

Figure 1 defines the various danger zones surrounding a piece of live electrical apparatus and the classification of persons working in the area.

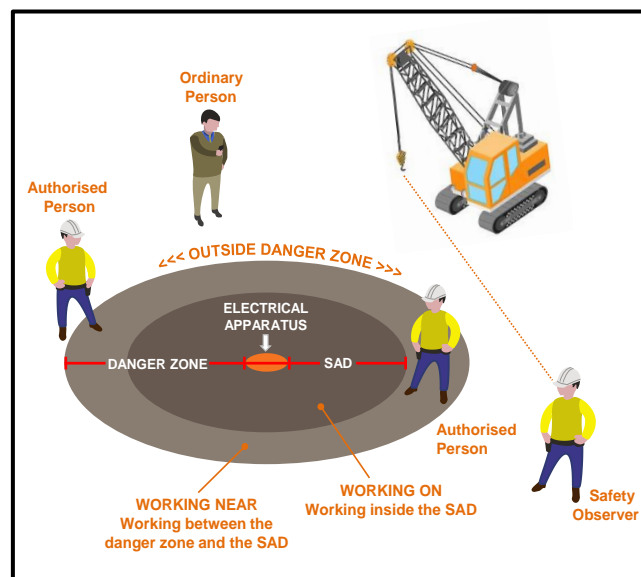


Figure 1 - Working on or near uninsulated electrical apparatus

Safety Observer

A Safety Observer shall be appointed where it is prescribed by Horizon Power procedures (refer to Field Instruction 2.27 Safety Observer) or, following a JRA process, it has been identified that a person, equipment or mobile plant might inadvertently infringe the SAD.

Under no circumstances shall the Safety Observer's concentration be diverted through distraction or be assigned another duty while the possibility of infringing the SAD exists.

Before any person can act as a Safety Observer of plant and equipment, in proximity of electrical apparatus, they shall:

- Be familiar with the task and be fully aware of the potential risks associated with the task.
- Have the authority to suspend the relevant work at any time.
- Be specifically instructed in the duties and workplace hazards applicable.
- Be positioned to effectively observe and immediately communicate with persons performing the work.
- Monitor the work and warn against potential infringement of SAD.

Hazard Approach

Hazard Identification and Risk Assessment

Hazards shall be identified and the associated risks assessed and controlled prior to working on or near any electrical apparatus.

Factors that assist in the control of hazards include:

- Adhering to the Safe Approach Distances (SAD) rules
- The work method employed, including the use of safety observers
- The skill of knowledge of work team or individual.
- Adequate and effective communication.

The risk assessment process shall be regularly audited to ensure compliance

Step Potential

In the case of a ground fault, for example a fallen conductor, electricity will pass into the ground causing Earth Potential Rise (EPR) and fan outwards with diminishing voltages.

Step potential is an electric shock hazard that occurs when a person is close to or steps towards an energised contact site. The step voltage that causes current to pass through the body is the difference in voltage of the energised soil between their feet.

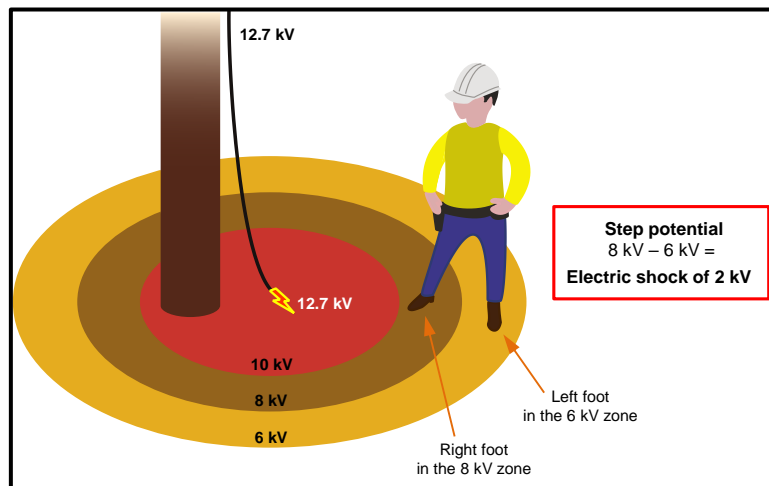


Figure 2 - Step potential

Touch Potential

Touch voltage is experienced when contact is made with an energised object. The touch voltage that causes current to pass through the body is the difference between the voltage of the energised object and the voltage of the zone where the feet are placed, remembering that voltages diminish in a radial pattern from the contact site.

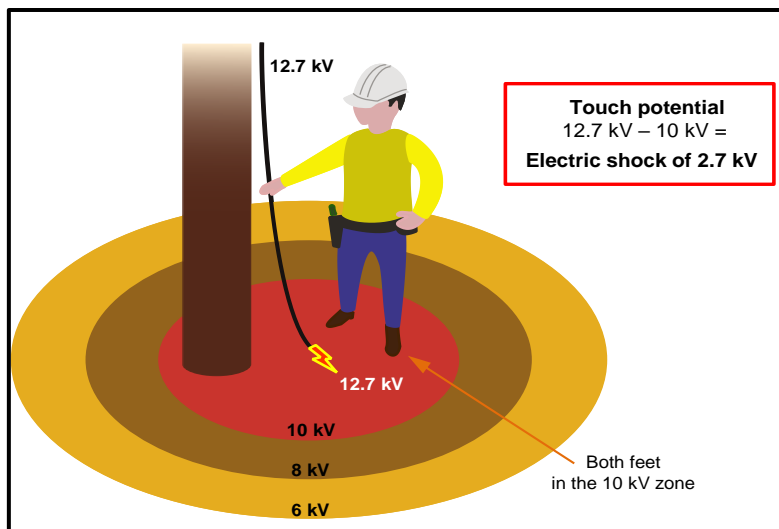


Figure 3 - Touch potential

References

- Occupational Safety & Health Act 1984
- Occupational Safety & Health Regulations 19962.27 Safety
- SHMS OSH-3.6-1-02 Job Risk Analysis (JRA) Procedure
- SHMS OSH-3.6-1-26 Personal Protective Equipment
- SHMS OSH-3.6-1-03 Mobile Plant and Equipment
- Electrical Safety Standards
- Field Instruction 2.6 Worksite Clothing / Personal Protective Equipment Requirements
- Field Instruction 2.23 Job Hazard and Risk Management (JRA)
- Field Instruction 2.27 Safety Observer Role
- Field Instruction 10.21 Work Permits
- High Voltage Live Work Manual
- AS 2067–2016 Substations and high voltage installations exceeding 1 kV a.c.
- Energy Network Association (ENA) NENS 03-006 and (ENA) NENS 04
- For work in Substations particular attention must be made to distances referred by AS 2067