High Voltage Live Work Procedures – Distribution Insulated Stick
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For the current version of this document, see:

- Depot Pack (see Depot Pack Instructions (DM# 9001578))
- the Western Power intranet site, busbar http://busbar/work-practices.html
- Enterprise Connect (DM# 12733098)

### Note

Any updates to this document will be communicated to the Network Total Workforce (NTW) and the electronic version updated on Depot Pack, the Western Power website and busbar.

This document has been prepared by Work Practice Development & Training.

work.practice.development@westernpower.com.au
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Introduction

These procedures have been developed to provide qualified and authorised high voltage (HV) live workers with standardised methods of HV live work. The procedures include the roles and responsibilities expected of HV live workers to create and maintain a safe working environment that meets state and national legislation, standards and work practices. All relevant staff must be issued with these procedures and follow them at all times.

There are three sets of HV live work procedures:
- High Voltage Live Work Procedures – Distribution Insulated Stick
- High Voltage Live Work Procedures – Glove and Barrier
- High Voltage Live Work Procedures – Transmission Insulated Stick (under development)

The following Australian Standards are the primary references for these procedures:
- AS 5804.1-2010 High-voltage live working – General
- AS 5804.2-2010 High-voltage live working – Glove and barrier work
- AS 5804.3-2010 High-voltage live working – Stick work

Hierarchy of documentation

Government legislation and regulations set the requirements for company-level policy. Within Western Power, documentation is governed by the hierarchy shown in Figure 1, below. If there is ever a difference between documentation, the higher level documentation always overrides documentation at a lower level.

For example:

Figure 1: Western Power’s Safety, Health and Environment Management System Document Framework

Keeping these procedures up-to-date

These procedures are regularly reviewed, updated and developed to meet legislative changes, newly developed techniques and technological advancements in equipment and network design for accessing and working on the Western Power network.

The following groups meet regularly to discuss HV live work, and oversee all major changes to the procedures:
- Senior Management High Voltage Live Line Work Committee
- High Voltage Live Line Work Group
- Local High Voltage Live Line Work Groups
Feedback
The Work Practice Development team strives for continual improvement of systems, procedures, processes and instructions. We value feedback and encourage suggestions and recommendations for changes, alterations or inclusions.

Feedback must be submitted to a formal leader for review, who can then forward it on to:
- the Work Practice Development team at work.practice.development@westernpower.com.au
- a representative of one of the High Voltage Live Line Work groups

Version control
- It is the user's responsibility to update and maintain hard copies for their own use.
- It is the formal leader's responsibility to ensure that employees are using the current version.

Note
Use the electronic version, wherever possible, to ensure that the most up to date version is being used. Access the electronic version from Depot Pack, the Western Power website and busbar.

Depot Pack
High Voltage Live Work Procedures are available on Depot Pack on the Operational page.
Depot Pack is an electronic resource designed to be used by workers in the field where an internet connection may not be available. It does not require a network or internet connection (although one is required to update the Depot Pack files).
Depot Pack is available to the entire Network Total Workforce and is in use by all Western Power staff and many of our contractors.
Depot Pack is:
- the one stop shop for all Western Power work practice information
- easier to use and more reliable than printed paper documents. It’s regularly updated, so you know the information is current, unlike a printed document that may have changed since your copy was printed.
- a controlled source of information, which is crucial when it comes to safe and efficient work practices
For information on installing and updating Depot Pack, see Depot Pack Instructions.

Western Power website

busbar
These procedures are available on busbar (Western Power’s intranet) on the Work Practice Development page: http://busbar/work-practices.html

References
- AS 5804.1-2010 High-voltage live working – General
- AS 5804.2-2010 High-voltage live working – Glove and barrier work
- AS 5804.3-2010 High-voltage live working – Stick work
- Depot Pack Instructions (DM# 9001578)
- Electrical System Safety Rules (ESSR) (DM# 9199327)
- High Voltage Live Work Manual (DM# 6127457)
- High Voltage Live Work Procedures – Glove and Barrier (DM# 12733030)
- High Voltage Live Work Procedures – Transmission Insulated Stick (DM# 12900876)
User guidelines

Support procedures
The support procedures at the end of this document have been developed to assist and support the HV live work procedures where required. They are procedures for carrying out high risk activities that do not fall into the same category as HV live work.

Support procedures:
- are not HV live work procedures and do not use HV live working principles
- are indicated by the word ‘Support’ in their title, e.g. ‘DIS-Support-01 Displace and replace return wires’.

Figures
Many procedures include a supporting photograph or drawing. These are provided for illustration purposes only. Insulating barriers have often been removed for clarity. The positioning of HV live work equipment in a particular figure does not imply that it is accurate for all construction types.

Resources
The ‘Resources’ section in each procedure is not a complete list of the resources required to perform that procedure. Instead, it lists:
- only the additional equipment or plant to what a distribution insulated stick HV live work team would normally have on hand
- the specific personnel numbers required to perform that procedure, and their basic roles.

Box outlines
Box outlines are used to indicate a break in the procedure. Where this occurs, the task in the box outline must be completed before continuing. In the example below, a new pole must be installed before proceeding to step 3.

Example
1. Untie the middle conductor and move to the conductor trap on the inside of the auxiliary arm.
2. Double insulate the last outside conductor, insulate the conductor and move away with the EWP bucket.

Install the new pole close to the existing pole, ensuring that the new pole is taller than the old pole.

3. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked or are in place.

Terminology
There are a few terms used in the procedures that are common to HV live work. We do not define them every time we use them, but have included them here to ensure there is no confusion over their meaning.

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<td>G&amp;B</td>
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Acronyms and definitions

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<td>Low voltage</td>
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<td>MAD</td>
<td>Minimum approach distance</td>
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<td>NO</td>
<td>Network Operations</td>
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<td>PG clamp</td>
<td>Parallel groove clamp</td>
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<td>PPE</td>
<td>Personal protective equipment</td>
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<td>RDA</td>
<td>Running disc angle</td>
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<td>RIC</td>
<td>Recipient in charge</td>
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<tr>
<td>SWL</td>
<td>Safe working load, also known as working load limit (WLL)</td>
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<tr>
<td>TDO</td>
<td>Temporary drop-out</td>
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<tr>
<td>Tensioning device</td>
<td>A device used to tension overhead conductors, e.g. strap hoist, pulley block rope tackle</td>
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Safety

Principles of HV live work

HV live work enables authorised HV line workers to safely perform construction and maintenance on HV energised or de-energised mains and apparatus using approved procedures.

Distribution insulated stick method

The authorised HV live worker uses tools and equipment mounted on HV live work sticks to maintain the MADs from energised components at worksites on the distribution part of the network (i.e. voltages up to 33 kV).

Note

All HV live work must be carried out in accordance with:

- Electrical Systems Safety Rules (ESSR)
- High Voltage Live Work Manual
- the procedures relevant to the method being used, as provided in:
  - High Voltage Live Work Procedures – Distribution Insulated Stick
  - High Voltage Live Work Procedures – Glove and Barrier
  - High Voltage Live Work Procedures – Transmission Insulated Stick (under development)

If any doubt arises regarding a procedure, seek clarification before proceeding.

These procedures only cover HV live work. Where LV conductors are attached to the pole that is being worked on, LV methods of work must be used when working on the LV conductors.

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2. Safety observer
3. Combining procedures
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7. Tools and equipment
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9. Rescue and emergencies
10. Control of conductors
11. Conductor loads
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14. SWER return wire
15. HV systems parallels
16. Insulating covers/barriers
17. Cast iron cable box terminations
18. Insulated stick requirements
   - Work practices
   - Clearance markers
   - Electrical rating of insulating sticks
1. General safety requirements

The following is a summary of section 2 (Safe working principles) in High Voltage Live Work Manual:

- All members of the public must be kept clear of all work sites while HV live work is in progress.
- All work and worksites must be inspected by an authorised person prior to work taking place.
- The integrity of the structure, adjacent structures and conductors must be visually checked before work takes place.
- Other work must not be carried out simultaneously on a pole while HV live work is being undertaken.
- HV live work PPE, tools and equipment, including the insulated EWP, must all be within the current test date.
- Always clean and inspect all PPE, tools, equipment and EWP before use.
- The correct permitting for the task must be in place, and received by the RIC before HV live work commences.
- Onsite hazards must be identified, risks assessed and control measures put in place and reviewed according to the hazard and risk control assessment in the risk assessment document.
- Vehicle GADs must be maintained.
- A safety observer and onsite person in charge must be in place before HV live work commences.
- Before commencement of HV live work, conductor weights and loading changes applied to structures must be assessed or calculated.
- Before commencement of HV live work, the following must be assessed (if required):
  - electrical loading on conductors
  - conductor temperature
- A drop zone must be established.
- MADs and GADs must be maintained.
- All work must be completed in accordance with the relevant HV live work procedures.
- Only one electrical potential may be exposed to work on, by a team, at any one time. All other potentials in reach must be shrouded.
- Where two teams are working on one structure, but on different potentials, a minimum of 2000 mm must be maintained between the EWPs. In this situation two safety observers will be required.
- The minimum number of authorised personnel must be on site at all times when the work is under commencement.
- Only web strap tensioning devices may be used for HV live work.
- Conversation between HV live workers must be limited to the necessary remarks concerning the work, to maximise focus and concentration on the task at hand.
- All HV live workers performing a procedure must be totally focused on the activity being performed.
- Where conductors are being moved, their movement is to be closely observed throughout the adjacent spans. This is to ensure that no clearances are breached.

2. Safety observer

When acting as a safety observer for HV live work the following be must be met:

- give undivided attention to those performing the work
- only focus on one work activity at a time
- do not undertake any other tasks that may distract their focus on the work that is being performed

3. Combining procedures

- It may be a requirement to combine various procedures to allow specific tasks to be completed.
- When HV live work is to be accomplished through a combination of procedures, the work must be limited to situations where the safety margins are not decreased.
High Voltage Live Work Procedures – Distribution Insulated Stick

- Such combinations must be agreed to by all team members and documented in the onsite risk assessment. The combination must be agreed to at the start of the job and must not be implemented in an unplanned manner during the work process.
- If it is found that during the task a change in work method is required, all work must stop and a suitable procedure chosen to carry on with the task. This must be agreed on by all members of the team and documented in the onsite risk assessment.

4. Resource requirements

The minimum resource requirements for HV live workers are provided within each procedure. The result of an onsite risk assessment may indicate that additional HV live workers are required.

5. Personal protective equipment

The following is a summary of work practice 2.10 (Personal protective equipment (PPE) requirements) in *High Voltage Live Work Manual*:

PPE must be:
- worn before leaving the ground or the EWP boom leaves rest
- worn continuously while work is carried out

The intent is to ensure that HV live workers are wearing PPE when:
- approaching and entering the work area
- work is being carried out in the work area
- leaving the work area

6. External clothing, jewellery and hair

- External clothing must be made of fire proofed cotton or other approved material as described in work practice 3.1 (Clothing and personal protective equipment requirements) in *Work Practice Manual*.
- Always ensure that full body cover is maintained.
- All personal metallic objects, e.g. wrist watches, bracelets, jewellery, medallions, rings, pencils, pens, must be removed.
- Hair may be a conducting medium and as such, its length may become an electrical hazard as well as posing dangers of entrapment in moving parts of tools and live work equipment. It must be securely fixed and confined close to the head to control these risks.

7. Tools and equipment

The following is a summary of section 6 (Tools and equipment) in *High Voltage Live Work Manual*:
- All work on HV live equipment must be carried out from an insulated EWP or ladder.
  a. Only approved tools may be used.
     - Hydraulic tools must have approved and tested insulating hoses.
     - The only electrically-powered tools that may be used are battery-operated power tools.
  b. Tools, equipment and materials must be kept in the appropriate bags or tool trays and not laid on structures or cross-arms.
  c. All approved, non-insulated lifting equipment must be inspected for damage prior to each use and rated to lift the calculated load. When not in use the equipment should be stored correctly and not exposed to the elements on the back of vehicles.
8. Weather conditions

The following is a summary of work practice 2.7 (Managing risks associated with weather conditions) in *High Voltage Live Work Manual*:

- Always be vigilant of weather changes. Work must not be started or continued when lightning is visible or thunder audible at the work location. If the weather changes after the work has commenced, the job must be left in a safe condition and personnel must descend to the ground.
- In wet weather conditions, the risk assessment must be reviewed to determine if it is safe to carry on with the work.
- High temperatures and humidity must be taken into consideration and suitable precautions must be taken to avoid HV live worker fatigue.
- Work must not start or commence in excessive winds.

9. Rescue and emergencies

The following is a summary of work practice 2.13 (Rescue and emergencies) in *High Voltage Live Work Manual*:

a. Hazards that may be found at an HV live worksite are:
   i. step and touch potential
   ii. energised vehicles, poles and structures
   iii. energised or potentially energised fallen mains and equipment
   iv. fire
   v. shattered glass or porcelain
   vi. ruptured hydraulic lines
   vii. unsafe overhead hazards e.g. damaged mains with potential for failure, loose overhead materials
   viii. other live circuits in the vicinity

b. Actions required in the event of an incident during HV live work are listed below:
   i. Ensure your safety and that of others onsite, including the public.
   ii. Attend to the needs of any casualties, if they can be approached without compromising your own and others safety.
   iii. Administer first aid as required.
   iv. Contact Network Operations Control (NOC), see appendix 4 in the *Work Practice Manual*.
   v. Contact Emergency Services, if required.
   vi. Report the incident to your supervisor as soon as reasonably possible.
   vii. Treat every part of the network as energised until proven de-energised earthed and short circuited.
   viii. The site must be preserved and not disturbed unless there are immediate safety concerns or you are authorised by Western Power.

10. Control of conductors

The following is a summary of work practice 7.0 (Conductors) in *High Voltage Live Work Manual*:

a. Conductors must be positively controlled when being displaced.

b. Conductors must be secured before any tie or conductor clamp is removed.

c. Covered conductors may be free-floated after giving due consideration to ground clearances, conductor spacing, wind, adjacent circuits, trees, etc. Covered conductors may be pulled out of the work area using ropes and spiral link sticks.

d. Care must be exercised when removing ties, jumpers and helical fittings. All clearances both to the body and equipment must be maintained. If possible, cut so that the free length is manageable and positively controlled.
e. Always make and break connections using insulated sticks from outside of the MAD so that the HV live worker is not in the potential flash area.

f. When a conductor is moved a phase to earth distance of 450 mm must be maintained or 150 mm when second points of contact are covered. A phase to phase distance of 550 mm must be maintained.

11. Conductor loads

The following is a summary of section 7 (Conductor loadings) in *High Voltage Live Work Manual*.

a. Where possible, the conductor load should be calculated on the pre-work site visit. This will ensure that the correct method is selected and appropriate equipment is taken to the site.

b. Onsite conductor load calculations must be performed before work commences to confirm the pre-work site visit calculations or determine the conductor load onsite.

12. Approach distances for HV live work

The following is a summary of work practice 9.0 (Distribution insulated stick method) in *High Voltage Live Work Manual*.

**MADs**

a. HV live workers must not to allow any part of their body, anything they wear or any conductive apparatus they are carrying closer to live apparatus than the MAD for that voltage. The MAD must always be maintained.

b. When there is doubt about a MAD, do one of the following:
   - measure the distance with an insulated stick
   - visually estimate the MAD, then increase the estimated distance

c. MAD distances must be marked on insulating sticks with consideration for the activity and equipment that is being used.

13. Debriefing

Once all work is complete the team must conduct a debriefing. This will include:

- Sign off permits and complete risk assessment.
- Notifying NOC that the live work is complete.
- Address any issues that may have occurred completing the task.

14. SWER return wire

a. When working on a SWER return wire the work principles described in work practice 6.30 (SWER return wire maintenance when the phase conductor is energised) in the *Work Practice Manual* must be followed.

15. HV System parallels

When carrying out HV live work, HV system parallels must not be made or broken.

16. Insulating covers/barriers

a. Approved covering must be applied to all energised apparatus and second points of contact in the work area when required. When applying covering, always cover the nearest and lowest conductor or equipment first. Covering must be removed in the reverse order to application. Work only on one phase or one item of equipment at a time.

b. Under normal circumstances, covering must be removed at the end of the working day and not left in place on energised apparatus. If the job has to be suspended, the covering can be left in place.
c. When the covering has been wet by rain or dew, assess its condition and check for damage if it has been left in place overnight or longer. If only lightly wet, shake or tap the covering with an insulated stick to remove most of the water. Covering that has been thoroughly soaked or has a continuous film of water must be replaced before starting work. Dry thoroughly before using again. If in doubt, replace wet covering.

17. Cast iron cable box terminations

- Personnel must not carry out any HV live work task on a structure or in a bay that has a cast iron cable box termination
- Re-energisation of the cast iron cable termination boxes must be carried out remotely and not on the same structure as the cable termination.
- Movement of cast iron cable termination boxes or attached conductors, whilst de-energised, should be avoided unless the old cable termination box is being replaced.
- Risks associated with older style cast iron cable termination boxes must be recorded on the risk assessment.

18. Requirements specific to stick work

The minimum requirements for stick work are that:

- Live work sticks must have insulation suitable for the work site environment to safely allow work on energised apparatus. They shall maintain rated insulation between the live electrical apparatus and the live worker and other sources of electrical potential; and
- Live work sticks shall have a structural capacity to adequately manipulate or support the electrical apparatus that they are attached to.

Work practices

Insulated fibreglass sticks are used to manipulate, support or take conductor tension providing electrical insulation between live electrical apparatus, the live worker and other sources of electrical potential difference.

Live work stick generally fall into two categories:

- hand sticks used by the live worker to manipulate or operate electrical apparatus; and
- supporting sticks, either individually or in rigs to support energised apparatus.

Clearance markers

Hand guards must be installed on hand sticks to define the insulated section of the stick and to define the separation from the hand held section.

Hand guards shall be secured to the live work stick to prevent their movement during work.

Clearance markers should be installed on all other insulating sticks at the insulation distance appropriate to the MAD for the voltage being worked on and the task being performed where practical (e.g. conductor lifting sticks).

Electrical rating of insulating sticks

The insulation rating of a stick is determined by the length of its effective insulation.

The stick only achieves this rating when the stick surface is clean, it is completely free from moisture, the surface is in good condition and the surface is hydrophobic
DIS-01 Use insulating barriers/covers and mats

Purpose
This procedure describes how to install and use temporary insulating barriers/covers and mats on overhead distribution lines up to 33 kV.

Parameters
- The task can be completed from an EWP, work platform, ladder or structures.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

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<th>Amount</th>
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<tbody>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulating barriers/cover to cover live conductors and second points of contact</td>
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**Personnel**

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<thead>
<tr>
<th>2+</th>
<th>HV live workers:</th>
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<tr>
<td></td>
<td>• 1+ in the EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
</tr>
</tbody>
</table>

Onsite job setup

Calculate load handling capacity
- Determine loads exerted on the HV live work equipment when performing the task
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations
High Voltage Live Work Procedures – Distribution Insulated Stick

Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site set up
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures

Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safe working principles) in High Voltage Live Work Manual

1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. Always cover the nearest and lowest conductor first.
3. Overlap flexible insulating barriers/covers or mats that do not have interlocking systems by at least 150 mm. This ensures that the overlap or join provides adequate insulation.
4. Covers must be installed and secured, in such a way, to prevent them from being dislodged.
5. Only work on one potential at a time.
6. Confirm that all second points of contact, within reach, are covered.
7. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures, Distribution Insulated Stick, Safety
DIS-02 Untie and retie conductors

Purpose
This procedure describes how to untie and retie conductors on overhead lines up to 33kV.

Figure 1: Retie the conductor

Parameters
- The conductor must be securely held with a downward force or secured in the wire holder of the lifting device before untying and retying a conductor.
- The conductor must be held by using a 38mm wire tong, link stick and tag line or trapped in the conductor wire holder.
- Always cover second points of contact within reach to maintain MADs. Only work on one potential at a time.

Resources

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
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<td><strong>Equipment</strong></td>
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<tr>
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<td>38mm wire tong</td>
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<tr>
<td>1</td>
<td>38mm wire tong saddle</td>
</tr>
<tr>
<td>1</td>
<td>Link stick and tag line</td>
</tr>
<tr>
<td>1</td>
<td>Lifting method</td>
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<tr>
<td>varies</td>
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<tr>
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</tbody>
</table>
### Personnel

<table>
<thead>
<tr>
<th>Amount</th>
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</thead>
</table>
| 2+     | HV live workers required:  
  - 1+ in the EWP, work platform or ladder  
  - 1 safety observer |

**Note**

Only one person required to untie and retie the conductor when it is secured in the wire holder of the lifting device.

### Onsite job setup

#### Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations.

#### Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup.
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

#### Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on.

#### Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures.
Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*

Untie the conductor

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover second points of contact within reach. Follow DIS-01 ‘Use insulating barriers/cover and mats’.
3. Before removing the old tie, securely hold the conductor with a downward force by:
   - using a wire tong and saddle or
   - using a link stick and live line rope or
   - securing in the conductor trap of the lifting device.

4. Cut the old tie into small lengths while it is being untied.

Retie the conductor

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover second points of contact within reach.
3. Ensure conductors are controlled at all times.
4. The conductor tie must be pre-paired for application by halving the coil.
5. Wrap the tie around the insulator one complete rotation ensuring the coils are facing down and out.
6. Using a tie installer, complete the tie.
7. On angle constructions, the tie is prepared with the coils facing inwards. This is because they will end up facing outwards when the tie is crossed over and along the conductor.
8. Remove equipment and insulating covers/barriers and mats.
9. Clean, wipe down and stow away all equipment.
Figure 3: Wire tong and saddle applying down force to conductor

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick
  - Safety
  - DIS-01 Use insulating barriers/cover and mats
DIS-03 Trim trees

Purpose
This procedure describes how to trim trees on overhead distribution lines up to 33 kV.

Parameters
- The EWP should be positioned to avoid vegetation falling on the cab or bed. For MAD and vegetation clearances see work practice 10.4 ‘Line workers doing vegetation management work’ in the Work Practice Manual. The MAD must be applied to the whole length of the insulated EWP.
- Do not use the EWP boom or bucket to lift vegetation.
- All members of the public must be kept clear of the worksite while tree trimming is in progress.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

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<thead>
<tr>
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<th>Item</th>
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</thead>
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<td><strong>Equipment</strong></td>
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<tr>
<td>1</td>
<td>Long reach or conventional chain saw or live line stick mounted manual saw</td>
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<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
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<tr>
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<td>Insulating barriers/covers to cover live conductors and second points of contact</td>
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<tr>
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<td><strong>Personnel</strong></td>
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<td>HV live workers:</td>
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<tr>
<td></td>
<td>• 2 in the EWP, work platform or ladders</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
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</table>

Onsite job setup

Calculate load handling capacity
- Determine loads exerted on the HV live work equipment when performing the task
• The calculations are used to ensure that:
  o the SWL of the equipment, crane and EWP is not exceeded
  o increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

Site setup
• EWPs should, where possible, be positioned so that all work areas can be:
  o accessed safely
  o reached from the one site set up
• EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
• A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment
• Clean, wipe down and inspect all equipment that is to be used.
• Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  o within test date
  o rated for the voltage to be worked on

Inspect structure
• Carry out a visual inspection of the following prior to commencing the task:
  o the structure, lines and equipment to be worked on
  o adjacent structures

Procedure

Remember to follow all safety requirements as listed in:
• Safety
• section 2 (Safe work principles) in High Voltage Live Work Manual

1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. If any branches are within the MAD:
   • apply insulation to the conductors by following ‘DIS-01 Apply insulated barriers/covers and mats, or
   • move the conductors to achieve the MAD between the conductor and vegetation
3. Pruning must commence from the tips of the branch and work back towards the trunk of the tree.
4. Pruning above conductors must be carried out using feathering techniques to a maximum of 300 mm.
5. Vegetation must also be cleared from around Western Powers poles, stay wires and attachments.
6. Clean, wipe down and stow away all equipment.

References
• High Voltage Live Work Manual:
  o section 2 (Safe work principles)
  o work practice 10.4 (Line workers doing vegetation management work)
• High Voltage Live Work Procedures, Distribution Insulated Stick:
  o Safety
  o DIS-01 Apply insulating barriers/covers and mats
**DIS-04 Fit armour rods, line splices, dead-ends, bird diverters and spiral vibration dampers**

**Purpose**
This procedure describes how to fit armour rods, line splices, dead-ends, spiral vibration dampers and bird diverters to overhead distribution lines up to 33 kV.

![Figure 1: Fitting of an armour rod](image)

**Parameters**
- This installation must be completed from an insulated EWP, platform, ladder or structure.
- The conductor to be worked on must be visually inspected for excessive damage such as broken strands. Do not commence the task if the damage is too excessive. When applying repair splices, armour rods or dead-ends, care must be taken as they may unravel and flick back towards the line worker.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

**Resources**

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<th>Item</th>
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</thead>
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<tr>
<td>1</td>
<td>Wire holding stick</td>
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<tr>
<td>1</td>
<td>Universal hand stick</td>
</tr>
<tr>
<td>1</td>
<td>Serviette ring tool, hot rodder tool or shepherd’s crook</td>
</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulating barriers/covers to cover live conductors and second points of contact</td>
</tr>
<tr>
<td>Amount</td>
<td>Item</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td></td>
<td>HV live workers required:</td>
</tr>
<tr>
<td></td>
<td>• 1+ in the EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
</tr>
<tr>
<td>*2+</td>
<td>*2 HV live workers are required in the EWP, work platform or ladder for the following tasks:</td>
</tr>
<tr>
<td></td>
<td>o Fit armour rods</td>
</tr>
<tr>
<td></td>
<td>o Fit line splices</td>
</tr>
<tr>
<td></td>
<td>o Fit dead ends</td>
</tr>
</tbody>
</table>

Onsite job setup

Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site set up
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures
Procedures

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safe working principles) in *High Voltage Live Work Manual*

**Fit armour rods or repair splice using the five and six strand method**

1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. Cover second points of contact within reach. Follow DIS-01 ‘Use insulating barriers/covers and mats
3. Prepare the area to be repaired by straightening or cutting away any broken strands, if required.
4. Wrap five strands and six strands separately.
5. Leaving approximately 100 mm of wrap undone at one end, wrap the two sections together for a length of approximately 100 mm.
6. Hold the wrapped section of armour rod or repair splice in a wire holder and position next to the conductor.
7. Wrap the longer length of open armour rod or repair splice onto the conductor using a serviette ring, hot rodder tool or shepherd’s crook.
8. Remove the wire holder and position onto the conductor the half-installed rod or splice.
9. Unwind the rod or splice and finish the installation.
10. Clean, wipe down and stow away all equipment.

**Figure 2: Fitting of an armour rod**

**Alternative armour rod installation process**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Wrap armour rods together in a set of five or six rods.
3. Fit a length of PVC conductor into one half of the armour rod, leaving a 50 mm section of conductor bent at 45° towards the centre of the armour rod.
4. Grip the PVC conductor and armour rod using a wire holding stick.
5. Hold the armour rod up to the conductor and wrap the clear side of the armour rod onto the conductor with a serviette ring, hot rodder tool or shepherd’s crook.
6. Move the wire holding stick to hold both the conductor and armour rod together and start wrapping the second half of the armour rod onto the conductor. As the rod is wrapped it will release the section of PVC conductor.

7. Repeat the process for the second part of the armour rod ensuring the strands do not overlap.

**Note**
An application of lubricating spray to the armour rod makes it easier to apply the rod.

**Removal of repair splices**
HV live line removal of repair splices is not permitted.
**Fit dead-ends**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Confirm that there is no conductor damage before starting to apply the dead-end.
3. Cover second points of contact within reach. Follow DIS-01 ‘Use insulating barriers/covers and mats’
4. Install preform dead-ends into the clevis ends, which are attached to the insulators.
5. Using a wire holding stick, clamp the dead-end close to the bend on the solid part of the dead-end.
6. Hold the dead-end up to the conductor, locating the conductor into the open splice of the dead-end.
7. Using a serviette ring or hot rodder tool, wrap and secure the first leg on to the conductor.
8. Transfer the wire holding stick onto the free leg of the dead-end and commence wrapping onto the conductor, ensuring the strands do not overlap and the clevis fitting has not become detached.
9. Clean, wipe down and stow away all equipment.

**Removal of dead-ends**

Reverse the procedure above to remove dead-ends.

**Fit spiral vibration dampers**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Confirm that there is no conductor damage before starting to apply the dead-end.
3. Cover second points of contact within reach. Follow DIS-01 ‘Use insulating barriers/covers and mats’.
4. Use a wire holding stick to clamp the spiral vibration damper, close to the centre, and hold it up to the conductor.
5. Use the serviette ring or hot rodder tool, wrap one half of the rod or slice along the conductor.
6. Remove the wire holding stick from the spiral vibration damper and wrap the second half of the damper on to the conductor.
7. Clean, wipe down and stow away all equipment.

**Removal of spiral vibration dampers**

Reverse the procedure above to remove spiral vibration dampers.

**Fit bird diverters**

1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. Confirm that there is no conductor damage before starting to apply the dead-end.
3. Cover second points of contact within reach. Follow DIS-01 ‘Use insulating barriers/covers and mats’.
4. Grip larger end of the bird diverter in a wire holding stick.
5. Offer the bird diverter to the conductor and wrap smaller diameter section onto the conductor with a serviette ring, hot rodder tool or shepherd's crook.
6. Hold the conductor and bird diverter with the wire holding stick and wrap the larger end of the bird diverter onto the conductor.
7. Clean, wipe down and stow away all equipment.
Figure 5: Bird diverter

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures, Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
DIS-05 Use temporary bypass jumpers

Purpose

This procedure describes how to bridge conductors up to 33 kV in order to temporarily bypass an electrical current. Once this task is complete, electrical conductors or apparatuses are able to be replaced, removed or joined.

Parameters

- Temporary conductor supports or HV coverings must be used to ensure that the temporary jumpers are controlled at all times and must not come in contact with any second point of contact.
- Ensure that the bypass tools or equipment have a current rating adequate for the peak feeder load. Contact NOC for the peak feeder load and the peak load current.
- Double insulation is required where contact can’t be avoided between second points of contact. Follow ‘DIS-01 Apply insulated barriers/covers and mats’.
- Temporary bypass jumpers must never be used to:
  - energise or de-energise or
  - make or break load current
- The bypass jumper must only be used to bypass existing conductors.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.
Resources

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<td><strong>Personnel</strong></td>
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<td>HV live workers:</td>
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<tr>
<td></td>
<td>• 2 EWP, work platform or ladder</td>
</tr>
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<td></td>
<td>• 1 safety observer</td>
</tr>
</tbody>
</table>

Onsite job setup

Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site set up
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures
Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safe working procedures) in High Voltage Live Work Manual

Install temporary bypass jumpers
1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. Confirm the feeder load and peak load current from NOC and check that the temporary bypass jumper current and voltage rating is adequate.
3. Recheck the load using an ammeter.
4. Cover all second points of contact. Follow DIS-01 ‘Use insulating barriers/covers and mats’.
5. Clean conductors where the bypass jumper connections will be made.
6. Install insulated hanger, if required.
7. Visually confirm that the bypass will be bridging the same phase.
8. Attach the temporary bypass jumper to the first connection point, ensuring that the other end of the bypass is securely held or connected to the insulated hanger. Once complete make the second connection.
9. If there is a possibility that the temporary bypass jumper will come in contact with any second point of contact check that:
   - the temporary bypass jumper is attached to the temporary conductor support or
   - a second layer of insulation has been applied
10. Measure the current in the temporary bypass jumper and confirm the presence of current.
11. Once the current in the temporary bypass jumper has been checked:
   - completely remove the bridge/tap or
   - cut the bridge/tap at one end and secure back to the line or the apparatus removed
12. Clean, wipe down and stow away all equipment.

Note
Temporary bypass jumpers can be a conductor of the same size or greater than the conductor that is being removed. The conductor must be covered with insulated barriers/cover and mats.

Remove temporary bypass jumpers
1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. Confirm that the covering is in place.
3. Check the load in the temporary bypass jumper using an ammeter.
4. Reconnect the permanent bridge/tap or apparatus.
5. Measure the current in the bridge/tap or apparatus and confirm the presence of current.
6. Install insulated hanger, if required
7. Remove the temporary bypass jumper ensuring that the first connection to be removed is held clear or parked on the insulated hanger, until the second connection has been removed.
8. Remove all covering and temporary conductor supports.
9. Clean, wipe down and stow away all equipment.
References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures, Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulated barriers/covers and mats
DIS-06 Make and break bridges or taps (PG clamps)

Purpose
This procedure describes how to make and break bridges or taps on the distribution network up to 33 kV to de-energise/re-energise the supply.

Parameters
- Electrical load must be measured and verified with NOC.
- Live work procedures requiring the energising and de-energising of circuits should only be undertaken with no load on the conductor.
- Bridges and taps must not be broken if the electrical load is greater than two amps.
- The energising/de-energising of overhead conductors may only be performed under the instruction of a switching program.
- When disconnecting do not exceed the maximum length of open wire conductor respective to the working voltage as per Table 1, work practice 9.3 (Energising/de-energising and bypassing of conductors and apparatus – distribution stick method) of the High Voltage Live Work Manual.
- When reconnecting the open wire conductor, the maximum length that can be energised will be determined by the line of sight of the HV live line worker.
- Where the whole length of the conductor cannot be seen then a TDO fuse must be used.
- If the load current cannot be removed then suitably rated load make/break devices are to be installed to control potential arc flash hazards.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

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<th>Item</th>
</tr>
</thead>
<tbody>
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<td>Insulated working sticks depending on the task</td>
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High Voltage Live Work Procedures – Distribution Insulated Stick

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<td>Ammeter</td>
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<tr>
<td>varies</td>
<td>Insulated barriers/cover to cover live conductors and second points of contact</td>
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**Personnel**

<table>
<thead>
<tr>
<th>3</th>
<th>HV live workers:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• 2 in the EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
</tr>
</tbody>
</table>

**Onsite job setup**

**Calculate load handling capacity**

- Determine loads exerted on the HV live work equipment when performing the task
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

**Site setup**

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

**Clean and inspect equipment**

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

**Inspect structure**

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures
Procedure

Remember to follow all safety requirements as listed in:

- Safety
- section 2 (Safe working procedures) in High Voltage Live Work Manual

Breaking bridges or taps/PG clamps

1. Confirm that all safety requirements, equipment checks, switching programs and permits have been checked and are in place.

2. Check the conductor load with an ammeter. Permanent bridges must not be broken if the load exceeds two amps.

3. Inspect the permanent bridges for signs of damage. If damage is found on the bridge it must be risk assessed to determine the actions to be taken to proceed with the work.

4. Cover second points of contact. Follow ‘DIS-01 Apply insulating barriers/cover and mats’.

5. If the conductor is to be totally removed:
   a. Clamp conductor with a wire holding stick.
   b. Cut conductor away from both ends of attachment.
   c. Remove conductor with wire holding stick.
   d. Remove old clamps if required

6. If the conductor is to be tied back:
   a. Clamp the conductor with a wire holding stick.
   b. Cut the bridge away from the main line.
   c. Shape and fold conductor back and clamp to the conductor that it is connected to.
   d. Remove old clamp if required.

7. Remove covering if bridge break is for a sustained period.

8. Clean, wipe down and stow away all equipment.

Making bridges or taps/PG clamps

1. Confirm that all safety requirements, conductor loads, switching programs equipment checks and permits have been checked and are in place.

2. Bridges must not be installed under load conditions. Confirm that the bridge you are making goes to an open point within the HV live workers line of sight.

3. Cover second points of contact within reach. Follow DIS-01 ‘Use insulating barriers/cover and mats’.

4. Conductor contact points must be cleaned.

5. For conductors that have been removed:
   a. Measure and cut a suitable length of conductor to be installed.
   b. Attach one end of the bridge to the de-energised side of the break.
   c. Hold the conductor with a wire holding stick.
   d. Connect the new bridge to the energised conductor using a clamp.

6. For conductors that have been tied back:
   a. Hold the conductor with a wire holding stick.
   b. Undo the clamp from the conductor.
   c. Move the bridge to the energised conductor and connect using a clamp.
7. Remove covering.
8. Clean, wipe down and stow away all equipment.

**Note**

If the bridges will be replaced at a later date, mark which phase they came from and store safely ready for reconnection. This will ensure that the correct length of conductor is used.

Where live line taps are used to break and make the connection the above no load checks must be completed. The tap is then removed or replaced using a live line stick.

**References**

- **High Voltage Live Work Manual:**
  - section 2 (Safe work principles)
  - work practice 9.3 (Energising/de-energising and bypassing of conductors and apparatus – distribution stick method)
- **High Voltage Live Work Procedures, Distribution Insulated Stick**
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
**DIS-07  Energise overhead mains with a TDO fuse**

**Purpose**

This procedure describes how to energise overhead mains, up to 22 kV, with a temporary drop out (TDO) fuse.

The TDO fuse is used to energise overhead mains to prove that no fault conditions exist before the connection is made. It is connected between the overhead line and the source of supply; the fuse is then closed.

**Parameters**

- The maximum size fuse that can be fitted into the unit is 25 amps.
- Must not be used on 33 kV systems.
- The temporary drop out fuse must never be used to make or break load current when energising or de-energising overhead lines.
- When connecting the temporary bypass jumper, always connect the jumper to the de-energised part of the circuit first, so that limited time is spent handling an energised jumper.
- The energising/de-energising of overhead conductors may only be performed under the instruction of a switching program.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.
Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equipment</td>
</tr>
<tr>
<td>1+</td>
<td>Temporary drop out fuse unit</td>
</tr>
<tr>
<td>1+</td>
<td>Temporary bypass jumper</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated working sticks</td>
</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated barrier/cover to cover live conductors and second points of contact</td>
</tr>
<tr>
<td></td>
<td>Personnel</td>
</tr>
<tr>
<td>3</td>
<td>HV live workers required:</td>
</tr>
<tr>
<td></td>
<td>• 2 in the EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
</tr>
</tbody>
</table>

Onsite job setup

Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site set up
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures
Procedure

Remember to follow all safety requirements as listed in:

- Safety
- section 2 (Safety) in High Voltage Live Work Manual

Installing and closing the temporary drop out fuse unit

1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. Cover all second points of contact. Follow ‘DIS-01 Apply insulated barriers/covers and mats’.
3. Clean the conductor and connect the temporary drop out fuse unit onto the overhead line, ensuring the drop out fuse is open.
4. A temporary bypass jumper is connected between the tee bar of the temporary drop out fuse unit and the point of supply.
   
   For a three phase system repeat steps 3 and 4 for the other two phases.

5. The fuse barrel or barrels can now be closed using a live line operating stick, energising the circuit in accordance with the switching program.

   **Important**

   If the fuse operates, the reason for the fuse operating must be determined.

6. The connection between the overhead line and the point of supply can now be made.
7. Remove temporary bypass jumper and drop out fuse unit.
8. Remove covers.
9. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
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DIS-08  Recover and erect poles

Purpose

This procedure describes how to erect and recover poles on the distribution system up to 33 kV.

Parameters

- An assessment must be carried out to determine the levels of covering required to complete the pole erection or recovery.
- Insulating gloves must be worn when controlling the pole, if a MAD of 1200 mm cannot be maintained.
- The butt of the pole must be controlled until it is safely positioned into the pole hole.
- MADs between the crane and live conductors must be maintained at all times.
- The pole erection and recovery must be carried out under the control and direction of a safety observer and a dogger.
- Where a distance of 1200 mm from the bare conductor to the pole or mobile plant cannot be maintained then one form of insulation must be applied to reduce the MAD to 450mm. If a MAD of 450 mm cannot be maintained then two levels of insulation must be applied. Follow ‘DIS-01 Apply insulated barriers/covers and mats’.
  - This can be achieved by applying covers to conductors, the pole or both.
  - Spiral link sticks and 16 mm tag lines can be attached to the conductor covering to allow for the covering to be moved as required. Alternatively you can apply two levels of insulation around the conductor and attach the tag line to the covers.
- Always cover second points of contact within reach to maintain MADs.
- Only expose and work on one potential at a time.
Resources

Due to the nature of the task the amount of covering required will depend on the task and method used to displace the conductors.

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td>3</td>
<td>Spiral link sticks, if required</td>
</tr>
<tr>
<td>3</td>
<td>16 mm tag lines, if required</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated working sticks</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated barriers to cover live conductors and second points of contact</td>
</tr>
<tr>
<td>1</td>
<td>Crane, including portable earth lead</td>
</tr>
</tbody>
</table>

|        | **Personnel**                             |
| 4      | HV live workers required:                 |
|        | • 2 in the EWP, work platform or ladder   |
|        | • 1 safety observer                      |
|        | • 1 dogger                               |

Onsite job setup

**Calculate load handling capacity**

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

**Site setup**

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site set up
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

**Clean and inspect equipment**

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

**Inspect structure**

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures
Procedure

Remember to follow all safety requirements as listed in:

- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*

**Erection of the pole**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Determine the height of the conductors and the pole to be planted to determine which procedure will be adopted to displace or spread the conductors, as required.
3. Cover all conductors and second point of contact.
4. Attach link sticks and 16 mm tag lines to covering as required.
5. Position the lifting boom and pole in the best position.
6. Determine the point of balance of the pole then place the chain around the pole to make the pole butt heavy for the lift.
7. As soon as possible, support the pole in the mechanical pole scissors attached to the boom.
8. Manoeuvre the pole into position and plant into the pole hole.
9. Where the pole is controlled by personnel from the ground, insulated gloves rated to the highest voltage of the pole must be worn if MAD of 1200 mm cannot be maintained.
10. The covering may be repositioned using the tag line and spiral link sticks, as required.
11. Pole hole to be back filled to secure pole into position prior to removing the lifting boom.
12. An appropriate HV live work procedure must be used to secure the conductors on to the new pole.
13. Remove, clean and stow all covering and equipment when the task is complete.

**Recovery of the pole**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Confirm that an appropriate procedure has been used to raise or spread the conductors.
3. Cover all conductors and second point of contact as required.
4. Attach spiral link sticks and 16 mm tag lines to covering as required.
5. Attach lifting boom to the pole with a lifting chain and close the pole scissors around the pole. The point of balance must be determined to ensure that the pole is butt heavy when lifted.
6. A hydraulic pole jack must be used when removing a pole from the ground.
7. Manoeuvre the pole away and down from the live conductors.
8. Where the pole is controlled by personnel from the ground, insulated gloves rated to the highest voltage of the pole must be worn if MAD of 1200 mm cannot be maintained.
9. The covering may be repositioned using the tag line and spiral link sticks, as required.
10. Remove, clean and stow all covering and equipment when the task is complete.

**Note**

Where MADs will not be breached then no covering of second points of contact are required.
References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
**DIS-09 Maintain switches**

**Purpose**
This procedure describes how to maintain switches on voltages up to 33 kV.

**Parameters**

- Switches that are in the closed position can have temporary bypass jumpers applied so that the switch can be opened and maintained. Switches that are in the open position can only be maintained. In this case, the switch must not be operated.
- Temporary bypass jumpers are only classed as single insulated and must not be rested on second points of contact, unless a second layer of insulation is applied to the jumper. Follow ‘DIS-05 Use temporary bypass jumpers’.
- Temporary bypass jumpers must not be used to make or break the load.
- The temporary bypass jumper must be of sufficient load carrying capacity.
- This procedure can be performed from a EWP or ladder.
- The switch maintenance is limited to oiling moving parts and greasing contacts.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

**Resources**

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td>1 +</td>
<td>Temporary bypass jumpers</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated working sticks</td>
</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated barriers/cover – enough to cover live conductors and second points of contact</td>
</tr>
<tr>
<td></td>
<td><strong>Personnel</strong></td>
</tr>
<tr>
<td>3</td>
<td>HV live workers:</td>
</tr>
<tr>
<td></td>
<td>- 2 in the EWP work platform or ladders</td>
</tr>
<tr>
<td></td>
<td>- 1 safety observer</td>
</tr>
</tbody>
</table>
Onsite job setup

Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site set up
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures

Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safety) in High Voltage Live Work Manual

Switch maintenance – closed point

1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. Confirm the switch is locked in the closed position.
3. Visually inspect the switch and conductors for any signs of damage or burning.
4. Electrical loads must be taken and verified with Network Operation Control (NOC).
5. Cover second points of contact within reach. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
6. Clean the conductor where the temporary bypass jumpers will be connected.
7. Attach the jumper to either side of the switch, ensuring the corresponding phases are connected. Follow ‘DIS-05 Use temporary bypass jumpers’.
8. Measure the current in the bypass jumper and confirm the presence of current.

   Repeat steps 1-8 for the other phases.

9. Unlock and open the switch.
10. Perform the maintenance to the switch.
11. Check the operation of the switch.
12. Close and lock the HV switch.
13. Remove the temporary bypass jumpers.
14. Remove all equipment and covering.
15. Clean, wipe down and stow away all equipment.

**Switch maintenance – open point**

1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. Confirm the switch is locked in the open position.
3. Visually inspect the switch and conductors for any signs of damage or burning.
4. Cover second points of contact within reach.
5. Carry out switch maintenance.
6. Remove all equipment and covers.
7. Clean, wipe down and stow away all equipment.

**References**

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-05 Use temporary bypass jumpers
DIS-10 Change surge diverters

Purpose
This procedure describes how to replace surge diverters on voltages up to 33 kV.

Parameters
- Insulating sticks must be used to energise/de-energise surge diverters.
- Only install correctly rated and tested composite type diverters.
- A 5000 V insulation resistance tester must be used to prove the integrity of the new surge diverter.
- No work can be carried out on poles that have old style cast iron cable termination boxes.
- All of the surge diverter must be isolated from all sources of supply before replacing.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td>1</td>
<td>5000 V insulation resistance tester</td>
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<tr>
<td>varies</td>
<td>Insulated working sticks</td>
</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated barriers/covers to cover live conductors and second points of contact</td>
</tr>
<tr>
<td></td>
<td><strong>Personnel</strong></td>
</tr>
<tr>
<td>3</td>
<td>HV live workers:</td>
</tr>
<tr>
<td></td>
<td>- 2 in the EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>- 1 safety observer</td>
</tr>
</tbody>
</table>
Onsite job setup

Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site set up
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures

Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safe working principles) in High Voltage Live Work Manual

Surge diverter replacement

Removal

1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. Cover second points of contact within reach. Follow ‘DIS-01 Apply insulating barriers/cover and mats’.
3. Disconnect all surge diverters from the overhead conductor, using wire holding sticks and cutters.
4. Once an active conductor has been disconnected it must be discharged to earth.
   Repeat steps 3 and 4 for all other phases.
5. All porcelain surge diverters must be replaced.
6. Clean, wipe down and stow away all equipment.
Replacement

1. Confirm that the new surge diverters are correctly rated and tested prior to installation.
2. Install the surge diverter and confirm that it is bonded to earth.
3. Connect the bridge to the surge diverter and using a wire holding stick, touch test the bridge to the conductor for a minimum of 10 seconds.
4. Permanently connect the bridge to the conductor using live line sticks.

| Repeat steps the 3 and 4 for all other phases. |

5. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual
  - section 2 (Safe work principles)
  - work practice 9.3 (Replacing surge diverters)
- High Voltage Live Work Procedures – Distribution Insulated Stick
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
**DIS-11 Change tension insulator**

**Purpose**
This procedure describes how to change tension insulators on distribution poles up to 33kV.

![Installation of covers, link stick and strap hoist](image)

**Figure 1: Installation of covers, link stick and strap hoist**

**Parameters**
- The effects of the increased tension applied to the conductor and fittings being worked on must be considered.
- Care must be taken to ensure that the insulator/s does not short out when performing this procedure.
- Consideration must be given to the increase or decrease of the conductor sag.
- The link stick must have at least 450mm of insulation.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

**Resources**

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td>1</td>
<td>Webbing strap ratchet hoist and come-along clamp</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated working sticks</td>
</tr>
<tr>
<td>1</td>
<td>Spiral link stick or strain link stick with 450mm of insulation</td>
</tr>
<tr>
<td>1</td>
<td>Sling</td>
</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated barrier/cover to cover live conductors and second points of contact</td>
</tr>
<tr>
<td>Amount</td>
<td>Item</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>3</td>
<td>HV live workers:</td>
</tr>
<tr>
<td></td>
<td>• 2 in the EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
</tr>
</tbody>
</table>

### Onsite job setup

#### Calculate load handling capacity
- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations.

#### Site setup
- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup.
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

#### Clean and inspect equipment
- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on.

#### Inspect structure
- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures.

### Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*

#### Replace insulator
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover second points of contact as and when the task requires. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
3. Attach a sling around the cross-arm.
4. Place the come-along clamp onto the conductor at a distance away from the insulator to allow for the link stick and extended tensioning device to be attached.
5. Attach a link stick to the sling.
6. Attach the extended tensioning device to the link stick.
7. Place the tensioning device between the link stick and come-along.
8. Take up tension with the tensioning device until there is enough slack to detach the insulator/s.
9. When detaching the conductor from the insulator, the conductor must be supported and controlled so that it does not swing free.
10. Replace the insulator/s and slacken the tensioning device.
11. Remove the tensioning device from the come-along clamp first, and then from the link stick.
12. Remove come-along clamp, link stick, sling and covers.
13. Repeat as necessary for other phases.
14. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual, section 2 (Safe working principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
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DIS-12 Change suspension hardware

Purpose
This procedure describes how to replace suspension hardware on distribution poles up to 33 kV.

Figure 1: Suspension insulators

Parameters
- Consider the effects of the increased tension applied to the conductor and fittings being worked on.
- Consideration must be given to the increase or decrease of the conductor sag.
- Choose a suitable lifting procedure before work commences.
- When changing suspension insulators/hardware, and where MADs cannot be maintained, suitable covering to conductors and second points of contact must be considered.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equipment</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated working sticks</td>
</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated barriers/covers – enough to cover second points of contact</td>
</tr>
<tr>
<td></td>
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<tr>
<td>3</td>
<td>HV live workers:</td>
</tr>
<tr>
<td></td>
<td>• 2 in the EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
</tr>
</tbody>
</table>
Onsite job setup

Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site set up
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures

Procedure

Remember to follow all safety requirements as listed in:

- Safety
- section 2 (Safety) in High Voltage Live Work Manual

Insulator disconnection

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Decide which lift procedure will be used to raise the conductor.
3. Cover second points of contact. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
4. Secure conductor in the wire holder or attach link stick.
5. Remove the split pin or loosen the nut on the clevis bolt while the tension is still on the insulator.
6. Raise the conductor so that the conductor clamp becomes slack.
7. Remove the clevis bolt from the conductor clamp.
8. The conductor can now be lowered and moved to provide a safe work area to carry out the insulator/hardware change.
9. Clean, wipe down and stow away all equipment.
Insulator reconnection
1. Move conductor back into position.
2. Attach the suspension clamp and reinstate the clevis bolt.
3. Lower the conductor so that the tension is applied to the insulator.
4. Detach the conductor from the wire holder or link sticks and remove the lifting device.
5. Clean, wipe down and stow away all equipment.

Conductor clamp removal
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Decide which lift procedure will be used to raise the conductor.
3. Cover second points of contact.
4. Secure conductor in the wire holder or attach link stick.
5. Remove the conductor U-clamp bolts from under the conductor clamp.
6. Remove the U-clamps and conductor tongue.
7. Remove the split pin or loosen the nut on the clevis bolt while the tension is still on the insulator.
8. Raise the conductor until the conductor clamp becomes slack.
9. Remove the clevis bolt from the conductor clamp.
10. Lower the conductor and change the conductor clamp.
11. Clean, wipe down and stow away all equipment.

**Figure 4: Replacement of the conductor tongue**

**Figure 5: Replacement of the U-bolts and nuts**

**Conductor clamp application**

1. Move conductor back into position.
2. Attach the suspension clamp and reinstate the clevis bolt to attach the conductor clamp to the insulator/s.
3. Lower the conductor so that the tension is applied to the conductor clamp.
4. Replace the conductor tongue and U-clamps over the conductor.
5. Tighten the nuts on the U-clamps.
6. Detach the conductor from the wire holder or link sticks and remove lifting device.
7. Clean, wipe down and stow away all equipment.

**References**

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats.
DIS-13  Change RDA insulator

Purpose
This procedure describes how to change insulators on distribution RDA poles using a gin pole and angle bridle up to 33kV.

Figure 1: Insulator change with angle bridle

Parameters
- The maximum conductor weight, to be lifted or pushed with the gin pole and angle bridle, is 300kg.
- MADs must be maintained at all times.
- The guard tool must be fitted to the gin pole.
- Best practice is to work from the top to the bottom conductor in a set sequence.
- The EWP should be set up within the conductor angle so that the bridle is in line with the centre of the angle.
- A second EWP or ladders should be set up at the rear of the angle to change the insulators and pole hardware, as required.
- Check conductor regulation is correct and that conductor clearances can be maintained during this procedure. This procedure must not be used if clearances cannot be maintained.
- Only replace strain insulators with new insulators of the same length to ensure conductor clearances are maintained.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
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<td><strong>Equipment</strong></td>
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<td>Twin wheeled angle bridle</td>
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<tr>
<td>1</td>
<td>Gin pole mounted wire catcher.</td>
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<td>varies</td>
<td>Insulated working sticks</td>
</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulating covers/barriers or mats – enough to cover second points of contact and live conductors.</td>
</tr>
</tbody>
</table>
## High Voltage Live Work Procedures – Distribution Insulated Stick

### Onsite job setup

#### Calculate load handling capacity
- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations.

#### Site setup
- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup.
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

#### Clean and inspect equipment
- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on.

#### Inspect structure
- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures.

### Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*

### Note

The preferred method is to use an EWP to change the insulators and hardware.

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
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</thead>
<tbody>
<tr>
<td>3+</td>
<td>HV live workers:</td>
</tr>
<tr>
<td></td>
<td>• 1 in the gin pole EWP</td>
</tr>
<tr>
<td></td>
<td>• 1 in EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1+ safety observer</td>
</tr>
</tbody>
</table>
Insulator change

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Position the EWP with the angle bridle within the conductor angle.
3. Cover all second points of contact. Follow ‘DIS-01 Apply insulated barriers/covers and mats’.
4. Position second EWP or ladder at the rear of the pole.
5. Raise the boom and position the angle bridle wheels either side of the conductor clamp and secure the conductor with the retaining pins.
6. Apply tension to collapse the insulators.
7. Remove the conductor clamp pin and release tension to disengage the insulators. Follow ‘DIS-12 Change suspension hardware’.
8. The conductor must be observed in the adjacent spans, at all times, to ensure that the conductor clearances are maintained.
9. The insulators and pole hardware can now be changed.
10. Lift new insulators with insulated stick and apply tension with the gin pole and attach the conductor clamp to the insulators.
11. Release the retaining pins and retract the angle bridle from the conductor.

Steps 3 to 11 can now be repeated for the remaining conductors.

12. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulated barriers/covers and mats
  - DIS-12 Change suspension hardware
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DIS-14  Change RDA insulator using a bull wheel

Purpose
This procedure describes how to change insulators on distribution RDA poles using a gin pole and bull wheel up to 33kV.

Parameters
- Maximum conductor weight to be lifted/pushed with the gin pole and bull wheel is 745kg.
- MADs must be maintained at all times.
- Guard tool must be fitted to the gin pole.
- Best practice is to work from top to the bottom conductor in a set sequence.
- The EWP should be set up within the conductor angle so that the bull wheel is in line with the centre of the angle.
- A second EWP or ladders should be set up at the rear of the angle to change the insulators and pole hardware as required.
- Check conductor regulation is correct and that conductor clearances can be maintained during this procedure. This procedure must not be used if clearances cannot be maintained.
- Only replace strain insulators with new insulators of the same length to ensure conductor clearances are maintained.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
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</thead>
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<td><strong>Equipment</strong></td>
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<td>Bull Wheel</td>
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<tr>
<td>1</td>
<td>Gin pole mounted wire catcher</td>
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<tr>
<td>varies</td>
<td>Insulated working sticks</td>
</tr>
<tr>
<td>Amount</td>
<td>Item</td>
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</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
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<td>varies</td>
<td>Insulating covers/barriers or mats – enough to cover second points of contact</td>
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**Personnel**

<table>
<thead>
<tr>
<th>3+</th>
<th>HV live workers:</th>
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<tbody>
<tr>
<td></td>
<td>• 1 in the gin pole EWP</td>
</tr>
<tr>
<td></td>
<td>• 1 in EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1+ safety observer</td>
</tr>
</tbody>
</table>

### Onsite job setup

#### Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations.

#### Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup.
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

#### Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on.

#### Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures.

### Procedure

Remember to follow all safety requirements as listed in:

- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*
Insulator change

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Position the EWP with the bull wheel within the conductor angle.
3. Position second EWP or ladder at the rear of the pole.
4. Cover all second points of contact. Follow ‘DIS-01 Apply insulated barriers/covers and mats’.
5. Raise the boom and position the bull wheel to one side of the conductor clamp and secure the conductor with the latching gate.
6. Apply tension to the conductor to collapse the insulators.
7. Remove the conductor clamp pin and release tension to disengage the insulators. Follow ‘DIS-12 Change suspension hardware’.
8. The conductor must be observed in the adjacent spans, at all time to ensure conductor clearances are maintained.
9. The insulators and pole hardware can now be changed.
10. Lift new insulators with insulated stick and apply tension with the gin pole and attach the conductor clamp to the insulators.
11. Open the latching gate and retract the bull wheel from the conductor.

Steps 4 to 11 can now be repeated for the remaining conductors.

12. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick
  - Safety
  - DIS-01 Apply insulated barriers/covers and mats
  - DIS-12 Change suspension hardware
DIS-15 Change RDA pole

Purpose
This procedure describes how to change a distribution RDA pole using a gin pole and angle bridle, up to 33kV.

Figure 1: RDA pole change

Parameters
- Maximum conductor weight, to be lifted or pushed with the gin pole and angle bridle, is 300kg.
- MADs must be maintained at all times.
- Guard tool must be fitted to the gin pole arm.
- The EWP must be set up within the conductor angle.
- A second EWP or ladder should be set up at the rear of the new pole to assist with the pole change.
- This procedure can only be used when RDA construction is correct (centre phase to top of RDA) as shown in Figure 2.
- This procedure must not be used when bay lengths exceed those detailed in Table 1 below.
- Check conductor regulation is correct and that conductor clearances can be maintained during this procedure. This procedure must not be used if clearances cannot be maintained.
- Always cover second points of contact within reach to maintain MADs. Only work on one potential at a time.

Resources

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<th>Amount</th>
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<tr>
<td>1</td>
<td>Twin wheeled angle bridle</td>
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<tr>
<td>1</td>
<td>Gin pole mounted wire catcher.</td>
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<td>varies</td>
<td>Insulated working sticks</td>
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<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
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<td>varies</td>
<td>Insulated barriers/covers to cover live conductors and second points of contact</td>
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</table>

Personnel
HV live workers:
- 1 in the gin pole EWP
- 1 in EWP, work platform or ladder
- 1+ safety observer

Table 1: Maximum permitted bay lengths for voltage and construction type

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
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<tbody>
<tr>
<td>3+</td>
<td>HV live workers:</td>
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<tr>
<td></td>
<td>• 1 in the gin pole EWP</td>
</tr>
<tr>
<td></td>
<td>• 1 in EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1+ safety observer</td>
</tr>
</tbody>
</table>

Figure 2: Correct RDA construction (centre phase to top of RDA)

Table 1: Maximum permitted bay lengths for voltage and construction type

<table>
<thead>
<tr>
<th></th>
<th>22kV</th>
<th>33kV</th>
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<tbody>
<tr>
<td>Pole construction either side of RDA</td>
<td>RDA pole construction</td>
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<td>DCSH: H01-1 Standard cross-arm</td>
<td>DCSH H6 - RDA 900mm</td>
<td>100</td>
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<tr>
<td>DCSH: H01-1 Standard cross-arm</td>
<td>DCSH H7 - RDA 1200mm</td>
<td>150</td>
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<tr>
<td>DCSH: H01-3 Anti-swan cross-arm with long raiser</td>
<td>DCSH H6 - RDA 900mm</td>
<td>175</td>
</tr>
<tr>
<td>DCSH: H01-3 Anti-swan cross-arm with long raiser</td>
<td>DCSH H7 - RDA 1200mm</td>
<td>200</td>
</tr>
</tbody>
</table>
Onsite job setup

Calculate load handling capacity
- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations.

Site setup
- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup.
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment
- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on.

Inspect structure
- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures.

Procedure
Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safety) in High Voltage Live Work Manual

Positioning of EWP and new pole
- A second EWP or ladder should be set up at the rear of the angle to affix insulators and pole hardware as required.
- The new pole must be installed to the side of the existing pole.
- It is easier to replace the pole if the new pole is planted higher than the existing pole.

Pole change
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Position the EWP with the angle bridle within the conductor angle.
3. Position second EWP or ladder at the rear of the pole.
4. Work must start on the top conductor first.
5. Cover all second points of contact. Follow ‘DIS-01 Apply insulated barriers/covering and mats’.
6. New armour rods must be fitted in the same place or position as the new conductor clamp. If possible, the old armour rods should be left in position.

7. Raise the boom and position the angle bridle wheels either side of the conductor clamp and secure the conductor with the retaining pins.

8. Apply tension to collapse the insulators.

9. The conductor must be observed in the adjacent spans at all times to ensure conductor clearances are maintained.

10. Remove the clevis split pin and bolt from the conductor clamp. Follow ‘DIS-12 Change suspension hardware’.

11. Remove the old conductor clamp.

12. Move the EWP arm to align the centre of the angle bridle with the middle of the new pole position.

13. Install new conductor clamp in the new position.

14. Lift the new insulators with an insulated stick and apply tension with the gin pole. Attach the conductor clamp to the insulators.

15. Move the gin pole back to apply tension to the new insulators. Remove the conductor safety holding pins and the gin pole and bridle.

Steps 5 to 15 can now be repeated for the middle and then the bottom conductors.

16. Remove old pole ensuring that MADs are maintained. If MADs cannot be maintained install covers to all second points of contact.

17. Remove all covers, clean, wipe down and stow away all equipment.

Note

The new pole can be set slightly forward of plumb when the conductors are being swapped over to the new pole, and then tension applied via the stays to pull back the pole.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulated barriers/covers and mats
  - DIS-12 Change suspension hardware
**DIS-16 Change RDA pole using a bull wheel**

**Purpose**
This procedure describes how to change a distribution RDA pole using a gin pole and bull wheel, up to 33kV.

**Figure 1: Bull wheel**

**Parameters**
- Maximum conductor weight, to be lifted/pushed with the gin pole and bull wheel, is 745kg.
- MADs must be maintained at all times.
- The wire catcher must be fitted to the gin pole.
- The EWP must be set up within the conductor angle.
- A second EWP or ladder should be set up at the rear of the new pole to assist with the pole change.
- This procedure can only be used when RDA construction is correct (centre phase to top of RDA) as shown in Figure 2.
- This procedure must not be used when bay lengths exceed those detailed in Table 1 below.
- Check conductor regulation is correct and that conductor clearances can be maintained during this procedure. This procedure must not be used if clearances cannot be maintained.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

**Resources**

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
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<td></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td>1</td>
<td>Bull wheel</td>
</tr>
<tr>
<td>1</td>
<td>Gin pole mounted guard pole.</td>
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<tr>
<td>varies</td>
<td>Insulated working sticks</td>
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<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
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<td>varies</td>
<td>Insulating covers/barriers or mats – enough to cover second points of contact</td>
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### Personnel

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<th>Amount</th>
<th>Item</th>
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</thead>
<tbody>
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<td>HV live workers:</td>
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<tr>
<td></td>
<td>• 1 in the gin pole EWP</td>
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<tr>
<td></td>
<td>• 1+ in the EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1+ safety observer</td>
</tr>
</tbody>
</table>

---

**Figure 2: Correct RDA construction (centre phase to top of RDA)**

---

**Table 1: Maximum permitted bay lengths for voltage and construction type**

<table>
<thead>
<tr>
<th>22kV</th>
<th>33kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole construction either side of RDA</td>
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<td>DCSH H6 - RDA 900mm</td>
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<tr>
<td>DCSH: H01-1 Standard cross-arm</td>
<td>DCSH H7 - RDA 1200mm</td>
</tr>
<tr>
<td>DCSH: H01-3 Anti-swan cross-arm with long raiser</td>
<td>DCSH H6 - RDA 900mm</td>
</tr>
<tr>
<td>DCSH: H01-3 Anti-swan cross-arm with long raiser</td>
<td>DCSH H7 - RDA 1200mm</td>
</tr>
</tbody>
</table>
Onsite job setup

Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations.

Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup.
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on.

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures.

Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*

Positioning of EWP

- A second EWP or ladder should be set up at the rear of the angle to affix insulators and pole hardware, as required.
- The new pole must be positioned to the side of the existing pole.
- It is easier to replace the pole if the new pole is planted higher than the existing pole.

Pole change

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Position the EWP with the bull wheel within the conductor angle.
3. Position second EWP or ladder at the rear of the pole.
4. Work must start on the top conductor first.
5. Cover all second points of contact as required. Follow ‘DIS-01 Apply insulated barriers/covers and mats’.

6. New armour rods must be fitted at the new conductor clamp position. If possible, the old armour rods should be left in position.

7. Raise the boom and position the bull wheel to one side of the conductor clamp and secure the conductor with the retaining pin.

8. Apply tension to collapse the insulators.

9. The conductor must be observed in the adjacent spans, at all times to ensure conductor clearances are maintained.

10. Remove the clevis split pin and bolt from the conductor clamp. Follow ‘DIS-12 Change suspension hardware’.

11. Remove the old conductor clamp.

12. Move the gin pole to align the centre of the bull wheel with the side of the new pole position. Install the new conductor clamp in the new position.

13. Lift the new insulators with an insulated stick, apply tension with the gin pole and attach the conductor clamp to the insulators.

14. Release tension on the new insulators then release the bull wheel retaining gate and remove.

   Steps 5 to 14 can now be repeated for the middle and then the bottom conductors.

15. Remove old pole ensuring that MADs are maintained. If MADs cannot be maintained install covers to all second points of contact.

16. Clean, wipe down and stow away all equipment.

**Note**

The new pole can be set slightly forward of plumb when the conductors are being swapped over to the new pole, and then tension applied via the stays to pull back the pole.

**References**

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulated barriers/covers and mats
  - DIS-12 Change suspension hardware
DIS-17 Displace conductors – three-phase lift using crane and lifting beam

Purpose
This procedure describes how to displace conductors on distribution poles, up to 33 kV, to enable the replacement of poles and pole top hardware.

Parameters
- This procedure must only be used on intermediate structures.
- MADs between the crane and live conductors must be maintained at all times.
- The lifting beam must be rated and tested. The SWL/WLL must be marked on the beam.
- The lifting beam is connected to the crane hook via 2 x 1 tonne web slings and either two link sticks or two 33 kV tested and rated polymeric insulators.
- Attachments below the beam consist of either three spiral link sticks or 3 x 33 kV tested and rated polymeric insulators.
- The angle between the lifting beam and the insulator and strap should be 60°. This can be achieved by the distance between the connections on top of the arm equalling the distance from the arm to the crane hook.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equipment</td>
</tr>
<tr>
<td>1</td>
<td>Rated lifting beam</td>
</tr>
<tr>
<td>2</td>
<td>1 tonne web slings</td>
</tr>
</tbody>
</table>
High Voltage Live Work Procedures – Distribution Insulated Stick

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>33 kV tested and rated polymeric insulators or spiral link sticks</td>
</tr>
<tr>
<td>or</td>
<td>2 tested and rated polymeric insulators and 3 link sticks</td>
</tr>
<tr>
<td>5 sets</td>
<td>Rated brackets and bolts</td>
</tr>
<tr>
<td>3</td>
<td>Rated D-shackles</td>
</tr>
<tr>
<td>3</td>
<td>Rated conductor gates or rollers (only required if not using link sticks)</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated working sticks</td>
</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulating covers/barriers or mats – enough to cover second points of contact</td>
</tr>
<tr>
<td>1</td>
<td>Crane suitable for the conductor lift + earth bonding lead</td>
</tr>
</tbody>
</table>

### Personnel

<table>
<thead>
<tr>
<th>4</th>
<th>HV live workers:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• 2 in the EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
</tr>
<tr>
<td></td>
<td>• 1 ground worker</td>
</tr>
</tbody>
</table>

### Onsite job setup

#### Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

#### Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site set up
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

#### Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

#### Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures
Procedure

Remember to follow all safety requirements as listed in:

- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*

Disconnection

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover the second points of contact. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
3. Set up the lifting arm and attach to the crane.
4. Position the lifting beam above the conductors. The MADs between the crane boom and live conductors must be maintained at all times.
5. Position the conductor gates or rollers directly above the conductors and secure the conductors.
6. Untie each conductor, working on one conductor at a time, until all the conductors are untied. Follow ‘DIS-02 Untie and retie conductors.’
7. Lift the conductors away from the pole hardware by raising the lifting beam.

**Carry out replacement of pole-top hardware or replace pole.**

**Note**

When lifting conductors in mid-bay to install a pole secure conductors and lift until sufficient clearance is obtained.

Replacement

1. Confirm that all work is complete and all second points of contact have been covered.
2. Lower the crane boom ensuring that the conductors are located in their permanent position.
3. Tie in all conductors working on one conductor at a time.
4. Remove conductors from the conductor traps and remove the crane boom and lifting beam from the work area and stow equipment and boom away.
5. Remove all covering from the conductors and the second point of contact.
6. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-02 Untie and retie conductors
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DIS-18 Displace conductors – crane boom-mounted auxiliary arm and mast

Purpose
This procedure describes how to displace conductors on distribution poles, up to 33 kV, to enable the replacement of the pole and pole top hardware.

Parameters
- Conductor weights and lifting attachment weights must be taken into account, to ensure that the crane lifting capacity is suitable.
- The brace pole assembly may be installed either parallel or perpendicular to the truck boom, however it must be kept as near parallel to the auxiliary arm as possible.
- The boom-mounted auxiliary arm must only be used on intermediate poles.
- The single wire holder is used for heavier conductors and is installed in place of the cross-arm clamp assembly. This fitting is preferred when handling only one conductor.
- Keep the mast as near as possible to vertical while holding up the conductors. Avoid pulling the conductors to the side as line angles may tip the boom unit.
- Rotate the arm so it is near to being at a right angle to the conductors.
- MADs between the crane and live conductors must be maintained at all times.
- The boom-mounted auxiliary arm and mast assembly with double brace can be used to lift conductors up to a maximum balanced load of 270 kg when roller wire holder traps are used.
- The maximum single conductor lift is 90 kg.
- The boom-mounted auxiliary arm and mast assembly may only be mounted on a crane boom.
- The sub boom auxiliary arm and conductor traps are assembled on the boom and are used to trap the conductors.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.
Onsite job setup

Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td>1</td>
<td>Boom-mounted auxiliary arm and mast</td>
</tr>
<tr>
<td>1</td>
<td>Sub-boom auxiliary arm</td>
</tr>
<tr>
<td>3</td>
<td>Conductor traps – roller 90 kg, fork 68 kg</td>
</tr>
<tr>
<td>1</td>
<td>Crane suitable for the pole and lift + earth bonding lead</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated working sticks</td>
</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulating covers/barriers or mats – enough to cover second points of contact</td>
</tr>
<tr>
<td></td>
<td><strong>Personnel</strong></td>
</tr>
<tr>
<td>4</td>
<td>HV live workers:</td>
</tr>
<tr>
<td></td>
<td>• 2 in the EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
</tr>
<tr>
<td></td>
<td>• 1 ground worker</td>
</tr>
</tbody>
</table>
Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safety) in High Voltage Live Work Manual

Crane and lifting arm setup

1. The lifting arm should be set up so that it is 90° to the conductor. Where the attachment has ratchet adjustment, the lifting arm can be adjusted as the conductors are lifted to keep the arm at 90°. This must be done with an insulated stick and the MADs must be maintained from the crane boom.

![Figure 2: Adjustable ratchet](image)

2. Keep the crane boom as near as possible to vertical whilst holding the conductors.
3. The positioning of the lifting beam around the pole will depend on access.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>- On flat constructions, all conductors are secured in the wire holders at the same time.</td>
</tr>
<tr>
<td>- The boom-mounted auxiliary pole can be setup to lift a single conductor where:</td>
</tr>
<tr>
<td>- one insulator requires changing, including suspension insulators</td>
</tr>
<tr>
<td>- a single-phase pole change is required</td>
</tr>
</tbody>
</table>

Displace conductor

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Set up the auxiliary arm and attach to the crane boom.
3. Cover all second points of contact. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
4. Position the crane boom so that the auxiliary arm is below the conductors. At all times, maintain the MADs between the crane boom and live conductors.
5. Position the conductor wire holders directly below the outside phase conductors and secure the conductors into the gates.
6. Untie the conductors one at a time. Follow ‘DIS-02 Untie and retie conductors’.
7. Lift the crane boom until the centre phase conductor is trapped in the conductor wire holder.
8. Untie the centre phase conductor and raise all the conductors so that sufficient MAD can be maintained to carry out the task.

| Carry out replacement of pole-top hardware or replace pole. |

Replace conductor
1. Confirm that all work is complete.
2. Cover all second points of contact.
3. Lower the crane boom so that the centre phase conductor sits securely on the insulator.
4. Tie in the centre phase conductor to the insulator and release the trap
5. Lower outer phase conductors on to their insulators.
6. Tie in both conductors one at a time and release the traps.
7. Slowly lower the Chance boom away from the live conductors.
8. Remove all covers.
9. Clean, wipe down and stow away all equipment.

Figure 3: Single-phase lift setup, 90 kg SWL

References
- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-02 Untie and retie conductors
DIS-19  Displace conductors – EWP boom-mounted arm

Purpose
This procedure describes how to displace conductors on distribution poles, up to 33 kV, to enable the replacement of the pole and pole top hardware.

Figure 1: Conductors displaced with EWP boom mounted arm

Parameters
- The boom mounted auxiliary arm must only be used for vertical lifts only. Slewing is not permitted.
- The boom mounting assembly must be removed immediately after the completion of the task.
- Refer to work practice 4.2 (EWP and crane mounted conductor support equipment) of the HV Live Work Manual for manufacturers lifting specifications.
- While the boom bracket is attached to the EWP:
  - the EWP must be treated as uninsulated
  - stick work may be performed from the EWP
- When the boom mounted arm is set up on a EWP only one person is allowed in the bucket, a second bucket or ladder should be used to complete the task.
- Due to the variances between differing EWP systems, the SWL of the mast, arm, wire holders and operators and conductor weight must be determined before the lift commences.
- The boom mounted arm can be used on three phase and single phase systems.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
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<td></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td>1</td>
<td>Boom bracket</td>
</tr>
<tr>
<td>1</td>
<td>Pivot stud and locking pin</td>
</tr>
<tr>
<td>1</td>
<td>Mast</td>
</tr>
<tr>
<td>1</td>
<td>Swivel support</td>
</tr>
<tr>
<td>1</td>
<td>Auxiliary arm</td>
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</tbody>
</table>
High Voltage Live Work Procedures – Distribution Insulated Stick

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Wire holders</td>
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<tr>
<td>1</td>
<td>Brace clamp</td>
</tr>
<tr>
<td>1</td>
<td>Brace</td>
</tr>
<tr>
<td>1</td>
<td>Ratchet</td>
</tr>
<tr>
<td>varies</td>
<td>Insulated working sticks</td>
</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulating covers/barriers or mats – enough to cover second points of contact and live conductors</td>
</tr>
<tr>
<td>1</td>
<td>Crane including portable earth lead, if required</td>
</tr>
</tbody>
</table>

**Personnel**

<table>
<thead>
<tr>
<th>Personnel</th>
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<tbody>
<tr>
<td>4+</td>
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<tr>
<td>HV live workers:</td>
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<tr>
<td>• 1+ in EWP, work platform or ladder</td>
</tr>
<tr>
<td>• 1 in EWP with boom mounted arm fitted</td>
</tr>
<tr>
<td>• 1+ safety observer</td>
</tr>
<tr>
<td>• 1 ground worker</td>
</tr>
</tbody>
</table>

**Onsite job setup**

**Calculate load handling capacity**

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

**Site setup**

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

**Clean and inspect equipment**

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

**Inspect structure**

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures
Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safety) in High Voltage Live Work Manual

Site layout of plant or EWPs
- The EWP or crane should be positioned so that the mast is vertical to the conductors being lifted.
- The mast can be rotated to position the conductor traps.
- The ratchet is used to position the mast.

Check and fit arm to the boom
- Carry out a visual inspection of the insulators and Hastings arm.
- Check that there is a valid testing label on auxiliary arm.
- Check that the wire holder safety gates work.

Note
The boom-mounted auxiliary arm can be used for single-phase conductor lifts by mounting a wire holder on the top of the mast. This can be used on an EWP.

Displace the conductor
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Fit covers onto second points of contact. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
3. Position and raise the boom-mounted arm under the circuit to be worked on, collecting the two outer phase conductors into the wire holders.
4. Raise the auxiliary cross-arm to take the weight of the two outer conductors ensuring the conductors are trapped in the wire holders.
5. Untie the outer conductors. Follow ‘DIS-02 Untie and retie conductors’.
6. Raise the auxiliary cross-arm until the remaining centre phase is collected in its wire holder.
7. Raise the auxiliary cross-arm to take the weight of the centre conductor, ensuring the conductor is trapped in the wire holder.
8. Untie the centre conductor.
9. Raise the boom mounted arm until the conductors are lifted to the required height to allow the maintenance task to be safely carried out outside of any MAD.

Note
Check adjacent spans for conductor tightness and clearances.
If the mid-span pole is to be installed lift the secured conductors with the EWP or crane to the required position and then install the mid-span pole.

Carry out replacement of pole-top hardware or replace pole.
Reinstate the conductor

1. Reposition the insulating covers on the new structure and cover up all secondary points of contact.
2. Using the lifting EWP, lower the boom mounted arm so that the conductor is positioned on the centre insulator.
3. Tie in the centre conductor and release the trap.
4. Lower and position the outer conductors onto the outer insulators.
5. Ensure all of the secondary points of contact are covered.
6. Tie in outer conductors one at a time and release traps.
7. Lower the boom mounted arm away from the circuit.
8. Remove all equipment, including insulating barriers and blankets.
9. Remove boom mounted arm and bracket from the boom
10. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual:
  - section 2 (Safe work principles)
  - work practice 4.2 (EWP and crane mounted conductor support equipment)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-02 Untie and retie conductors
DIS-20  Displace conductors – crane single conductor lift

Purpose
This procedure describes how to displace conductors on distribution poles, up to 33 kV, to enable the replacement of the following items on three-phase systems:

- single-phase systems – poles and pole-top hardware/insulators
- three-phase systems – pole-top hardware/insulators

Parameters
- This procedure must only be used on intermediate structures.
- Consideration must be given to the increase or decrease of the conductor sag.
- MADs between the crane and live conductors must be maintained at all times.
- Two levels of insulation must be placed between the uninsulated part of the crane hook and live conductor. The insulation can be either:
  - Two 33 kV rated and tested polymeric insulators or
  - One link stick with a minimum insulation distance of 450 mm
  - Two smaller link sticks with a combined insulating distance of 450 mm
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td>1+</td>
<td>1 tonne web slings</td>
</tr>
<tr>
<td>1+</td>
<td>2 tested and rated 33 kV polymeric insulators, or</td>
</tr>
<tr>
<td></td>
<td>1 link stick with a minimum insulation distance of 450 mm, or</td>
</tr>
<tr>
<td></td>
<td>2 smaller link sticks with a combined insulating distance of 450 mm</td>
</tr>
</tbody>
</table>
### High Voltage Live Work Procedures – Distribution Insulated Stick

**Amount** | **Item** |
--- | --- |
1 | Rated D-shackles |
1 | Rated conductor holder (e.g. termination clevice, D-shackle), only required if not using spiral link sticks |
varies | Insulated working sticks |
varies | Pegs and cable ties to secure insulating covers/barriers and mats |
varies | Insulating covers/barriers or mats – enough to cover second points of contact and live conductors |
1 | Crane suitable for the lift + portable earth lead |

**Personnel**

2+ | HV live workers: |
--- | --- |
• 1+ in the EWP, work platform or ladder |
• 1 safety observer |

### Onsite job setup

#### Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

#### Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

#### Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

#### Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures
Procedure

Remember to follow all safety requirements as listed in:
• Safety
• section 2 (Safety) in *High Voltage Live Work Manual*

**Displace and replace conductors**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked or are in place.
2. Set up insulators or link sticks and attach to the crane hook.
3. Cover all second points of contact. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
4. Position the crane hook directly above the conductors.
5. Lower the lifting insulators or link stick and secure the conductor.
6. Raise the hook and apply a small amount of tension to the conductor.
7. Untie the conductor from the insulator, move the conductor to a position that provides a safe work area to carry out the task. Follow ‘DIS-02 Untie and retie conductors’.

**Carry out replacement of pole-top hardware or replace single-phase pole.**

8. Ensure all second points of contact within reach are covered.
9. Lower the hook to place the conductor on the insulator.
10. Tie-in the conductor to the insulator.
11. Disconnect lift insulators or link stick from the conductor.

If working on a three phase system repeat steps 3 to 11 for any other insulators that require changing.

12. Clean, wipe down and stow away all equipment.

**Displace and replace conductors with suspension insulators**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Set up insulators or link sticks and attach to the crane hook.
3. Cover all second points of contact within reach.
4. Position the crane hook directly above the conductor.
5. Lower the lifting insulators or link stick and secure the conductor.
6. Raise the hook and apply a small amount of tension to the conductor so that the insulator/s becomes slack.
7. Disconnect the conductor clamp from the insulator and change insulators and hardware as required.

**Carry out replacement of pole-top hardware or replace single-phase pole.**

8. Ensure all second points of contact within reach are covered.
9. Reconnect the conductor clamp to the insulator/s.
10. Lower the hook so that the tension is applied to the insulators.
11. Disconnect lift insulators or strain/link sticks from the conductor and remove crane from the area.

Repeat steps 3 to 11 for any other insulators that require changing.

13. Clean, wipe down and stow away all equipment.
References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/cover and mats
  - DIS-02 Untie and retie conductors
DIS-21 Displace conductors – pole and cross-arm mounted insulating auxiliary arm

Purpose
This procedure describes how to use pole mounted insulated arms that can be used on distribution poles, up to 33kV, to enable the replacement of pole hardware.

Parameters
- Pole mounted insulated arms may be rated as low as 15kV. Insulators must be fitted to the wire holders when used on 22kV and 33kV circuits.
- Care must be taken to ensure the correct length arm is used when displacing two conductors onto an arm.
- A cross-arm-mounted extension arm can only be used on steel cross-arms.
- The minimum phase-to-earth distance must be maintained at 450mm, when conductors are secured on a temporary cross-arm.
- The phase-to-phase distance must be maintained at 550mm.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equipment</td>
</tr>
<tr>
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<td>Temporary pole or cross-arm mounted insulated arm</td>
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<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
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<td>HV live workers:</td>
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<td></td>
<td>• 2 in the EWP, work platform or ladder</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
</tr>
</tbody>
</table>
Onsite job setup

Calculate load handling capacity
• Determine loads exerted on the HV live work equipment when performing the task.
• The calculations are used to ensure that:
  o the SWL of the equipment, crane and EWP is not exceeded
  o increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

Site setup
• EWPs should, where possible, be positioned so that all work areas can be:
  o accessed safely
  o reached from the one site setup
• EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
• A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment
• Clean, wipe down and inspect all equipment that is to be used.
• Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  o within test date
  o rated for the voltage to be worked on

Inspect structure
• Carry out a visual inspection of the following prior to commencing the task:
  o the structure, lines and equipment to be worked on
  o adjacent structures

Procedures

Remember to follow all safety requirements as listed in:
• Safety
• section 2 (Safety) in High Voltage Live Work Manual

Displace and replace conductors
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover all second point of contact within reach. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
3. Secure the insulated arm that is being used into position.
4. Untie one conductor at a time, displace the conductor to the wire holder and close the conductor gates to secure. Follow ‘DIS-02 Untie and retie conductors’.
5. Observe the conductors in the adjacent spans while the displacement is in progress.
6. Repeat steps 3 to 5 for all other phases if required
7. Carry out replacement of pole-top hardware.
8. Ensure all second points of contact within reach are covered.
9. Open the conductor gate and displace the conductor back to the insulator and tie in.
9. Observe the conductors in the adjacent spans whilst the replacement is in progress.
10. Repeat steps 7 to 9 for all other phases if required.
11. Remove insulated arm.
12. Clean, wipe down and stow away all equipment.

Examples of conductor supports

Cross-arm mounted extension arm

The extension arm can be used on voltages up to 33kV, providing the wire holders are fitted with epoxy insulators.

It is suspended under the cross-arm by brackets so the conductor can be removed from the original cross-arm and placed in the wire holder mounted on the extension arm. The following parameters are applicable to this activity:

- Where two conductors are placed on the extension arm, the extension arm must be 1800mm in length.
- If the load exceeds 25kg then a 38mm brace must be used.
- The maximum conductor load must not exceed 68kg.

![Figure 2: Cross-arm mounted auxiliary arm](image)

Pole mounted conductor support

The extension arm can be used on voltages up to 33kV, providing the wire holders are fitted with epoxy insulators.

The pole mounted conductor support can be attached to the pole using a chain and chain tightener or ratchet binder and nylon strap.

Where two conductors are placed on the pole mounted conductor support, the conductor support must be 1200mm in length.

The maximum vertical load will be determined by the size of the extension arm. This must be checked before work commences.

![Figure 3: Pole mounted auxiliary arm](image)

V-arm conductor support

The V-arm can be used on voltages up to 33kV providing the wire holders are fitted with epoxy insulators.

The arm mounting assembly can be fitted to the pole with a chain and tightener or ratchet binder and nylon strap. The V-arm is attached to the base and secured. The following parameters are applicable to this activity:

- Where three conductors are placed on the V-arm conductor support, the V-arm conductor support must be 2060mm in length.
- The maximum vertical load per arm is 68 kg or total load of 136kg.
The V-arm can be used on voltages up to 33kV providing the wire holders are fitted with epoxy insulators. The arm mounting assembly can be fitted to the pole with a chain and tightener or ratchet binder and nylon strap. The V-arm is attached to the base and secured.

Where three conductors are placed on the V-arm conductor support, the V-arm conductor support must be 2060mm in length.

The maximum vertical load per arm is 68kg or total load of 136kg.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-02 Untie and retie conductors
DIS-22  Displace conductors – auxiliary arm

Purpose

This procedure describes how to displace conductors on distribution poles, up to 33 kV, to enable the replacement of pole top hardware.

Figure 1: Auxiliary arm

Parameters

- The maximum lift is 68 kg per conductor with two brace arms fitted.
- The maximum line deviation must not exceed $5^\circ$ when using this rig.
- Insulators must be installed between the arm and wire holder when used on 22 kV and 33 kV systems.
- Two 63 mm wire tong saddles are used to mount the mast of the auxiliary arm to the pole. Two braces can be fitted to increase the SWL of the rig.
- The auxiliary arm can be mounted either above or below the conductors.
- The reason that the auxiliary arm is used is to enable all conductors to be lifted at the same time by the operation of a tensioning device.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
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<td>Equipment</td>
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<tr>
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<td>63 mm lifting beam – working load limit is 68 kg per conductor.</td>
</tr>
<tr>
<td>1</td>
<td>63 mm temporary cross arm lifting beam – working load limit is 68 kg per conductor</td>
</tr>
<tr>
<td>2</td>
<td>38 mm support beams</td>
</tr>
<tr>
<td>3</td>
<td>Wire holder fork type or C-type wire holder</td>
</tr>
<tr>
<td>2</td>
<td>63 mm wire tong saddles</td>
</tr>
<tr>
<td>1</td>
<td>Strap hoist</td>
</tr>
</tbody>
</table>
High Voltage Live Work Procedures – Distribution Insulated Stick

### Amount | Item
--- | ---
varies | Insulated working sticks
varies | Pegs and cable ties to secure insulating covers/barriers and mats
varies | Insulated barriers/covers to cover live conductors and second points of contact

### Personnel

<table>
<thead>
<tr>
<th>3</th>
<th>HV live workers:</th>
</tr>
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<tr>
<td>2</td>
<td>in the EWP, work platform or ladder</td>
</tr>
<tr>
<td>1</td>
<td>safety observer</td>
</tr>
</tbody>
</table>

### Onsite job setup

#### Calculate load handling capacity
- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

#### Site setup
- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup
- The EWP may have to be moved to reach all of the work positions. If required, a second EWP can be used, or work can take place from ladders, platform or structures.
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

#### Clean and inspect equipment
- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

#### Inspect structure
- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures
**Procedure**

Remember to follow all safety requirements as listed in:

- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*

**Installing the auxiliary cross-arm**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.

2. Pre-assemble the auxiliary arm on the ground. The wire holder spacing will need to be a minimum of 550 mm between phases.

3. The upper wire tong saddle should be fitted to the pole on the opposite side to the existing cross-arm and slightly offset to allow for the placement of the conductor trap and removal and installation of the king bolts and as high as possible whilst maintaining clearances.

4. Placing of the lower 63 mm wire tong saddle should be 1.0 to 1.2 m vertically below the upper saddle.

5. Secure the 63 mm mast into the two wire tong saddles ensuring the height of the auxiliary arm will provide clearance for the wire holders to be used.

6. Attach the strap hoist or rated sling to the lifting D of the wire tong saddle and to the lifting attachment or butt ring at the bottom of the lifting mast. Apply tension to the strap hoist to support the lifting mast, if required.

7. Install wire holders and brace clamps to the auxiliary cross-arm. The wire holders should be positioned on the auxiliary arm to align with the conductor position on the existing structure.

8. Secure the auxiliary cross-arm to the top of the 63 mm lifting mast. The locking pin must be secured.

9. A single brace must be fitted for loads up to 68 kg, for loads greater than 68 kg up to a maximum of 210 kg two braces must be fitted.

10. The height of the auxiliary arm assembly can be adjusted by loosening off the wire tong pole clamps and operating the strap hoist.

![Figure 2: Auxiliary arm setup](image-url)
Conductor displacement

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover all second point of contact within reach. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
3. Position the auxiliary arm so that the outside conductors can be located into the wire holders and confirm the gates are locked.
4. Untie each outside conductor, working on one conductor at a time. Follow ‘DIS-02 Untie and retie conductors’.
5. Raise the conductors using the strap hoist to raise the auxiliary arm and trap the centre conductor.
6. Untie the centre conductor.
7. Raise all three conductors so that the MADs can be maintained whilst doing the task.
8. Observe the conductors in the adjacent spans whilst the lift in in progress.
9. Once the conductors have reached the desired height secure the wire tong saddles.

Carry out replacement of pole-top hardware.

Replace conductor

1. Confirm that all work is completed ready to replace the conductors and all second points of contact have been covered.
2. Lower the auxiliary cross arm into a position to replace the centre conductor onto the insulator.
3. Retie the centre conductor and open the wire holder gate.
4. Lower the auxiliary cross arm until the outside conductors are replaced on to the outside insulators.
5. Retie the conductors back to the insulators, working on one conductor at a time.
6. Open the conductor gates on the wire holders and lower the auxiliary arm.
7. Once clear of the conductors the auxiliary arm and attachments can be removed.
8. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-02 Untie and retie conductors
DIS-23 Displace conductors – gin pole – horizontal lift

Purpose
This procedure describes how to change the pole or pole hardware using a gin pole (horizontal lift) on distribution.

Parameters
- For maximum conductor weights and gin pole angles the appropriate tables must be checked in work practice 4.2 (EWP and crane mounted conductor support equipment) in the High Voltage Live Work Manual.
- The maximum vertical weight for a conductor trap is 300kg.
- Maximum side pull on the conductor traps is 80kg.
- Maximum conductor weight for the GP stick assembly is 330kg.
- When calculating conductor weights prior to lifting conductors always consider the SWL/WLL of all the lifting components and de-rate accordingly.
- Minimum approach distances (MAD) must be maintained at all times.
- The EWP-mounted gin pole assembly consists of a mast complete with an auxiliary arm containing wire holders, arm braces and a boom mounting bracket.
- The horizontal gin pole can be used to change pin angles where the side pull on the conductor traps is no greater than 80kg.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

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<thead>
<tr>
<th>Amount</th>
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<tbody>
<tr>
<td>2</td>
<td>38mm fibreglass sticks</td>
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<td>3</td>
<td>Conductor traps</td>
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</table>

Figure 1: Gin pole conductor lift
<table>
<thead>
<tr>
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<th>Item</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Bracket, clamping, brace</td>
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<tr>
<td>1</td>
<td>Fibreglass brace support, swivel end</td>
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<tr>
<td>1</td>
<td>Adaptor plate, brace supporting</td>
</tr>
<tr>
<td>1</td>
<td>End cap adaptor</td>
</tr>
<tr>
<td>1</td>
<td>Adaptor plate</td>
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<tr>
<td>varies</td>
<td>Insulated working sticks</td>
</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulating covers/barriers or mats – enough to cover second points of contact</td>
</tr>
</tbody>
</table>

**Personnel**

3+

HV live workers:
- 1 in the lifting EWP
- 1+ in the EWP or on work platform or ladder
- 1+ safety observer

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**Onsite job setup**

**Calculate load handling capacity**

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations.

**Site setup**

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup.
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

**Clean and inspect equipment**

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on.

**Inspect structure**

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures.
Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safety) in High Voltage Live Work Manual

Site layout of EWP
- The EWP is positioned alongside, running parallel to the conductors.
- The EWP boom is positioned at 90° to the line to lift the conductors.
- The second EWP is positioned so that it has clear access to untie the pole.

Conductor displacement
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Assemble insulated sticks to align with the line construction.
3. Secure insulated sticks to the gin pole and position the gin pole under the outside conductors.
4. Elevate gin pole so that the outside conductors are secured in the conductor traps.
5. From the second EWP or ladder, cover all second points of contact as required. Follow ‘DIS-01 Apply insulating barriers/covers and mats’
6. Untie the outer phase conductors one at a time. Follow ‘DIS-02 Untie and retie conductors’.
7. Elevate the gin pole until the centre phase conductor is secured in the conductor trap.
8. Untie the centre phase conductor and raise all the conductors so that MAD can be maintained to carry out the task.

Carry out replacement of pole-top hardware or replace pole.

Replace conductors
1. Confirm that all work is completed ready to replace the conductors and all second points of contact have been covered.
2. Lower the gin pole so that the centre phase conductor rests on the insulator.
3. Tie in the centre phase conductor to the insulator and release the trap.
4. Proceed to lower the gin pole so that the outer phase conductors are located on their insulators.
5. Tie in both conductors one at a time and release traps.
6. Remove all covers.
7. Clean, wipe down and stow away all equipment.

Anti-swan cross arms and pin angles
When displacing conductors on anti-swan cross arms and pin angles the gin pole is set 30° below horizontal:
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Assemble insulated sticks to align with the line construction.
3. Secure the insulated sticks to the gin pole and position the gin pole so that the nearest conductor to the EWP is trapped in the conductor traps. If this is a pin angle the EWP must be set up on the outside of the angle.
4. From the second EWP, cover all second points of contact.
5. Untie the nearest conductor and lift the gin pole until the centre conductor is trapped in the centre conductor trap.

6. The centre conductor is untied and the gin pole lifted until the last conductor is trapped in the outer conductor trap.

7. This conductor is untied and lifted to allow the required task to be completed.

   Once the task is completed the conductors can be reattached by reversing the above process.

8. Remove all covers.

9. Clean, wipe down and stow away all equipment.

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**Figure 2: Gin pole setup**

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**References**

- High Voltage Live Work Manual:
  - section 2 (Safe work principles)
  - work practice 4.2 (EWP and crane mounted conductor support equipment)
- High Voltage Live Work Procedures – Distribution Insulated Stick
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-02 Untie and retie conductors
**DIS-24 Displace conductors – gin pole – vertical lift**

**Purpose**

This procedure describes how to change the pole or pole hardware using a gin pole (vertical position).

![Figure 1: Gin pole conductor lift](image)

**Parameters**

- For maximum conductor weights and gin pole angles the appropriate tables must be checked in work practice 4.2 (EWP and crane mounted conductor support equipment) in the *High Voltage Live Work Manual*.
- The maximum vertical weight for a conductor trap is 300kg.
- Maximum conductor weight for the GP stick assembly is 330kg.
- When calculating conductor weights prior to lifting conductors always consider the SWL/WLL of all the lifting components and de-rate accordingly.
- The gin pole is to be used with the General Purpose (GP) stick assembly, complete with an auxiliary arm containing wire holders, arm braces and a gin pole mounting bracket.
- The GP stick assembly can be lengthways or crossways, depending upon the most convenient position of the EWP.
- MAD must be maintained at all times.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

**Resources**

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<td>Conductor traps</td>
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<td>Bracket, clamping, brace</td>
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<td>Fibreglass brace support</td>
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### High Voltage Live Work Procedures – Distribution Insulated Stick

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<td>Adaptor plate</td>
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<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
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#### Personnel

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<th>3+</th>
<th>HV live workers:</th>
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<tr>
<td></td>
<td>• 1+ in the EWP, work platform or ladder</td>
</tr>
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<td></td>
<td>• 1 in the lifting EWP</td>
</tr>
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<td>• 1+ safety observer</td>
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</table>

### Onsite job setup

#### Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations.

#### Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup.
- The position of the EWP depends on whether the gin pole conductor sticks are positioned lengthwise or crosswise.
- A second EWP or ladder can be used.
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

#### Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on.

#### Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures.
Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safety) in High Voltage Live Work Manual

Conductor displacement

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Assemble insulated sticks to align with the line construction.
3. Secure insulated sticks to the gin pole and position the gin pole under the outside conductors.
4. Elevate the gin pole so that the outside conductors are secured in the conductor traps.
5. From the second EWP or ladder, cover all second points of contact as required. Follow ‘DIS-01 Apply insulating barriers/covers and mats’
6. Untie the outer phases one at a time. Follow ‘DIS-02 Untie and retie conductors’.
7. Elevate the gin pole until the centre phase conductor is secured in the conductor trap.
8. Untie the centre phase conductor and raise all the conductors so that sufficient minimum approach distance (MAD) can be maintained to carry out the task.

Carry out replacement of pole-top hardware or replace pole.

Replace conductors

1. Confirm that all work is completed ready to replace the conductors and all second points of contact have been covered.
2. Lower the gin pole so that the centre phase conductor rests on the insulator.
3. Tie in the centre phase conductor to the insulator and release the trap
4. Proceed to lower the gin pole so that the outer phase conductors are located on their insulators.
5. Tie in both conductors one at a time and release traps.
6. Remove all covers.
7. Clean, wipe down and stow away all equipment.

Note

The gin pole can be set up to lift a single conductor so that;
- one insulator requires changing, including suspension insulators
- single phase poles can be changed.
References

- High Voltage Live Work Manual:
  - section 2 (Safe work principles)
  - work practice 4.2 (EWP and crane mounted conductor support equipment)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-02 Untie and retie conductors
DIS-25  Wire tong angle method

Purpose
This procedure describes how to displace conductors on distribution angle poles, up to 33 kV, to enable the replacement of pole top hardware.

Parameters
- Maximum conductor lift is 110 kg per phase.
- All link sticks must have a minimum insulation length of 450 mm.
- Outer phase conductor is displaced by using a 63 mm wire tong (lifting tong), 38 mm wire tong (holding tong), wire tong saddle, lever lift, but ring extension and a tensioning device, this can be a strap hoist or rope tackle set. The angle of the conductor is held via a link stick, live work rope and tensioning device secured at ground level.
- Centre phase conductor is displaced by using 63 mm wire tong (lifting tong), One 60 mm wire tong extension saddles and one tensioning device. The angle of the conductor is held via a link stick, live work rope and tensioning device secured at ground level.
- This picture shows the wire tong lift set up using pulley rope blocks, if rope blocks are used a rope snubbing bracket must be attached to the pole 1.3 m from the ground, and used to tie off the rope.
- Alternatively a sling can be attached to the pole above the 38 mm wire tong saddles and place a ratchet strap between the sling and the lever lift.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

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<tr>
<th>Amount</th>
<th>Item</th>
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<td>63 mm wire tong lifting beam</td>
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<tr>
<td>2</td>
<td>38 mm wire tong holding tong</td>
</tr>
<tr>
<td>2</td>
<td>Lever lifts</td>
</tr>
</tbody>
</table>
Amount | Item
--- | ---
2 | 38 mm wire tong saddles
1 | 63 mm wire tong saddles
3 | Strap hoist or 2 pulley block rope tackle sets and one strap hoist
3 | Strap hoists for tensioning conductor tag lines
3 | Link sticks
2 | HV live line ropes
1 | Insulated rope
varies | Insulated working sticks
varies | Pegs and cable ties to secure insulating covers/barriers and mats
varies | Insulating covers/barriers or mats – enough to cover second points of contact

### Personnel

4 | HV live workers:
   - 2 in the EWP, work platform or ladder
   - 1 safety observer
   - 1 ground worker

### Onsite job setup

#### Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

#### Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

#### Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

#### Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures
Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*

**Displace outer angle conductor**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover all second points of contact where required. Follow 'DIS-01 Apply insulating barriers/covers and mats'.
3. Attach a 38 mm wire tong saddle to the working side of the pole, approximately 1200 mm below the conductor, on the opposite quarter to conductor.
4. Attach a 38 mm wire tong to the outer angle conductor, approximately 250 mm from the insulator, and place the wire tong into the wire tong saddle.
5. Apply downward pressure on the wire tong and tighten the wire tong saddle to secure the conductor.
6. Attach a link stick with 16 mm rope to the conductor between the 38 mm wire tong and the 63 mm wire tong.
7. Attach the 16 mm rope to a suitable anchor point, via a strap hoist and take up the slack on the rope.
8. Attach the 63 mm wire tong to the conductor between the link stick and the insulator.
9. Attach the lever lift to the bottom of the 63 mm wire tong, and attach the lever lift to the pole.
10. Place the tensioning device between the 38 mm wire tong saddle and lever lift, and take up the slack.
11. Untie or disconnect the outer angle conductor from the insulator. Follow 'DIS-02 Untie and retie conductors' or 'DIS-12 Change suspension hardware'.
12. Raise the lever lift gently controlling the conductor with the 38 mm wire tong. When clear of the insulator, check there is tension on the tag line strap hoist.
13. Slowly take up tension on the tag line strap hoist, moving the conductor away, whilst watching the conductor clearances in the adjacent spans, so that a safe working area is created, and tighten the 38 mm wire tong saddle.

**Note**

Do not allow the 38 mm wire tong to move below the horizontal

**Displace inner angle conductor**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover all second points of contact where required.
3. Attach a 38 mm wire tong saddle to the working side of the pole, approximately 1200 mm below the conductor, on the opposite quarter to conductor.
4. Attach a 38 mm wire tong to the inner angle conductor, approximately 250 mm from the insulator, and place the wire tong into the wire tong saddle.
5. Apply some downward pressure on the wire tong and tighten the wire tong saddle to secure the conductor.
6. Attach a link stick with 16 mm rope to the conductor between the 38 mm wire tong and the insulator.
7. Attach the 16 mm rope to a suitable anchor point, via a tensioning device and take up the slack on the rope.

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DIS-25  Wire tong angle method

3 of 6
8. Attach the 63 mm wire tong to the conductor between the link stick and the 38 mm wire tong.
9. Attach the lever lift to the bottom of the 63 mm wire tong, and attach the lever lift to the pole.
10. Place the tensioning device between the 38 mm wire tong saddle and lever lift, and take up the slack.
11. Untie or disconnect the inner angle conductor from the insulator.
12. Raise the lever lift gently controlling the conductor with the 38 mm wire tong. When clear of the insulator, check there is tension on the tag line strap hoist.
13. Slowly take up tension on the tag line strap hoist, moving the conductor away, whilst watching the conductor clearances in the adjacent spans, so that a safe working area is created, and tighten the 38 mm wire tong saddle.

**Note**

Do not allow the 38 mm wire tong to move below the horizontal.

**Displace centre angle conductor**

![Figure 3: Wire tong angle pole set up](image)

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked or are in place.
2. Cover all second points of contact where required.
3. Attach a 63 mm wire tong saddle to the working side of the pole, in line with the conductor.
4. Attach a 63 mm wire tong to the conductor and place it into the wire tong saddle.
5. Attach a link stick with 16 mm rope to the conductor.
6. Attach the 16 mm rope to a suitable anchor point, via a tensioning device and take up the slack on the rope.
7. Install a tensioning device between the butt ring on the bottom of the 63 mm wire tong and the 63 mm wire tong saddle.
8. Apply a slight downward pressure to the conductor and tighten the clamp on the saddle.
9. Untie or disconnect the centre conductor from the insulator.
10. Loosen the clamp on the saddle and lift the 63 mm wire tong with the tensioning device until the conductor is lifted.
11. Slowly let out the tension on the tag line strap hoist, moving the conductor away, whilst watching the conductor clearances in the adjacent spans, so that a safe working area is created, and tighten the 63 mm wire tong saddle.

12. The designated task can now be carried out.

**Note**
The displace centre phase conductor procedure can be used on its own for single phase constructions.

**Replace centre angle conductor**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover all second points of contact where required.
3. Loosen the clamp on the saddle and lower the 63 mm wire tong using the tensioning device whilst tensioning the tag line strap hoist until the conductor is seated on the insulator.
4. Apply a slight downward pressure to the conductor and tighten the clamp on the saddle.
5. Tie in or connect the conductor to the insulator.
6. Slacken the tension on the tensioning device and remove from the 63 wire tong saddle and butt ring.
7. Remove the 63 mm wire tong from the wire tong saddle, and remove from the centre phase conductor.
8. Release tag line tensioning device and remove the 16 mm rope and link stick.
9. Remove the wire tong saddle.
10. If used on single phase construction, remove covering.
11. Clean, wipe down and stow away all equipment.

**Replace inner angle conductor**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover all second points of contact where required.
3. Loosen the clamp on the 38 mm wire tong saddle and hold on the wire tong and apply tension to the tag line tensioning device to raise the conductor above the insulator that it will rest on and tighten the clamp on the wire tong saddle. When raising the conductor the conductor clearances must be maintained.
4. Loosen the clamp on the 63 mm wire tong saddle and lower the 63 mm wire tong using the tensioning device until the conductor is seated on the insulator or clamp.
5. Apply a slight downward pressure to the conductor and tighten the clamp on the 63 mm wire tong saddle.
6. Tie in or connect the conductor to the insulator.
7. Release tension on the tensioning device and remove.
8. Release tag line tensioning device and remove the 16 mm rope and link stick.
9. Remove both wire tongs from the wire tong saddles.
10. Remove both wire tong saddles.
11. Remove all covering.
12. Clean, wipe down and stow away all equipment.
Replace outer angle conductor

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover all second points of contact where required.
3. Loosen the clamp on the 38 mm wire tong saddle and hold on the wire tong and apply tension to the tag line tensioning device to raise the conductor above the insulator that it will rest on and tighten the clamp on the wire tong saddle. When raising the conductor the conductor clearances must be maintained.
4. Loosen the clamp on the 63 mm wire tong saddle and lower the 63 mm wire tong using the tensioning device until the conductor is seated on the insulator or clamp.
5. Apply a slight downward pressure to the conductor and tighten the clamp on the 63 mm wire tong saddle.
6. Tie in or connect the conductor to the insulator.
7. Release tension on the tensioning device and remove.
8. Release tag line tensioning device and remove the 16 mm rope and link stick.
9. Remove both wire tongs from the wire tong saddles.
10. Remove both wire tong saddles.
11. Remove all covering.
12. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-02 Untie and retie conductors
  - DIS-12 Change suspension hardware
DIS-26  Wire tong method

Purpose
This procedure describes how to displace conductors on distribution intermediate poles, up to 33 kV, to enable the replacement of pole top hardware.

Parameters
- Maximum outer conductor lift is 110 kg per phase.
- Maximum centre phase conductor lift is 225 kg.
- Maximum line deviation allowed on the line is 5°.
- Outer phase conductor is displaced by using a 63 mm wire tong (lifting tong), 38 mm wire tong (holding tong), wire tong saddle, lever lift and a tensioning device, this can be a strap hoist or pulley block rope tackle set.
- Centre phase conductor is displaced by using 63 mm wire tong (lifting tong), two 63 mm wire tong extension saddles, one tensioning device and butt ring.
- This picture shows the wire tong lift set up using pulley rope blocks, if rope blocks are used a rope snubbing bracket must be attached to the pole 1.3 m from the ground, and used to tie off the rope.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

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<td>2</td>
<td>63 mm wire tong saddles</td>
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### Personnel

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</tr>
<tr>
<td></td>
<td>• 1+ safety observer</td>
</tr>
</tbody>
</table>

### Onsite job setup

#### Calculate load handling capacity
- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

#### Site setup
- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

#### Clean and inspect equipment
- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

#### Inspect structure
- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures
Procedure

Remember to follow all safety requirements as listed in:
- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*

**Displace outer conductor**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover all second points of contact where required. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
3. Attach a 38 mm wire tong saddle to the working side of the pole, approximately 1200 mm below the conductor, on the opposite quarter to conductor.
4. Attach a 38 mm wire tong to the outside conductor, approximately 200 mm from the insulator, and place the wire tong into the wire tong saddle.
5. Apply some downward pressure on the wire tong and tighten the wire tong saddle to secure the conductor.
6. Attach the 63 mm wire tong to the conductor between the 38 mm wire tong and the insulator.
7. Attach the lever lift to the butt ring on the bottom of the 63 mm wire tong, and attach the lever lift to the pole.
8. Place the tensioning device between the 38 mm wire tong saddle and lever lift, and take up the slack.
9. Untie the conductor from the insulator. Follow ‘DIS-02 Untie and retie conductors’.
10. Raise the lever lift gently.
11. When clear of the insulator slowly control the conductor movement, whilst watching the conductor clearances in the adjacent spans, so that a safe working area is created, and tighten the 38 mm wire tong saddle.

![Diagram showing outer phase setup](image)

**Displace second outer conductor**

If it is necessary to move the other outer conductor, repeat steps 2 to 11 above, placing saddles just above existing positions.
Displace centre phase conductor

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover all second points of contact where required.
3. Attach a 63 mm wire tong saddle, as high as possible, to the working side of the pole. If replacing the cross-arm or insulator bracket, ensure the bolt can be removed.
4. Attach a 63 mm wire tong to the conductor and place it into the wire tong saddle.
5. Attach a second 63 mm saddle approximately 1200 mm below the first saddle and place the wire tong into the wire tong saddle.
6. Attach a tensioning device between the 63 mm wire tong saddle and the butt ring of the 63 mm wire tong.
7. Apply a slight downward pressure to the conductor and tighten the clamp on the saddle.
8. Untie the conductor.
9. Loosen the clamps on the saddles and lower the 63 mm wire tong with the tensioning device until the conductor is seated on the insulator.
10. Tighten the clamps on the saddles.
11. The designated task can now be carried out.

Note

To displace centre phase conductor procedure can be used on its own for single phase constructions.

Replace centre phase conductor

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked or are in place.
2. Ensure all second points of contact are covered where required.
3. Loosen the clamps on the saddles and lower the 63 mm wire tong using the tensioning device until the conductor is seated on the insulator.
4. Apply a slight downward pressure to the conductor and tighten the clamps on the saddles.
5. Tie in the conductor.
6. Slacken off the tension on the tensioning device and remove from the butt ring.
7. Remove wire tong and saddles
8. If used on single phase construction, remove covering.
9. Clean, wipe down and stow away all equipment.

**Replace outer phase conductor**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Ensure all second points of contact are covered where required.
3. Loosen the clamp on the 38 mm wire tong saddle and release tension to the lever to lower the conductor on to the insulator.
4. Apply a slight downward pressure to the conductor and tighten 38 mm saddle.
5. Tie in the conductor.
6. Release tension on the lever lift and tensioning device and remove.
7. Remove both wire tongs and wire tong saddle.
8. Remove covering.
9. Clean, wipe down and stow away all equipment.

**Replace second outer phase conductors**

If it has been necessary to displace the second outer phase conductor repeat steps 1 to 8 above.

**References**

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-02 Untie and retie conductors
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**DIS-27  Wire tong standard pole saddle method**

**Purpose**
This procedure describes how to displace conductors on distribution intermediate poles, up to 33 kV, to enable the replacement of pole top hardware. This method is only used when one conductor requires displacing.

![Figure 1: Standard pole saddle setup](image)

**Parameters**
- Maximum outer conductor lift is 110 kg per phase.
- Maximum line deviation allowed on the line is 5°.
- Outer phase conductor is displaced by using a 63 mm wire tong (lifting tong), 38 mm wire tong (holding tong), wire tong saddles, and a strap hoist connected between the wire tong saddle and butt ring of the 63 mm wire tong.
- Centre phase conductor is displaced by using 63 mm wire tong (lifting tong), two 63 mm wire tong extension saddles and a strap hoist connected between the wire tong saddle and butt ring of the 63 mm wire tong.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

**Resources**

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High Voltage Live Work Procedures – Distribution Insulated Stick

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Onsite job setup

Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures

Procedure

Remember to follow all safety requirements as listed in:

- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*

Displace outer conductor

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover all second points of contact where required. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
3. Attach a 38 mm wire tong saddle to the working side of the pole, approximately 1200 mm below the conductor, on the opposite quarter to conductor.
4. Attach a 63 mm wire tong saddle to the working side of the pole, approximately 1200 mm below the 38 mm saddle.
5. Attach a 38 mm wire tong to the outside conductor, approximately 200 mm from the insulator, and place the wire tong into the wire tong saddle.
6. Attach the 63 mm wire tong to the conductor between the 38 mm wire tong and the insulator.
7. Secure the 63 mm wire tong in to the saddle and attach a strap hoist between the 63 mm wire tong saddle and the butt ring on the 63 mm wire tong.
8. Untie the conductor from the insulator. Follow ‘DIS-02 Untie and retie conductors’.
9. Loosen the clamps on the saddles and raise the 63 mm wire tong using the strap hoist, controlling the conductor with the 38 mm wire tong.
10. When clear of the insulator, slowly push the conductor away, while watching the conductor clearances in the adjacent spans, so that a safe working area is created, then tighten the wire tong saddles.

Carry out replacement of insulator/task.

Displace centre phase conductor

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover all second points of contact where required.
3. Attach a 63 mm wire tong saddle, as high as possible, to the working side of the pole.
4. Attach a 63 mm wire tong to the conductor and place it into the wire tong saddle.
5. Attach a second 63 mm saddle approximately 1200 mm below the first saddle and place the wire tong into the wire tong saddle.
6. Attach a strap hoist between the 63 mm wire tong saddle and the butt ring on the 63 mm wire tong.
7. Untie the conductor from the insulator.
8. Loosen the clamps on the saddles and lift the 63 mm wire tong with the strap hoist until the conductor is lifted the required height.
9. Tighten the clamps on the saddles.

Carry out replacement of insulator/task.
Replace centre phase conductor
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Ensure all second points of contact are covered where required.
3. Loosen the clamps on the saddles and lower the 63 mm wire tong using the strap hoist until the conductor is seated on the insulator.
4. Tie in the conductor.
5. Release tension on the strap hoist and remove from the wire tong saddle and butt ring.
6. Remove the 63 mm wire tong from the wire tong saddles and conductor.
7. Remove both wire tong saddles.
8. Remove all covering.
9. Clean, wipe down and stow away all equipment.

Replace outer conductor
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Ensure all second points of contact are covered where required.
3. Loosen the clamp on the 38 mm wire tong saddle and pull on the wire tong to raise the conductor above the insulator that it will rest on and tighten the clamp on the wire tong saddle. When raising the conductor the conductor clearances must be maintained.
4. Loosen the clamp on the 63 mm wire tong saddle and lower the 63 mm wire tong using the strap hoist until the conductor is seated on the insulator.
5. Tie in the conductor.
6. Release the tension on the strap hoist and remove from the wire tong saddle and butt ring.
7. Remove both wire tongs from the wire tong saddles and conductor.
8. Remove both wire tong saddles.
9. Remove all covering.
10. Clean, wipe down and stow away all equipment.

**References**

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-02 Untie and retie conductors
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DIS-28 Wire tong support saddle method

Purpose
This procedure describes how to displace conductors on distribution intermediate poles, up to 33 kV, to enable the replacement of pole top hardware.

![Figure 1: Wire tong support saddle setup](image)

Parameters
- Maximum outer conductor lift is 110 kg per phase.
- Maximum line deviation allowed on the conductor is 5°.
- Do not lower the conductor below the wire tong saddle height.
- On multi-phase construction displace the lower conductor first, middle second and top third. Do the reverse for replacing.
- All phases are displaced by using a 63 mm wire tong and strap hoist with a link stick and tag line rigged above the conductor so that the conductor can be lowered and raised.
- The supported pole saddle method is similar to the standard pole saddle method the difference being that the 38 mm wire tong (holding stick) is replaced by a link stick attached as high as possible to the pole.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

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**Personnel**

4 HV live workers:
- 2 in the EWP, work platform or ladder
- 1 safety observer
- 1 ground worker

**Onsite job setup**

**Calculate load handling capacity**
- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

**Site setup**
- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

**Clean and inspect equipment**
- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

**Inspect structure**
- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures
Procedure

Remember to follow all safety requirements as listed in:

- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*

**Displace lower conductor**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover conductors and second points of contact. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
3. Attach a 63 mm wire tong saddle to the working side of the pole, approximately 2000 mm below the conductor, on the opposite quarter to conductor.
4. Attach the 63 mm wire tong to the conductor and secure in the wire tong saddle.
5. Attach a strap hoist between the wire tong saddle and the butt ring on the bottom of 63 mm wire tong.
6. Attach a snubbing bracket to the pole 1000 mm from ground level
7. Attach a 1 tonne sling and snatch block to the pole 1000 mm to 2000 mm above the height of the conductor.
8. Attach a tag line and 450 mm link stick to the conductor, pass through the snatch block and secure to the snubbing bracket at ground level.

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<td>A tensioning device can be used at ground level to lower or raise the conductors if the weight of the conductor is excessive to raise or lower by hand.</td>
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9. Apply tension to the conductor via the 63 mm wire tong and tag line, so that the insulators become slack.
10. Clamp the 63 mm wire tong in the wire tong saddle.
11. Disconnect the conductor from the insulator. Follow ‘DIS-12 Change suspension hardware’.
12. Loosen the tension on the tag line from ground level so that a safe work area is achieved.
13. Secure the tag line to the snubbing bracket at ground level.

The process for displacing the middle and top phase conductors is the same as the lower conductor.

![Figure 2: Diagram wire tong support saddle setup](image-url)
Replace top conductor

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover conductors and second points of contact. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
3. Take up tension on the tag line at ground level to raise the conductor up to the insulator.
4. Attach the conductor to the insulator; adjustment of the strap hoist on the 63 mm wire tong may be required.
5. Release the tension on the conductor from the ground snubbing bracket and the strap hoist on the 63 mm wire tong.
6. Remove link stick and tag line from the conductor.
7. Remove the 1 tonne sling and snatch block from the pole.
8. Remove the strap hoist from the wire tong bracket and butt ring.
9. Remove the 63 mm wire tong from the wire tong saddle and conductor.
10. Remove wire tong saddle.
11. Remove all covering.
12. Clean, wipe down and stow away all equipment.

Replace middle and bottom conductor

The process for replacing the middle and bottom phase conductors is the same as the top conductor.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick:
  - Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-12 Change suspension hardware
DIS-29 Additional stick control methods

Purpose
This procedure describes additional control methods that can be used when displacing overhead conductors on distribution poles, up to 33 kV.

Parameters
- The procedure safety requirements must be followed.
- Additional control measures are used when the weight of the conductor makes it difficult to control the conductor when it is being displaced. When the following methods are used an extra team member may be required to carry out the procedure.
- These methods are used alongside the Distributed Insulated Stick procedures.
- Each method is shown for only one conductor. If more than one conductor is being displaced the method must be repeated for each phase.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equipment</td>
</tr>
<tr>
<td>1+</td>
<td>450 mm link stick</td>
</tr>
<tr>
<td>1+</td>
<td>16 mm live work rope</td>
</tr>
<tr>
<td>1+</td>
<td>Swivel wire tong saddle</td>
</tr>
<tr>
<td>1+</td>
<td>Rope block</td>
</tr>
<tr>
<td>1+</td>
<td>1 tonne sling</td>
</tr>
<tr>
<td>1+</td>
<td>Tensioning device</td>
</tr>
<tr>
<td>1+</td>
<td>Snubbing bracket</td>
</tr>
</tbody>
</table>

Onsite job setup

Calculate load handling capacity
- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations

Site setup
- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.
Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures

Procedures

Remember to follow all safety requirements as listed in:

- Safety
- section 2 (Safety) in High Voltage Live Work Manual

Conductor connected additional support

1. Attach a snubbing bracket to the pole 1 m from the ground.
2. Apply a sling to the pole just above the height of the conductor.
3. Attach a rope block to the sling.
4. Attach a 16 mm live work rope to the link stick.
5. Capture the live work rope in the rope block and attach the link stick to the conductor.
6. Attach the live work rope to the snubbing bracket. A tensioning device can be used between the snubbing bracket and rope.
7. The additional support can now be used to assist with the displacement of the conductor.

Figure 1: Additional support setup
38 mm wire tong connected additional support

Figure 2: 38 mm additional support setup

1. Attach a snubbing bracket to the pole 1 m from the ground.
2. Attach a 38 mm swivel wire tong band to the wire tong 1.2 m from the conductor.
3. Attach a rope block to the wire tong saddle.
4. Capture the live work rope in the rope block and attach to the 38 mm swivel wire tong band.
5. Attach the live work rope to the snubbing bracket. A tensioning device can be used between the snubbing bracket and rope.
6. The additional support can now be used to assist with the displacement of the conductor.

63 mm wire tong connected additional support

Figure 3: 63 mm additional support setup
1. Attach a snubbing bracket to the pole 1 m from the ground.
2. Apply a sling to the pole 1000 mm above the height of the conductor.
3. Attach a rope block to the sling.
4. Attach a 63 mm swivel wire tong band to the wire tong 1.2 m from the conductor.
5. Capture the live work rope in the rope block and attach to the 63 mm swivel wire tong band.
6. Attach the live work rope to the snubbing bracket. A tensioning device can be used between the snubbing bracket and rope.
7. The additional support can now be used to assist with the displacement of the conductor.

**38 mm wire tong butt ring connected additional support**

1. Attach a snubbing bracket to the pole 1 m from the ground.
2. Attach 38 mm wire tong saddle to the pole at a suitable height depending on the support required.
3. Attach a rope block to the wire tong saddle.
4. Attach the 38 mm wire tong to the conductor and secure in the saddle.
5. Attach a butt ring to the bottom of the 38 mm wire tong.
6. Capture the live work rope in the rope block and attach the live line rope to the butt ring.
7. Attach the live work rope to the snubbing bracket. A tensioning device can be used between the snubbing bracket and rope.
8. The additional support can now be used to assist with the displacement of the conductor.

**Note**
The 16 mm ropes in all of the rigs illustrated above can be replaced by either a strap hoist or rope and tackle.

**References**
- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick, Safety
DIS-30  Displace conductors – wishbone construction

Purpose

This procedure describes how to displace and replace conductors on a wishbone construction, with or without an overhead return wire. A wishbone construction is illustrated in Figure 1, below.

This procedure can also be used for:

- a pole change
- pole attachment maintenance
- Buck-arm and Fir tree construction, with or without an overhead return wire, as shown in Figures 2 and 3.

Parameters

- This procedure must only be used on intermediate structures.
- Consideration must be given to the increase or decrease of the conductor sag.
- MADs between the crane and live conductors must be maintained at all times.
- The following minimum levels of insulation must be placed between the uninsulated part of the crane hook and the live conductor. The insulation can be one of the following:
  - Two 33kV rated and tested polymeric insulators.
  - One link stick with a minimum insulation distance of 450mm.
  - Two smaller link sticks with a combined insulating distance of 450mm.
- For maximum conductor weights and gin pole angles the appropriate tables must be checked in work practice 4.2 (EWP and crane-mounted conductor support equipment) in the High Voltage Live Work Manual.
- Calculate conductor weights and ensure they do not exceed the WLL of either the rated attachment points, and the total WLL of the crane and the lifting EWP.
- The maximum vertical weight for a conductor trap is 300kg.
- Maximum side pull on the conductor traps is 80kg.
- Always cover second points of contact within reach to maintain MADs.
- Only work on one potential at a time.
Figure 2: Buck-arm construction without overhead return wire

Figure 3: Fir tree construction with overhead return wire
High Voltage Live Work Procedures – Distribution Insulated Stick

Resources

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<tr>
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<th>Item</th>
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</thead>
<tbody>
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<tr>
<td>1</td>
<td>Crane (such as Hiab™) with two rated attachment points</td>
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<tr>
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<td>Lifting bucket with gin pole</td>
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<tr>
<td>1+</td>
<td>2 tonne webbing sling 1.5m</td>
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<td>2+</td>
<td>Conductor rollers</td>
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<td>1+</td>
<td>1.5m insulated link stick</td>
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<tr>
<td>2+</td>
<td>1.5 tonne min. D shackle</td>
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<tr>
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<td>Conductor traps</td>
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<td>1+</td>
<td>End cap adaptor</td>
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<tr>
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<td>Adaptor plate</td>
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<tr>
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<td>Insulating covers/barriers or mats – enough to cover second points of contact</td>
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<table>
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</tr>
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<td></td>
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</tbody>
</table>

Onsite job setup

Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations.

Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site setup.
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.
Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on.

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures.

Procedure

Remember to follow all safety requirements as listed in:

- Safety
- section 2 (Safety) in *High Voltage Live Work Manual*

Displace conductors and overhead return wire

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked or are in place.
2. Set up insulators or link sticks and attach to the first (higher) rated attachment point on the crane for the overhead return wire.
3. Set up insulators or link sticks and attach to the second (lower) rated attachment point on the crane for the red phase conductor.
4. Cover all second points of contact. Follow ‘DIS-01 Apply insulating barriers/covers and mats’.
5. Position the crane and insulated attachment points directly above the overhead return wire and red phase conductor. Ensure MADs to the uninsulated plant are maintained.
6. Lower the lifting insulators or link sticks and secure the overhead return wire.
7. Raise the crane boom and apply a small amount of tension to the overhead return wire.
8. Untie the conductor from the insulator. Follow ‘DIS-02 Untie and retie conductors’.
9. Raise the overhead return wire away from the insulator.
10. Manoeuvre the lifting insulators or link sticks of the second crane attachment point to the red phase and secure the conductor.
11. Raise the crane boom and apply a small amount of tension to the red phase conductor.
12. Disconnect the red phase conductor clamp from the insulator. Follow ‘DIS-12 Change suspension hardware’.
13. Raise the conductors suspended by the crane so that MADs can be maintained when replacing pole top hardware or replacing the pole. See Figure 4 below.
14. Assemble insulated sticks to align with the white and blue phase conductors.
15. Secure insulated sticks to the gin pole and position the gin pole under the blue phase conductor.
16. Elevate gin pole so that the blue phase conductor is secured in the inside conductor trap.
17. Disconnect the blue phase conductor clamp from the insulator.
18. Manoeuvre the blue phase conductor horizontally away from pole until the outside conductor trap is in line with the white phase conductor.
19. Elevate the gin pole to secure the white phase conductor in the outside conductor trap.
20. Disconnect the white phase conductor clamp from the insulator.
21. Raise the white and blue phase conductors so that MADs can be maintained when replacing pole top hardware or replacing the pole. See Figure 5 below.

**Figure 4: Crane supporting overhead return wire and red phase conductor**

**Figure 5: Gin pole with insulated stick assembly lifting white and blue phase conductors**

Carry out replacements of pole top hardware or replace pole
Replace conductors and overhead return wire

1. Confirm that all work is completed and ready to replace the conductors with all second points of contact having been covered.

2. Lower the white and blue phase conductors so that the white phase is in position to reconnect to the white phase insulator.

3. Connect the white phase conductor clamp to the insulator and release the conductor trap. Follow ‘DIS-12 Change suspension hardware’.

4. Proceed to lower the gin pole so that the blue phase conductor is located in a position to enable the reconnection of the blue phase insulator.

5. Connect the blue phase conductor clamp to the insulator and release the conductor trap then remove the gin pole from the work area.

6. Lower the crane boom and position the red phase conductor to reconnect to the red phase insulator.

7. Connect the red phase conductor clamp to the insulator and release from the roller.

8. Lower the boom and position the overhead return wire to rest on the overhead return wire insulator.

9. Tie in overhead return wire conductor and release roller. Follow ‘DIS-02 Untie and retie conductors’.

10. Remove the crane from the work area.

11. Remove all covers.

12. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Distribution Insulated Stick, Safety
  - DIS-01 Apply insulating barriers/covers and mats
  - DIS-02 Untie and retie conductors
  - DIS-12 Change suspension hardware
**DIS-Support-01  Displace and replace return wire**

**Purpose**

This procedure describes how to displace and replace a return wire for the purpose of return wire maintenance or in preparation for a pole change on the distribution network.

The return wire has the potential to become energised to the phase voltage under fault conditions. The controls in this support procedure allows for the HV live worker to displace and replace the return wire to and from its attachment point on the pole. Once the return wire has been removed from its attachment point it can be treated as an energised conductor and controlled using a pre-determined HV live work procedure.

![Figure 1: Bypass setup for a suspect or damaged return wire](image)

**Parameters**

- Return wire movement must be closely monitored and controlled at all times.
- Before untying or retying, the return wire must be securely held with a downward force.
- Insulated HV gloves rated to the highest working voltage on the structure must be worn for this procedure.
- Assess the weight to ensure manual handling techniques can be used.
- When moving the return wire to a temporary pole mounted auxiliary arm, the support and trap must be ready to receive the return wire before the return wire is untied and lifted.
- Always maintain MADs to the energised phase conductors.

**Resources**

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td>1</td>
<td>Insulated and tested Class 3 HV gloves with protective outers</td>
</tr>
<tr>
<td>1</td>
<td>Insulated EWP</td>
</tr>
<tr>
<td>1</td>
<td>Temporary bypass jumper (when required)</td>
</tr>
<tr>
<td>1</td>
<td>Strap hoist (when required)</td>
</tr>
<tr>
<td>2</td>
<td>Come-along clamps (when required)</td>
</tr>
<tr>
<td>1</td>
<td>Proximity tester (e.g. Modiewark)</td>
</tr>
<tr>
<td>1</td>
<td>Temporary conductor support, pole-mounted (when required)</td>
</tr>
</tbody>
</table>
Onsite job setup

Calculate load handling capacity

- Determine loads exerted on the HV live work equipment when performing the task.
- The calculations are used to ensure that:
  - the SWL of the equipment, crane and EWP is not exceeded
  - increases in conductor tension (when moving/relocating conductors with the HV live equipment) do not place undue strain on adjacent ties or terminations.

Site setup

- EWPs should, where possible, be positioned so that all work areas can be:
  - accessed safely
  - reached from the one site set up.
- EWPs and plant must always maintain the required MAD from conductors and other live apparatus.
- A drop zone must be established and agreed to by the HV live work team.

Clean and inspect equipment

- Clean, wipe down and inspect all equipment that is to be used.
- Items that are subject to periodic testing (e.g. insulating gloves, insulating covers and mats) must be checked to ensure that they are:
  - within test date
  - rated for the voltage to be worked on.

Inspect structure

- Carry out a visual inspection of the following prior to commencing the task:
  - the structure, lines and equipment to be worked on
  - adjacent structures.

Procedure

Remember to follow all safety requirements as listed in:
- ‘Safety’ section in High Voltage Live Work Procedures – Distribution Insulated Stick
- section 2 (Safety) in High Voltage Live Work Manual.

Important

Insulated HV gloves rated to the highest working voltage of the structure must be worn for this procedure.
Repair and displace return wire – damage identified or suspected

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.

2. Conduct a risk assessment to determine whether this procedure can be followed without the return wire breaking.
   - If the risk of the return wire breaking is high then:
     a. do not proceed with this procedure
     b. notify Network Operations
     c. arrange for an outage of the HV lines to make repairs.
   - If the repairs can be done safely, proceed to step 3.

3. Set the proximity tester to the HV setting appropriate to the phase voltage and test the return wire.
   - If the proximity tester operates (i.e. lights up or buzzes), there is a fault on the return wire in which case:
     a. do not proceed with this procedure
     b. notify Network Operations
     c. arrange for an outage of the HV lines to make repairs.
   - If the proximity tester does not operate, proceed to step 4.

4. Install the pole-mounted temporary auxiliary arm below the return wire.

5. Install the temporary bypass jumper either side of the return wire attachment point.

6. Attach come-along clamps either side of the return wire attachment point.

7. Install strap hoist between the two come-along clamps and take up a small amount of tension.

8. The return wire can now be untied and moved to the conductor trap of the pole mounted auxiliary arm. Ensure that the return wire is controlled at all times.

9. Check the condition of the return wire and make repairs as required.

10. Once repairs are complete remove the bypass jumper, strap hoist and come-along clamps.

11. The return wire can now be displaced using a pre-determined HV distribution insulated stick procedure.

12. Remove the temporary pole-mounted auxiliary arm.
Displace return wire for pole change – no damage identified

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Set the proximity tester to the HV setting appropriate to the phase voltage and test the return wire.
   - If the proximity tester operates (i.e. lights up or buzzes), there is a fault on the return wire in which case:
     a. do not proceed with this procedure
     b. notify Network Operations
     c. arrange for an outage of the HV lines to make repairs.
   - If the proximity tester does not operate, proceed to step 3.
3. Untie return wire.
4. Displace return wire using a pre-determined HV distribution insulated stick procedure.

   The MADs for the return wire can now be maintained. Treat the return wire as an energised conductor for the duration of the task.

Displace return wire for maintenance of the return wire and/or attachments – no damage identified

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Set the proximity tester to the HV setting appropriate to the phase voltage and test the return wire.
   - If the proximity tester operates, (i.e. lights up or buzzes), there is a fault on the return wire in which case:
     a. do not proceed with this procedure
     b. notify Network Operations
     c. arrange for an outage of the HV lines to make repairs.
   - If the proximity tester does not operate, proceed to step 3.
3. Install the pole-mounted temporary auxiliary arm below the return wire.
4. The return wire can now be untied and moved to the conductor trap of the pole-mounted auxiliary arm. Ensure that the return wire is controlled at all times.
5. Carry out maintenance to the return wire and/or associated hardware.

Replace return wire

1. When work is complete, ensure the return wire insulator is ready to receive the return wire.
2. Return the return wire to the insulator on the pole and tie-in. Ensure that the return wire is controlled at all times.
3. Remove temporary pole-mounted auxiliary arm (when used for maintenance).
4. Clean, wipe down and stow away all equipment.

**Important**

Insulated HV gloves rated to the highest working voltage of the structure must be worn for this procedure.

References

- High Voltage Live Work Manual, section 2 (Safe work principles).