High Voltage Live Work Procedures – Glove and Barrier
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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# 12733030)

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.
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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](image)

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 a 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

These 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 a data connection may not be available. It does not require a network or internet connection to be used (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 procedures

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 – Distribution Insulated Stick (DM# 12733098)
- 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. ‘GB-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 glove and barrier 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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<td>GAD</td>
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### Acronyms and definitions

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<th>Definition</th>
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<td>LV</td>
<td>Low voltage</td>
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<td>MAD</td>
<td>Minimum approach distance</td>
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<td>NO</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.

Glove and barrier method

The authorised HV live worker is fully insulated from earth and other phases by using:

- insulated EWPs
- two independent layers of approved insulation:
  - insulating gloves and sleeves
  - insulating barriers

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*

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.

Contents

1. General safety requirements for glove and barrier work
2. Safety observer
3. Combining procedures
4. Resource requirements
5. Personal Protective Equipment (PPE)
6. External clothing, jewellery and hair
7. Tools and equipment
8. Weather conditions
9. Rescue and emergencies
10. Control of conductors
11. Conductor loads
12. Approach distances for HV live work
13. Debriefing
14. SWER return wire
15. HV systems parallels
16. Insulating covers/barriers
17. Cast iron cable box terminations
Safety requirements

1. General safety requirements for glove and barrier work

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

- Prior to the HV live work team attending the site, an authorised person must:
  - assess the task to be performed
  - inspect the worksite
- Immediately before work begins:
  - visually inspect the integrity of the structure, adjacent structures and conductors
  - ensure that onsite hazards are identified, risks assessed and control measures are put in place and reviewed according to the hazard and risk control assessment in the risk assessment document
- Before HV live work commences:
  - always clean and inspect all PPE, tools, equipment and EWP
  - ensure that the correct permitting for the task is in place and received by the RIC
  - ensure that a safety observer and onsite person in charge are present
  - assess or calculate conductor weights and loading changes applied to structures
  - establish a drop zone
  - establish vehicle GADs
  - ensure that a plan is in place to keep the public clear of the worksite
- 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.
- MADs and GADs must be maintained.
- All work must be performed from an insulated EWP.
- EWPVs that have a telescopic boom must have the boom extended to ensure that the insulating requirement is adequate for the voltage being worked on.
- All work must be completed in accordance with the relevant HV live work procedures.
- The following must be assessed (if required):
  - electrical loading on conductors
  - conductor temperature
- Only one electrical potential may be exposed to work on by a team at any one time. All other contact points in reach must be covered.
- Where two teams are working on one structure, a minimum of two metres must be maintained between the EWP’s. In this situation two safety observers will be required.
- The minimum number of authorised personnel must be onsite at all times when the work is in progress.
- 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 must 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:

• 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 from 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.
• 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 that a change in work procedures 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.

Note

This is not to be confused with combining HV live work methods as outlined in work practice 1.3 (Combining the insulated stick method with the glove and barrier method – voltages up to 33 kV) in the High Voltage Live Work Manual.

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 the High Voltage Live Work Manual.

PPE must be worn continuously 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

Insulating gloves and sleeves:

• must be worn at all times whilst inside the contact area
• must be suitably rated for the voltage being worked on
• must be visually inspected inside and out, and a roll and air test completed, before the gloves can be used
• have little mechanical strength and must not be worn without protective leather outers
• must be correctly sized so that a minimum overlap of the gloves and sleeves is maintained during work (see Table 1, below). This includes when the HV live worker’s arm is at full extension.

Table 1: Minimum insulating rubber glove and sleeve overlap

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<tr>
<th>Glove Class*</th>
<th>Overlap (mm)</th>
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<tbody>
<tr>
<td>3</td>
<td>100</td>
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<tr>
<td>4</td>
<td>150</td>
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* Western Power only uses Class 3 and Class 4 gloves.
Protective leather outers:
- must be visually inspected for defects and contamination prior to use
- must be used with rubber gloves
- must not be used for any other purpose

6. External clothing, jewellery and hair
- External clothing must be made of fire-proofed cotton or other approved material as outlined in work practice 3.1 (Clothing and personal protective equipment requirements) in the 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 the High Voltage Live Work Manual.
- All work on HV live equipment must be carried out from an insulated EWP.
- 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.
- Tools, equipment and materials must be kept in the appropriate bags or tool trays and not laid on structures or cross-arms.
- 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 the 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 taken to avoid HV live worker fatigue.
- Work must not start or continue in excessive winds.

9. Rescue and emergencies
The following is a summary of work practice 2.13 (Rescue and emergencies) in the High Voltage Live Work Manual.
- Hazards that may be found at an HV live work site are:
  - step and touch potential
  - energised vehicles, poles and structures
  - energised or potentially energised fallen mains and equipment
  - fire
  - shattered glass or porcelain
ruptured hydraulic lines
- unsafe overhead hazards, e.g. damaged mains with potential for failure, loose overhead materials
- other live circuits in the vicinity

- Actions required in the event of an incident during HV live work are listed below.
  - Ensure your safety and that of others onsite, including the public.
  - Attend to the needs of any casualties if they can be approached without compromising your own safety and the safety of others.
  - Administer first aid as required.
  - Contact NOC:
    - Emergency switching to stop injury or damage during the emergency
      Network Operations (08) 9427 0626
    - To report an incident after the emergency has passed
      Incident Hotline 1300 CALL WP (1300 2255 97)
  - Contact emergency services (if required). For emergency contact information, see Appendix 4 (Emergency contact information) in the Work Practice Manual.
  - Report the incident to your formal leader as soon as reasonably possible.
  - Treat every part of the network as energised until proven de-energised, earthed and short-circuited.
  - 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 and insulators) in the High Voltage Live Work Manual.

- Conductors must be positively controlled when being displaced.
- Conductors must be secured before any binder or conductor clamp is removed.
- 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.
- 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 the conductor so that the free length is manageable and positively controlled.
- Unless circumstances forbid, 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.
- 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 (Conductors and insulators) in the High Voltage Live Work Manual.

- Where possible during the pre-job worksite visit, assess or calculate conductor weights and loading changes applied to structures. This will ensure that the correct method is selected and appropriate equipment is taken to the worksite.
- Before work commences, assess or calculate conductor weights and loading changes applied to structures. If the loads were calculated during the pre-job worksite visit, ensure that the calculations are correct.
12. Approach distances for HV live work

The following is a summary of work practice 8.0 (Glove and barrier method) in the *High Voltage Live Work Manual*.

**Minimum Approach Distances (MADs):**
- HV live workers must not 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.
- When there is doubt about a MAD, do one of the following:
  - measure the distance with an insulated stick (preferred)
  - visually estimate the MAD, then increase the estimated distance
- MAD distances must be marked on insulating sticks with consideration for the activity and equipment that is being used.

**Minimum air insulation to uninsulated body:**
- There are no MADs that apply to glove and barrier work because the gloved hands are in contact with the energised electrical apparatus being worked on.
- It is important, however, that HV live workers maintain a minimum of 150 mm air insulation gap between the uninsulated part of their body and the energised electrical apparatus being worked on. The air insulation must never be compromised. Reduction of the air insulation eliminates one of the two independent levels of insulation.

13. Debriefing

Once all work is complete the team must conduct a debriefing. This will include:
- signing off the permits and completing the onsite risk assessment
- notifying NOC that the live work is complete
- addressing any issues that may have occurred during the task

14. SWER return wire

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

- Approved covers must be applied to all energised apparatus and second points of contact in the work area. When applying covers, always cover the nearest and lowest conductor or equipment first. Covers must be removed in the reverse order to application. Work only on one phase or one item of equipment at a time.
- Under normal circumstances, covers 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 covers can be left in place.
- When covers have been wet by rain or dew, assess their condition and check for damage if it has been left in place overnight or longer. If only lightly wet, shake or tap the cover with an insulated stick to remove most of the water. Covers that have been thoroughly soaked or have a continuous film of water must be replaced before starting work. Dry thoroughly before using again. If in doubt, replace wet covers.
- Physical contact with covers installed on live parts must not be made by any part of the body other than that protected by insulated rubber gloves and sleeves. If accidental contact cannot be avoided, two layers of insulation must be installed.
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.
This page has intentionally been left blank.
GB-01 Apply insulating barriers/covers and mats

Purpose
This procedure describes the installation and use of temporary insulating covers on overhead distribution lines up to 33 kV.

Parameters
- The task must be completed from an insulated EWP.
- Always cover all second points of contact within reach.
- Only expose and 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>
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<tr>
<td>varies</td>
<td>Pegs and cable ties to secure mats and covers</td>
</tr>
<tr>
<td>varies</td>
<td>Insulating covers/barriers and mats – enough to cover live conductors and second points of contact</td>
</tr>
<tr>
<td></td>
<td><strong>Personnel</strong></td>
</tr>
<tr>
<td>2+</td>
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</tr>
<tr>
<td></td>
<td>• 1+ in the EWP</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</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 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

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. Where flexible insulating covers or mats without an interlocking system have to be overlapped or joined, then ensure the overlap or join provides adequate insulation, by ensuring an overlap of at least 150 mm.
4. Covering 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.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier, Safety
Purpose
This procedure describes how to untie and retie conductors on overhead distribution lines up to 33 kV.

Parameters
- Before untie or retie, the conductor must be securely held with a downward force (by hand, link stick and tag line) or secured in the wire holder of the lifting device.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
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<tbody>
<tr>
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<td><strong>Equipment</strong></td>
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<tr>
<td></td>
<td>1  Link stick and tag line</td>
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<tr>
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<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
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<td><strong>Personnel</strong></td>
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<td>HV live workers:</td>
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<td>• 2 in the EWP</td>
</tr>
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<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:
  - 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

Untie the 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. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
3. Before removing the old tie, the conductor must be securely held with a downward force by hand or link stick and live line rope or secured in the conductor trap of the lifting device.
4. When removing the old tie, it must be coiled into a small ball or cut into small lengths whilst being uncoiled.
5. Use a suitable displacement procedure to raise/displace the conductor.
6. Clean, wipe down and stow away all equipment.

Retie the 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 within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
3. The conductor tie must be prepared for application by halving the coil.
4. Wrap the tie around the insulator one complete rotation ensuring the coils are facing down and out.
5. Complete the tie, ensuring the coil of the tie is safely maintained at all times.
6. 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.
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 – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
This page has intentionally been left blank.
GB-02 Untie and retie conductors

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

Parameters
- Before untying or retying, the conductor must be securely held with a downward force (by hand, link stick and tag line) or secured in the wire holder of the lifting device.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
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<tbody>
<tr>
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<td><strong>Equipment</strong></td>
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<td>1</td>
<td>Link stick and tag line</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><strong>Personnel</strong></td>
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<td>HV live workers:</td>
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<td>• 2 in the EWP</td>
</tr>
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<td>• 1 safety observer</td>
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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:
  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:
  - 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

Untie the 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. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
3. Before removing the old tie, the conductor must be securely held with a downward force by hand or link stick and live line rope or secured in the conductor trap of the lifting device.
4. When removing the old tie, it must be coiled into a small ball or cut into small lengths whilst being uncoiled.
5. Use a suitable displacement procedure to raise/displace the conductor.

Retie the 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 within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
3. The conductor tie must be prepared for application by halving the coil.
4. Wrap the tie around the insulator one complete rotation ensuring the coils are facing down and out.
5. Complete the tie, ensuring the coil of the tie is safely maintained at all times.
6. 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.
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 – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
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GB-03 Trim trees

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

Parameters
- For MADs 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.
- The EWP should be positioned so that any falling vegetation does not fall upon the cab or bed of the EWP.
- You must not lift vegetation using the boom or bucket of the EWP. As no vegetation is allowed to be lifted by the EWP, there should be no load handling capacity issues.
- All members of the public must be kept clear of the worksite while tree trimming is in progress.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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<td><strong>Equipment</strong></td>
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<td><strong>Personnel</strong></td>
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<td>3</td>
<td>HV live workers:</td>
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<td>2 in the EWP</td>
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<td>1 safety observer</td>
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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 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

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:
   - cover the conductors. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   - 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 (maximum 300 mm).
5. Vegetation must also be cleared from around Western Power’s poles, stay wires and attachments.
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 – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
- Work Practice Manual, work practice 10.4 (Line workers doing vegetation management work)
GB-04  Fit line splices, bird diverters and spiral vibration dampers

Purpose
This procedure describes the fitting of line splices, bird diverters and spiral vibration dampers to overhead distribution lines up to 33 kV.

Parameters
- The conductor to be worked on must be visually inspected, from below and above, for excessive damage such as broken strands. If the damage found is too excessive the task must not commence.
- When applying repair line splices care must be taken as they may unravel and flick back towards the HV live worker.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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<tr>
<th>Amount</th>
<th>Item</th>
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<tbody>
<tr>
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<td>Pegs and zip ties to secure mats and covers</td>
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<td>- 1 safety observer</td>
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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 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

1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. Cover all adjacent phases, circuits and second points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
3. Confirm the area of conductor where the equipment is to be fitted is suitably prepared.
4. When installing line splices and vibration dampers as a single person task, a cable tie can be used to ensure that the end of the preform is controlled at all times.
5. Hold one half of the preform securely against the conductor whilst wrapping the other half of the preform along the conductor
6. Then complete by wrapping the other end of the preform along the conductor.
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 – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/cover and mats
GB-05  Use temporary bypass jumpers

Purpose
This procedure describes how to bridge overhead distribution lines up to 33 kV to enable the temporary bypassing of electrical current. This allows for the replacement, removal or joining of electrical conductors or apparatus.

Parameters
- Ensure that the current rating of the bypass tools or equipment have a current rating adequate for the feeder load. This will involve establishing the feeder load and peak load current from NOC.
- Temporary conductor supports or insulating covers/barriers must be used so that the temporary bypass jumper does not contact any second point of contact.
- Two layers of insulation are required where contact can't be avoided between any second points of contact. For more on this, see ‘GB-01 Apply insulating barriers/covers and mats’.
- Temporary bypass jumpers must never be used to energise or de-energise or to make and break load current.
- The temporary bypass jumper must only be used to bypass existing conductors.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.
Resources

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<th>Amount</th>
<th>Item</th>
<th>Equipment</th>
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<td>Ammeter</td>
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<td>varies</td>
<td>Insulating barriers/ covers</td>
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Personnel

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<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:
  - 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*

1. Installation
   a. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
   b. Confirm the feeder load and peak load current from NOC and check that the temporary bypass jumper current and voltage rating is adequate.
   c. Check the load using an ammeter.
   d. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   e. Clean conductors where the temporary bypass jumper connections will be made.
   f. Install insulated hanger, if required. Visually confirm the temporary bypass jumper will be bridging the same phase.
   g. Attach the temporary bypass jumper to the first connection point, ensuring that the other end of the temporary bypass jumper is securely held or connected to the insulated hanger. After this, make the second connection.
   h. Check that the temporary bypass jumper is attached to the temporary conductor support, if required, or that a second layer of insulation has been applied if the temporary bypass jumper will come into contact with any second point of contact.
   i. Measure the current in the temporary bypass jumper and confirm the presence of current.
   j. The conductor can now be removed or cut at one end and secured, or the apparatus removed.

   Carry out maintenance on the conductor or apparatus.

   **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 insulating covers/barriers.

2. Removal
   a. Confirm covering is in place.
   b. Check load current in the temporary bypass jumper using an ammeter.
   c. Reconnect the conductors or apparatus.
   d. Measure the current in the conductor or apparatus and confirm the presence of current.
   e. Install insulated hanger, if required.
   f. 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.
   g. Remove all covers, temporary conductor supports and insulated hanger, if applicable.
   h. Clean, wipe down and stow away all equipment.
References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
GB-06  Make and break bridges and taps (PG clamps)

Purpose
This procedure describes how to make and break bridges and taps (PG clamps) on overhead distribution lines up to 33kV to de-energise/re-energise the supply.

Parameters
- Electrical load must be measured and verified with NOC.
- HV live work procedures requiring the isolation 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 2A.
- 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 in 'Table 1: Maximum length of unloaded open aerial lines that can be energised or de-energised by operating open wire taps and bridges’ in work practice 8.4 (Energising/de-energising and bypassing conductors and apparatus – glove and barrier method) in 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 the HV live worker can physically see along the line.
- Where the whole length of the conductor cannot be seen then a TDO fuse must be used.
- If load current cannot be removed then suitably rated load make and break devices are to be installed to control potential arc flash hazards.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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<td><strong>Equipment</strong></td>
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<td>1</td>
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<tr>
<td>varies</td>
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High Voltage Live Work Procedures – Glove and Barrier

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<table>
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<td>• 2 in the EWP</td>
</tr>
<tr>
<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.
- 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

Breaking bridges

1. Confirm that all safety requirements, equipment checks, switching programs and permits have been checked and are in place.
2. Check the conductor electrical load with an ammeter. Permanent bonds must not be broken if the load exceeds 2A.
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 before proceeding with the work.
4. Cover all second points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.

5. Disconnect from the energised conductor:
   - If the conductor is to be totally removed:
     a. hold the bridge firmly
     b. cut conductor away from both ends of attachment
     c. remove conductor and stow safely for future use.

   **Note**
   If the bridges will be replaced at a later date, mark which phase they came from and store safely ready to reconnect. This will ensure you have the correct length of conductor used.

   - If the conductor is to be tied back – shape and fold the conductor back on itself and secure using PG clamps or rated cable ties.

6. Remove the covering if the bridge break is for a sustained period.

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

**Making bridges**

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

2. Bridges must not be installed under load conditions.

3. Cover all second points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.

4. Conductor contact points must be cleaned.

5. Connect to the energised conductor:
   - For conductors that have been removed – using approved connections, connect the bridge to the de-energised conductor and, holding the bridge securely, connect to the energised conductor.
   - For conductors that have been tied back – release the bridge while holding securely then connect to the energised conductor using approved connections.

6. Remove covering.

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

   **Note**
   Where taps are used to break and make the connection, the above no load checks must be completed.

**References**

- High Voltage Live Work Manual:
  - section 2 (Safe work principles)
  - work practice 8.4 (Energising/de-energising and bypassing conductors and apparatus – glove and barrier method)

- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
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GB-07  Energise overhead mains with a TDO fuse

Purpose
This procedure gives detailed instructions on how to energise overhead distribution lines, up to 22 kV, with a TDO fuse.

Parameters
- The TDO fuse is used to energise overhead mains to prove that no fault conditions exist before the connection is made.
- The maximum size fuse that can be fitted into the unit is 25 A.
- Must not be used on 33 kV systems.
- Never operate a drop-out device by the gloved hand only. An insulated operating stick must be used.
- Always connect the temporary bypass jumper to the de-energised part of the circuit first so that limited time is spent handling an energised temporary bypass jumper.
- The energising/de-energising of overhead conductors may only be performed under the instruction of a switching program.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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<td>TDO fuse</td>
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<tr>
<td>1+</td>
<td>Temporary bypass jumper</td>
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<tr>
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<tr>
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<td>Insulating barrier/cover – enough to cover live conductors and second points of contact</td>
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|        | **Personnel**                                                        |
|        | 3  HV live workers:                                                  |
|        | • 2  in the EWP                                                      |
|        | • 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 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

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 ‘GB-01 Apply insulating barriers/cover and mats’.
3. Clean the conductor and connect the TDO fuse unit onto the overhead line, ensuring the TDO fuse is open.
4. A temporary bypass jumper is connected between the tee bar of the TDO fuse and the point of supply.
5. For a three phase system repeat steps 3 and 4 for the other two phases.
6. The fuse barrel or barrels can now be closed using an insulated operating stick to energising the circuit in accordance with the switching program.

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

7. The connection/connections between the overhead line and the point of supply can now be made.
8. Remove temporary bypass jumpers and TDO units.
9. Remove covers.
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 – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
This page has intentionally been left blank.
GB-08  Change HV fuses

Purpose
This procedure gives detailed instructions on how to change HV fuses and fuse units, up to 22 kV, with a TDO.

Parameters
- TDO fuses must be used when changing HV fuses so that the supply can be maintained and protection still provided.
- The maximum size fuse that can be fitted into the unit is 25 A.
- TDO fuses must not be used on 33 kV systems.
- Never operate a TDO by the gloved hand only. An insulated operating stick must be used.
- The TDO fuse must never be used to make or break load current when changing HV fuses or fuse units.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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<td>Insulated barrier/cover – enough to cover live conductors and second points of contact</td>
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<td>3</td>
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HV live workers:
- 2 in the EWP
- 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 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

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 within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
5. Secure existing expulsion drop-out fuse unit with a cable tie.
6. Clean the conductor and connect the TDO fuse unit onto the overhead line, ensuring the drop-out fuse is open.
7. A temporary bypass jumper is connected between the tee bar of the TDO fuse unit and the other side of the HV fuse.
8. The fuse barrel can be closed, using an insulated operating stick.
9. Measure the current in the temporary bypass jumper and confirm the presence of current.
10. The HV fuse or fuse unit can now be replaced.
11. Ensure that the expulsion drop-out fuse of the new unit has been secured with a cable tie.
12. Open the fuse on the TDO fuse.
13. Remove temporary bypass jumper.
14. Remove TDO fuse unit.
15. Remove cable tie from new fuse unit.
16. Remove covers.
17. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulated barriers/covers and mats
GB-09  Use inline isolators

Purpose
This procedure describes the installation of inline isolator links using helical dead-ends. Inline isolators are installed to isolate sections of the network allowing work to be carried out under EAPs.

Parameters
- Inline isolators must:
  - have a valid test date which will not expire during the period that they are installed
  - be inspected for damage prior to each use
  - be stored and transported in a manner which ensures the equipment is not exposed to excess moisture, dust, abrasion or any other deteriorating effects.
- When fitting the inline isolator, ensure that the link opens towards the de-energised side.
- Electrical load must be measured and must not exceed 200A.
- When using dead end wraps they must be new and in good condition. Never re-use old dead end wraps.
- The assembly components can be constructed on the line if weight is a problem.
- The maximum time an inline isolator can be installed is 90 days.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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<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.
- 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

Isolator installation
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Electrical load must be measured (do not exceed 200A).
3. Inline isolators must be installed:
   - as close as possible to the cross-arm to prevent excess conductor movement
   - in a staggered configuration to prevent the blades from breaching the phase-to-phase clearances when in the open position
   - with the blade opening towards load side (de-energised side).
4. For three-phase systems, if the MAD can’t be maintained, follow ‘GB-01 Apply insulating barriers/coveres and mats’ to cover adjacent phases not being worked on and second points of contact.
5. Suspend the isolator on the conductor using the opposing hooks, ensuring the blade opens towards the load side (de-energised side).
6. Connect each end of the isolator to the conductor.
7. The turnbuckle ratchet is wound to take up the conductor tension.
8. Apply integrated jumpers to the conductor as close as possible to both of the dead-end eyes. Ensure connections are tight.
9. Confirm the blade is closed and secure with a cable tie.
10. Confirm the presence of load in the integrated jumper.
11. Cut conductor between last insulating skirts.
12. Secure tails using cable ties back along conductor being careful not to birdcage conductor.
13. Secure tails using cable ties back along conductor being careful not to birdcage conductor.
14. If MADs can’t be maintained, follow ‘GB-01 Apply insulating barriers/covers and mats’ to cover isolator with insulating mat ensuring second points of contact are insulated before installing isolators on adjacent phase.

Repeat above procedure for all phases.

15. Remove mats and covers from the overhead distribution lines.
16. Clean, wipe down and stow away all equipment.

Note
Once isolators have been installed, they can only be operated as part of a switching program.

Isolator removal
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. If MADs can’t be maintained, follow ‘GB-01 Apply insulating barriers/covers and mats’ to cover isolators and ensure second points of contact are insulated before removing isolators on adjacent phases.
3. Inspect inline isolators for integrity of connections and confirm blades are closed. Secure isolator blades with cable ties.
4. Apply the compression sleeve to the short side conductor tail and crimp.
5. Draw up additional slack in conductor to allow crimping tool access.
6. Controlling longer tail, insert conductor into tension joint and crimp.
7. Release tension on conductor using ratchet or turnbuckle.
8. Remove integrated jumpers and secure to isolator.
9. With the isolator suspended on the conductor using the opposing hooks, the preformed dead-end can be removed.
10. Remove isolator from the conductor.
11. Repeat for all phases.
12. Remove mats and covers from the overhead distribution line.
13. Clean, wipe down and stow away all equipment.

References
- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Manual, section 8.3 (Inline isolators)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
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GB-010 De-energise and energise underground cables directly connected to an overhead conductor

Purpose
This procedure describes how to de-energise/energise underground cables on voltages up to 33 kV.

Parameters
- No work can be carried out on poles that have old style cast iron cable termination boxes.
- Where possible, the underground cable must be isolated from all sources of load.
- The cable to be de-energised/energised must be less than 1.0 km in length.
- De-energising/energising an underground cable must only be performed under the instruction of a switching program and under the direct supervision of a switching operator.
- A TDO must be used to re-energise the cable and de-energise a cable where transformer windings are connected.
- Temporary bypass jumpers are only classed as single insulated.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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<tr>
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<td>• 1 safety observer</td>
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<td></td>
<td>• 1 ground worker</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 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*

De-energise cable no load
1. Confirm that all safety requirements, conductor electrical loads, equipment checks and permits have been checked and are in place.
2. Confirm there is no load present with an ammeter.
3. Cover conductors and all second points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
4. Check that the switching operator is witnessing the operations and that the disconnection is okay to go ahead.

5. Remove bridges to the cable box. Follow ‘GB-06 Breaking and making bridges or taps’.

6. Disconnect the conductor:
   - If the conductor is to be totally removed:
     a. hold and secure the bridge firmly
     b. cut conductor away from both ends of attachment
     c. remove conductor and store safely for possible reuse
   - If the conductor is to be tied back – shape and fold the conductor back and secure to the overhead conductor that it is connected to. Use either PG clamps or rated cable ties.

7. Repeat for all phases.

8. Remove covers and barriers

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

**Note**

If a clamp is not used, 9 mm cable ties can be used.

---

**De-energise cable with transformer load**

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

2. Check and record the load with an ammeter.

3. Cover conductors and all second points of contact. Follow ‘GB-01 Apply insulating barriers/cover and mats’.

4. Check that the switching operator is witnessing the operations and that the disconnection is okay to go ahead.

5. Fit TDO fuse units to the overhead conductor, ensuring the fuse is not installed (open).

6. Fit temporary bypass jumper between the TDO fuse, load side, and the underground cable dropper lead.

7. Repeat steps 2 to 6 for all other phases.

8. Ensure the TDO fuse is fitted with a maximum 25 A fuse element.

9. Using an insulated operating stick, install all three fuses then secure the fuses with a cable tie.

10. Disconnect the conductors:
    - If the conductors are to be totally removed:
      a. hold and secure the bridge firmly
      b. cut conductor away from both ends of attachment
      c. remove conductor and store safely for possible reuse
    - If the conductors are to be tied back – shape and fold the conductor back and secure to the overhead conductor that it is connected to. Use either PG clamps or rated cable ties.

11. Remove the cable ties from the fuse and, using an insulated operating stick, open all three fuses.

12. Remove the temporary bypass jumper and TDO fuse from all phases.

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

**Note**

Where transformer load is present, a load box may be required at the low voltage side of the transformer.
Energise cable with a TDO

1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. Cover conductors and second points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
3. Fit TDO fuse units to the overhead conductor, ensuring the fuse is not installed (open).
4. Ensure the TDO fuse is fitted with a maximum 25 A fuse element.
5. Fit temporary bypass jumper between the TDO fuse, load side, and the underground cable dropper leads, leaving enough tail to connect to the main line.
6. Repeat steps 3 to 5 for all phases.
7. Check that the switching operator is witnessing the operations and that the cable is ready to energise.
8. Using an insulated operating stick, install all three fuses.
9. Using an insulated operating stick, close each TDO fuse on all phases.
10. Secure each TDO fuse with a cable tie.
11. Connect each permanent bridge to the respective overhead conductor and underground cable in turn on all phases.
12. Remove the cable tie from the fuse and, using an insulated operating stick, open all three fuses.
13. Remove the temporary bypass jumper and TDO fuse from all phases.
14. Clean, wipe down and stow away all equipment.

Note
Where underground cables are connected to the overhead conductors through a rated switch, the switch should be used to de-energise and re-energise the cable. The live work component of the task is the reconnection and disconnection of the bridging cable.

References
- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
  - GB-06 Breaking and making bridges or taps
GB-11 **Fit and remove temporary polymeric insulator with turnbuckle**

**Purpose**

This procedure describes how to install polymeric insulators into conductors to make temporary points of isolation on distribution poles, up to 33 kV.

![Figure 1: Installed temporary polymeric disc with turn buckle](image)

**Parameters**

- The insulator must be installed so that when the cable is cut it isolates the supply to a normal open point or point of isolation.
- 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 in 'Table 1: Maximum length of unloaded open aerial lines that can be energised or de-energised by operating open wire taps and bridges' in work practice 8.4 (Energising/de-energising and bypassing conductors and apparatus – glove and barrier method) in 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 the HV live worker can physically see along the line.
- Only use insulators that are:
  - tested or new and unused
  - rated electrically and mechanically for the voltage that is being work on
- When cutting the conductor, the longest end must be on the de-energised side.
- No load is to be broken when the conductor is cut.
- No load is to be connected when the conductor is re-joined.
- Always cover all second points of contact within reach.
- Only expose and 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 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

Resources

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<td>- 1 safety observer</td>
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Procedure

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

Installation

1. Confirm that all safety requirements, conductor loads removed, equipment checks and permits have been checked and are in place.
2. The line must be tested with an ammeter to prove that no load greater than 2 A will be broken.
3. For three-phase systems, if MADs can’t be maintained, follow ‘GB-01 Apply insulating barriers/covers and mats’ to cover adjacent phases not being worked and second points of contact.
4. Whilst one person holds the insulator and turnbuckle ratchet, wrap preform deadend to one side of the insulator and then install the second preform deadend to the other side.

5. The turnbuckle ratchet is wound to take up the conductor tension.

6. Cut conductor so that the longer end of the conductor is on the de-energised end.

7. Secure longer tail using cable ties back along conductor, being careful not to birdcage conductor.

8. If MADs can’t be maintained, follow ‘GB-01 Apply insulating barriers/covers and mats’ to cover insulator, turnbuckle and second points of contact before installing the temporary polymeric disc on adjacent phase.

9. Repeat above steps for all phases.

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

**Removal**

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

2. If MADs can’t be maintained, follow ‘GB-01 Apply insulating barriers/covers and mats’ to cover insulator, turnbuckle and second points of contact before removing insulator and turnbuckle on adjacent phases.

3. The conductor must not be re-joined under load conditions.

4. Apply the joint to the short side conductor tail and crimp.

5. Draw up additional slack in conductor to allow crimping tool access.

6. Controlling longer tail, insert conductor into tension joint and crimp.

7. Release tension on conductor using turnbuckle.

8. Unwrap and remove deadends and remove insulator and turnbuckle.

9. Repeat above steps for all phases.

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 – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
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GB-12  Recover and erect poles

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

Parameters
- Where a MAD of 1200 mm from the bare conductor to the pole or mobile plant cannot be maintained, one layer of insulation must be applied, reducing the MAD to 450 mm. If a 450 mm MAD cannot be maintained, two layers of insulation must be applied. For more on this, see ‘GB-01 Apply insulating barriers/overs and mats’.
  - This can be achieved by applying covers to conductors, pole or both.
  - Spiral link sticks and 16 mm tag lines can be attached to the conductor cover to allow for the covering to be moved as required. Alternatively you can apply two layers of insulation around the conductor and attach the tag line to the covers.
- An assessment must be carried out on the levels of covering required to complete the 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/recovery must be carried out under the control and direction of a safety observer and a dogger.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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<td>16 mm tag lines, if required</td>
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<tr>
<td>varies</td>
<td>Insulating barriers/overs – enough to cover live conductors and second points of contact</td>
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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*

Note
Where MADs will not be breached then no covering of second points of contact is required.

Recover pole
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. The crane and lifting equipment used in the erection or recovery of the pole must be assessed before the lift commences.

3. If the conductors have been lifted the extra weight of the covering must be taken into consideration.

4. Confirm that an appropriate procedure has been used to raise or spread the conductors.

5. Cover all second point of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.

6. Attach spiral link sticks and 16 mm tag lines to covering as required.

7. 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.

8. A hydraulic pole jack must be used when removing a pole from the ground.

9. Manoeuvre the pole away and down from the live conductors.

10. Where the pole is controlled by personnel from the ground, insulating gloves rated to the highest voltage of the pole must be worn if a MAD of 1200 mm cannot be maintained.

11. The covering may be repositioned using the tag line and spiral link sticks as required.

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

**Erect pole**

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

2. The crane and lifting equipment used in the erection or recovery of the pole must be assessed before the lift commences.

3. If the conductors have been lifted the extra weight of the covering must be taken into consideration.

4. Determine a suitable displacement procedure that will be used to raise the conductors.

5. Determine the height of the conductors and the pole to be planted to determine which HV live work procedure will be adopted to displace or spread the conductors, as required.

6. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.

7. Attach spiral link sticks and 16 mm tag lines to covering as required.

8. Position the lifting boom and pole in the most appropriate position.

9. Determine the point of balance of the pole and place the chain around the pole to make the pole butt-heavy for the lift.

10. As soon as possible, support the pole in the mechanical pole scissors attached to the boom.

11. Manoeuvre the pole into position and plant into the pole hole.

12. Where the pole is controlled by personnel from the ground, insulating gloves rated to the highest voltage of the pole must be worn if a MAD of 1200 mm cannot be maintained.

13. The covering may be repositioned using the tag line and spiral link sticks as required.

14. Pole hole to be back filled to secure pole into position prior to removing the lifting boom.

15. Determine a suitable procedure to be used to secure the conductors on to the new pole.

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

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
GB-13  Change pole-top switch or switch pole

Purpose
This procedure describes how to change a closed pole-top switch or switch pole on voltages up to 33 kV.

Figure 1: Switch replacement

Parameters
- 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 temporary bypass jumper. For more on this, see ‘GB-05 Use temporary bypass jumpers’.
- Temporary bypass jumpers must not be used to make or break load.
- The temporary bypass jumper must be of sufficient load carrying capacity.
- Work must only take place on one potential at a time.
- The method of displacing the conductors must be established before work commences.
- This procedure is carried out using one or two glove and barrier teams working simultaneously from two EWPs on one phase at a time.
- The preferred method is to work on the outside conductor, the middle conductor and finally the last outside conductor. When reconnecting the conductors, the reverse sequence for displacing the conductors should be used.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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</table>
### High Voltage Live Work Procedures – Glove and Barrier

#### Amount | Item
--- | ---
3 | Lengths of conductor, same conductor type and size as existing
6 | Tension sleeves
2 | Crimping tools
1 | Ammeter
varies | Pegs and cable ties to secure mats and covers
varies | Insulating barriers/covers – enough to cover live conductors and second points of contact
1 | Crane, including:
  - 1 pole puller
  - 1 pole chain
  - portable earth lead

### Personnel
- HV live workers:
  - 4 (2 in each EWP)
  - 1-2 safety observers (2 required if 2 EWPs are used)
- 1 dogger

### Note
- If work is carried out from 2 EWPs then a 2000 mm gap between the EWPs must be maintained and each crew will require a safety observer.
- When one EWP is used, a minimum of 4 HV live workers are required for a pole change.

#### 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:
  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 (Safety) in High Voltage Live Work Manual

1. Join and displace conductors
   a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
   b. Confirm the switch is locked in the closed position.
   c. Visually inspect the switch and conductors for any signs of damage or burning.
   d. Electrical loads must be taken and verified with NOC.
   e. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   f. Cut and prepare a suitable length of conductor by:
      • applying two layers of insulating covering to the centre section of conductor
      • rolling up each end of the conductor and securing it
   g. The double insulated section of the conductor is secured to the switch frame and the remaining conductor is secured along the existing conductor using cable ties.
   h. Using a strap hoist with a come-along attached at each end, attach one come-along to the new conductor and one to the existing, ensuring there is no slack in the strap hoist.
   i. Clean and attach a temporary bypass jumper to the new and existing conductors. Follow ‘GB-05 Use temporary bypass jumpers’.
   j. At the other side of the switch, unroll the conductor and, using a strap hoist with a come-along attached at each end, attach one come-along to the new conductor and one to the existing and take up tension on the strap hoist.
   k. Clean and attach a temporary bypass jumper to the new and existing conductors.
   l. Tension can now be taken up on the strap hoists until the insulators on the switch are no longer under tension.
   m. The existing conductor can now be cut and joined to the new conductor at each end.
   n. The existing conductor and cable ties can be removed.
   o. Remove both temporary bypass jumpers.
   p. Release tension on both strap hoists and remove.
   q. The conductor can now be displaced and secured away from the switch.
   r. Steps f to q must be repeated on the centre and second outer phase.
2. Replace conductors and reconnect the switch

There are two methods that can be applied to restore the conductors to the switch.

**False bridge method**

a. Confirm that the switch is closed and locked before starting to reconnect.
b. Cover all second points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
c. Move the centre phase conductor back into position on the switch frame ensuring that the conductor is double insulated.
d. Connect the insulator to the conductor using preform deadends.
e. Connect the false bridges to the switch (female side) and raiser bar (male side) and then to the cleaned conductor.
f. Take up conductor tension using a strap hoist before cutting the conductor to eliminate shock loading on the switch.
g. The tension on the conductor can be released.
h. Remove the redundant conductor from the switch.
i. Steps a. to h. must be repeated on the outer phases.
j. Once all phases are connected, all insulating coverings can be removed.
k. Clean, wipe down and stow away all equipment.

**Continuous bridges method**

a. Confirm that the switch is closed and locked before starting to reconnect.
b. Cover all second points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
c. Move the centre phase conductor back into position on the switch frame, ensuring that the conductor is double insulated.
d. Connect the insulator to the conductor using preform dead ends.
e. Take up conductor tension using a strap hoist before cutting the conductor to eliminate shock loading on the switch.
f. Install a temporary bypass jumper.
g. Cut conductor and connect each tail to the switch.
h. The tension on the conductor can be released.
i. Steps a to h must be repeated on the outer phases.

j. Once all phases are connected, all insulating coverings can be removed.

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

### Note

The sequence to displace and replace the conductors can be determined onsite, according to the onsite situation.

### References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/cover and mats
  - GB-05 Use temporary bypass jumpers
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GB-14 Maintain or repair switches

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

Parameters
- The operational state of the switch must not be changed. If the switch is in a closed position it must be bypassed and if the switch is in the open position no bypassing of the switch is allowed.
- 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 temporary bypass jumper.
- Temporary bypass jumpers must not be used to make or break load.
- The temporary bypass jumper must be of sufficient load carrying capacity.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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<th>Description</th>
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</tr>
<tr>
<td></td>
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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 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

Maintain switches – 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 NOC.
5. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
6. Clean the conductor where the temporary bypass jumpers will be connected. Follow ‘GB-05 Use temporary bypass jumpers’.
7. Attach the temporary bypass jumper to either side of the switch, ensuring the corresponding phases are connected.
8. Measure the current in the bridge and confirm the presence of current.

Repeat steps 6 to 8 for the other phases.
9. Unlock and open the switch open.
10. Remove bridges from one or all three phases from one side of the switch (depending on the maintenance to be undertaken).
11. To completely isolate the switch, both sides of the switch will require all the bridges to be removed.
12. Remove and secure all three bridges on second side of the switch (if required depending on the maintenance to be undertaken).

Carry out maintenance or repairs.

13. Check the switch operation.
14. Clean points of contact.
15. Reconnect all the switch bridges that were disconnected.
16. Close and lock the HV switch.
17. Remove temporary bypass jumpers.
18. Remove all equipment and insulating covers.
19. 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 insulating barriers.

Maintain switches – 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 all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
5. Remove bridges from one or all three phases from one side of the switch (depending on the maintenance to be undertaken).
6. To completely isolate the switch, both sides of the switch will require all the bridges to be removed.
7. Remove and secure all three bridges on second side of the switch (if required depending on the maintenance to be undertaken).

Carry out maintenance or repairs.

8. Check the switch operation.
9. Confirm that the switch is open and locked.
10. Clean points of contact.
11. Reconnect all the switch bridges that were disconnected.
12. Remove all equipment and insulating covers.
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 – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
  - GB-05 Use temporary bypass jumpers
GB-15  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 the surge diverters must be isolated from all sources of supply before replacing.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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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 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

1. Removal
   a. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
   b. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’
   c. Disconnect all surge diverters from the overhead conductor, using wire holding sticks and cutters.
   d. Once the active of the surge diverter has been disconnected, it must be discharged to earth.
   e. Repeat steps c and d for all other phases.
   f. All porcelain surge diverters must be replaced.
2. **Replacement**
   a. Confirm that the new surge diverters are correctly rated and tested prior to installation.
   b. Install the surge diverter and confirm that it is bonded to earth.
   c. 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.
   d. Permanently connect the bridge to the conductor.
   e. Repeat steps c and d for all other phases.
   f. Clean, wipe down and stow away all equipment.

**References**
- High Voltage Live Work Manual
  - section 2 (Safe work principles)
  - 8.4 Replacing surge diverters
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
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GB-16  Repair tensioned conductor

Purpose
This procedure describes how to repair conductors under tension on the distribution system up to 33 kV.

Parameters
- The effects of the increased tension applied to the conductor and fittings being worked on must be considered.
- Consideration must be given to the increase or decrease of the conductor sag.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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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 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

1. Confirm that all safety requirements, conductor loads, 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. Check the extent of damage to the conductor to ensure that this task can be done safely using HV live working procedures. If in many doubt make arrangements to de-energise the lines and carry out repair to the conductor.
4. Recheck the load using an ammeter.
5. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’. Only one potential to be exposed and worked on at one time.
6. Attach two come-along clamps either side of where the conductor is to be repaired and place the tensioning device between the come-along clamps.
7. Take up tension using the tensioning device.
8. Clean conductors where the temporary bypass jumper connections will be made.
9. Install temporary bypass jumper across section of conductor to be worked on.
10. Attach the temporary bypass jumper to the first connection point, ensuring that the over end of the bypass is securely held, and then make the second connection to the conductor.

11. Measure the current in the temporary bypass jumper and confirm the presence of current.

12. Take up extra tension in the conductor, enough to make repair.

13. The conductor can now be cut and repaired.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Join the conductors together using one of the following:</td>
</tr>
<tr>
<td>• the correctly sized joiner sleeve and dies for the conductor that is being repaired</td>
</tr>
<tr>
<td>• the correctly sized, full tension helical splice for the conductor that is being repaired</td>
</tr>
</tbody>
</table>

14. Remove tension from the tensioning device, remove device and come-along clamps.

15. Remove temporary bypass jumper

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

**Repeat steps 5 to 16 for any other phases that require repair.**

**References**

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
GB-17  Change tension insulator

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

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 insulators are not bridged 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 450 mm of insulation.
- Always cover all second points of contact within reach.
- Only expose and 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>1</td>
<td>Nylon sling</td>
</tr>
<tr>
<td>1</td>
<td>Spiral link stick or strain link stick with 450 mm of insulation</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 – enough to cover live conductors and second points of contact</td>
</tr>
</tbody>
</table>

|        | **Personnel**                                   |
| 3      | HV live workers:                               |
|        | • 2 in the EWP                                 |
|        | • 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 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

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 ‘GB-01 Apply insulating barriers/covers and mats’.
3. Attach nylon sling around cross arm.
4. Place come-along clamp onto the conductor at a distance away from the insulator to allow for the spiral link stick and extended tensioning device to be attached.
5. Attach the link stick to the nylon string.
6. Place covers over the cross-arm and conductor.
7. Place the tensioning device between the link stick and come-along clamp.
8. Cover the link stick end and metal end of the tensioning webbing strap. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
9. Take up tension with the tensioning device until there is enough slack to detach the insulators.
10. Place insulating cover on the conductor between the insulator and come-along to ensure a safe work area.

11. When detaching the conductor from the insulator, the conductor must be supported so that it does not swing free.

12. Replace the insulators and slacken the tensioning device.

13. Remove the tensioning device from the come-along clamp first, and then from the link stick.

14. Remove come-along clamp, link stick, nylon sling and covers.

15. Repeat as necessary for other phases.

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

Figure 2: Link stick and tensioning device with second points of contact covered

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
GB-18   Change suspension hardware

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

Parameters
- The effects of the increased tension applied to the conductor and fittings being worked on must be considered.
- Consideration must be given to the increase or decrease of the conductor sag.
- A suitable lifting HV live work procedure must be determined before work commences.
- Always cover all second points of contact within reach.
- Only expose and 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>varies</td>
<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulating barriers/covers – enough to cover second points of contact</td>
</tr>
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<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</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*

Insulators

1. Insulator disconnection
   - a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
   - b. Determine a suitable displacement procedure from this manual to be used to raise the conductor.
   - c. Cover all second points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   - d. Secure conductor in the wire holder or attach link stick.
   - e. Remove split pin and loosen the nut on the clevis bolt whilst the tension is still on the insulator.
   - f. If necessary, raise the conductor so that the conductor clamp becomes slack.
   - g. The conductor can now be lowered and moved to provide a safe work area to carry out the insulator/hardware change.

2. Insulator reconnection
   - a. Move conductor back into position.
   - b. Attach the suspension clamp and reinstate the clevis bolt.
   - c. Lower the conductor so that the tension is applied to the insulator.
   - d. Replace the clevis bolt and nut and replace the split pin.
   - e. Detach the conductor from the wire holder or sticks and remove lifting device.
   - f. Clean, wipe down and stow away all equipment.

Conductor clamps

1. Conductor clamp removal
   - a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
   - b. Determine suitable displacement procedure from this manual to be used to raise the conductor.
   - c. Cover all second points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   - d. Secure conductor in the wire holder or attach link stick.
   - e. Remove the conductor U-clamp bolts from under the conductor clamp.
   - f. Remove the U-clamps and conductor tongue.
   - g. Remove split pin or loosen the nut on the clevis bolt whilst the tension is still on the insulator.
   - h. If necessary, raise the conductor so that the conductor clamp becomes slack.
   - i. The conductor can now be lowered and the conductor clamp changed.
2. **Conductor clamp application**
   
a. Move conductor back into position.

b. Attach the suspension clamp and reinstate the clevis bolt to attach the conductor clamp to the insulators.

c. Lower the conductor so that the tension is applied to the conductor clamp.

d. Replace the conductor tongue and U-clamps over the conductor.

e. Tighten the nuts on the U-clamps.

f. Detach the conductor from the wire holder or sticks and remove lifting device.

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

**References**

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
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GB-19  Change RDA insulator

Purpose
This procedure describes how to displace conductors on RDA distribution poles, up to 33kV, to enable insulator replacement.

Parameters
- Position the EWP on the outside of the angle where possible so that the bucket can reach both sides of the pole. If it is not possible to do this then the EWP may need to be repositioned.
- Link sticks with minimum insulation of 450mm must be used. Two smaller link sticks can be used as long as the combined insulation is equal to or greater than 450mm.
- Check that the 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 all second points of contact within reach.
- Only expose and 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>Snubbing bracket</td>
</tr>
<tr>
<td>2</td>
<td>Slings</td>
</tr>
<tr>
<td>2</td>
<td>Strap hoist</td>
</tr>
<tr>
<td>2</td>
<td>2 x 450mm link sticks or 4 x smaller link sticks</td>
</tr>
<tr>
<td>2</td>
<td>Come-along clamps</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/cover - enough to cover live conductors and second points of contact</td>
</tr>
</tbody>
</table>
### High Voltage Live Work Procedures – Glove and Barrier

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>3*</td>
<td>HV live workers:</td>
</tr>
<tr>
<td></td>
<td>• 2 in the EWP</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
</tr>
<tr>
<td></td>
<td>* 1+ ground worker required when using the ‘Live work rope and tensioning device method’</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*

**Change insulator**

1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Cover conductors and all second points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
3. Position EWP to install the snubbing bracket or slings and secure in place.
4. At one side of the pole, attach link stick to the snubbing bracket or sling and attach the strap-hoist to the link stick.
5. Support the strap hoist and spiral link stick and attach the come-along clamp to the conductor, take up slack with the strap-hoist and apply a small amount of tension to the conductor.
6. Set up a strap-hoist and link stick with come-along clamp on the same conductor on the opposite side of the pole.
7. The conductor must be observed in the adjacent spans at all times to ensure MADs are maintained.
8. Apply equal tension to each strap hoist until the insulators sag enough to release the split pin on the conductor clamp.
9. Remove the holding pin, detach the conductor clamp from the insulator string and control the insulators as they fall away from the conductor. Follow ‘GB-18 Replace suspension hardware’.
10. The new insulator discs can now be placed into the eye bolt. If working inside the angle of the conductors, use an insulated stick to lift the insulators up to the conductor clamp and reinstall the holding pin and split pin. If the insulators can be controlled at the live end, the insulator can be moved into position with a gloved hand.
11. When the conductor is secure, the tension on the conductors can be released and the come-along clamps removed from the conductor.

Repeat steps 2 to 11 for all phases that require insulator changes.

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

**Alternative rigging methods**

**Live work rope and tensioning device method**

1. Attach a snubbing bracket or sling to the pole and affix a running block.
2. Secure the polypropylene rope to a link stick and apply the link stick to the line, directly as shown in Figure 3 or via come-along clamps, as shown in Figure 2.
3. Locate the rope in the running block.
4. Apply a second snubbing bracket or sling at the base of the pole and attach the strap-hoists, as shown in Figure 4.
5. Attach the polypropylene rope to the strap-hoist.
6. When tension is applied via the strap-hoist, the conductor is pulled towards the pole slackening the tension on the insulator allowing for the insulator to be changed.

![Figure 2: Secure rope via come-along clamps](image-url)
Figure 3: Secure rope directly

Figure 4: Attach strap-hoists at base of the pole

**Strap hoist and link stick method**

1. Attach a snubbing bracket or sling to the pole.
2. Attach a link stick to the snubbing bracket or sling.
3. Attach two come-along clamps to the conductor each side of the conductor clamp.
4. Fully extend a strap-hoist and secure the strap in the link stick hook.
5. Attach each end of the strap hoist to the come-along clamps.
6. Apply tension to the strap hoist. This will pull the conductor towards the pole, slackening the tension on the insulator, allowing for the insulator to be changed.

**References**

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/cover and mats
  - GB-18 Replace suspension hardware
GB-20  Change RDA pole – angle bridle method

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

Parameters
- Maximum conductor weight to be lifted/pushed with the gin pole and angle bridle is 300kg.
- Guard tool must be fitted to the gin pole arm.
- This procedure is a combination of glove and barrier, and distribution insulated stick methods.
- 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 all second points of contact within reach.
- Only expose and 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>Twin-wheeled angle bridle</td>
</tr>
<tr>
<td>1</td>
<td>Gin pole-mounted wire catcher</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 live conductors and second points of contact</td>
</tr>
</tbody>
</table>
Table 1: Maximum permitted bay lengths for voltage and construction type

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Pole construction either side of RDA</th>
<th>RDA pole construction</th>
<th>Maximum bay length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>22kV</td>
<td>DCSH: H01-1 Standard cross-arm</td>
<td>DCSH H6 - RDA 900mm</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>DCSH: H01-1 Standard cross-arm</td>
<td>DCSH H7 - RDA 1200mm</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>DCSH: H01-3 Anti-swan cross-arm with long raiser</td>
<td>DCSH H6 - RDA 900mm</td>
<td>175</td>
</tr>
<tr>
<td></td>
<td>DCSH: H01-3 Anti-swan cross-arm with long raiser</td>
<td>DCSH H7 - RDA 1200mm</td>
<td>200</td>
</tr>
<tr>
<td>33kV</td>
<td>DCSH: H01-1 Standard cross-arm</td>
<td>DCSH H6 - RDA 900mm</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>DCSH: H01-1 Standard cross-arm</td>
<td>DCSH H7 - RDA 1200mm</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>DCSH: H01-3 Anti-swan cross-arm with long raiser</td>
<td>DCSH H6 - RDA 900mm</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>DCSH: H01-3 Anti-swan cross-arm with long raiser</td>
<td>DCSH H7 - RDA 1200mm</td>
<td>175</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

<table>
<thead>
<tr>
<th>Remember to follow all safety requirements as listed in:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Safety</td>
</tr>
<tr>
<td>- section 2 (Safety) in <em>High Voltage Live Work Manual</em></td>
</tr>
</tbody>
</table>

1. Position plant and EWP
   a. The new pole must be planted to the side of the existing pole.
   b. It is easier to replace the pole if the new pole is planted higher than the existing pole.
   c. The old pole should be checked to see if it is plumb. If the pole is leaning, the new pole should be
      planted on the side that the old pole is leaning away from.
   d. The EWP with gin pole and twin-wheeled angle bridle must be set up within the conductor angle so
      that the rear of the EWP is in line with the internal bisection of the angle.
   e. Position a second EWP at the rear of the angle to affix insulators and pole hardware as required.

2. Pole change
   a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been
      checked and are in place.
   b. Work must start on the top phase first.
   c. Fit new armour rods at the new conductor clamp position. Follow ‘GB-31 ‘Fit armour rods’. If
      possible, the old armour rods should be left in position.
d. Extend the gin pole with the angle bridle attached and the conductor safety pins removed.
e. Position the bridle so that the conductor clamp is within the two rollers and the conductors are within the conductor traps.
f. Replace the conductor safety holding pins.
g. Extend the gin pole. Tension is removed from the insulators and they become slack.
h. The conductor must be observed in the adjacent spans at all times to ensure conductor clearances are maintained.
i. Remove the clevis split pin and bolt from the conductor clamp. Follow ‘DIS-12 Change suspension hardware’ in High Voltage Live Work Procedures – Distribution Insulated Stick.
j. Allow the insulators to fall towards the pole.
k. Remove the old conductor clamp.
l. Move the EWP arm so that the centre of the angle bridle is centred in the middle of the new pole position.
m. Install new conductor clamp in the new position.

References
• Distribution Construction Standards Handbook, Part 4 High voltage overhead (DM# 4831000v29), drawings:
  o H06 Running disc angle or vertical termination (900mm spacing)
  o H07 Running disc angle or vertical termination (1200mm spacing)
• High Voltage Live Work Manual, section 2 (Safe work principles)
• High Voltage Live Work Procedures – Distribution Insulated Stick, ‘DIS-12 Change suspension hardware’
• High Voltage Live Work Procedures – Glove and Barrier:
  o Safety
  o GB-31 Fit armour rods

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.
GB-21  Displace conductors – tag lines

Purpose
This procedure describes how to move conductors using tag lines. The tag lines can be used to move the conductors vertically or horizontally.

Figures 1 and 2: Tag lines used to displace conductors

Parameters
- Conductor movement must be closely monitored and controlled at all times.
- Assess the weight to ensure manual handling techniques can be used.
- The SWL/WLL of the EWP must not be breached when lifting the conductors.
- When securing tag lines, they must be attached to a suitable attachment such as a star picket on a 45° angle or to a vehicle (keys removed).
- When using tag lines, a 450mm link stick must always be placed between the live conductor and the rope.
- When moving the conductor to a temporary conductor support or new final conductor position, the new position must be ready to receive the conductor before the lift is commenced.
- If side force is to be maintained on the conductor so that the conductor can be displaced away from the pole, it must be confirmed that the minimum conductor ground clearance can be maintained.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
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</thead>
<tbody>
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<td><strong>Equipment</strong></td>
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<td>Temporary conductor support, if required</td>
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<td>Live work rope</td>
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<td>450mm link stick</td>
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<tr>
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<td>Pegs and cable ties to secure insulating covers/barriers and mats</td>
</tr>
<tr>
<td>varies</td>
<td>Insulating barriers/cover – enough to cover live conductors and second points of contact</td>
</tr>
<tr>
<td>Amount</td>
<td>Item</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
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<td></td>
<td>Personnel</td>
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<tr>
<td>3*</td>
<td>HV live workers:</td>
</tr>
<tr>
<td></td>
<td>- 2 in the EWP</td>
</tr>
<tr>
<td></td>
<td>- 1 safety observer</td>
</tr>
<tr>
<td>*</td>
<td>4 HV live workers are required if the pole will be changed</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*

1. **Confirm load handling capacity**
   - Confirm that the conductor loads have been calculated before the conductors are displaced to ensure that the HV live worker will be able to comfortably lift the conductor when using the tag lines.

2. **Displace conductor**
   - a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
b. Cover the conductor to be moved and all second points of contacts. Follow ‘GB-01 Apply insulating barriers/covers and mats’.

c. Ensure that there is a suitable attachment point to attach the tag line to before commencing the lift.

d. If moving the conductor to a permanent or temporary position, confirm that the new position is ready for the conductor before starting the lift.

e. If moving conductors away from the pole and securing to attachment point, check that the conductor will not drop below the minimum conductor ground clearance.

f. When using tag line to pull conductors, always use controlled movement and maintain phase-to-phase and phase-to-earth clearances.

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

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
This page has intentionally been left blank.
GB-22  Displace conductors – manual handling

Purpose
This procedure describes how to move conductors that have light loads and need to be moved a minimal distance by manually lifting them into position on the distribution system up to 33 kV.

Figure 1: Displacing conductors by hand

Parameters
- Conductor movement must be closely monitored and controlled at all times.
- Assess the weight to ensure manual handling techniques can be used.
- The SWL/WLL of the EWP must not be breached when lifting the conductors.
- The conductors can be moved to temporary cross-arm mounted extension arms, pole-mounted supports or securely held on the EWP bucket.
- Temporary conductor supports or new final conductor position must be ready to receive the conductor before the lift is commenced.
- Cross-arm mounted extension arms must not be used on wooden cross-arms as it cannot be determined if the wooden cross-arm is made of Batu wood.
- Conductor supports have an SWL/WLL ranging from 45kg to 90kg per wire holder.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.
Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1+</td>
<td>Temporary conductor support, if required</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 – enough to cover live conductors and second points of contact</td>
</tr>
</tbody>
</table>

**Personnel**

- 3*
- HV live workers:
  - 2 in the EWP
  - 1 safety observer

* 4 HV live workers are required if the pole will be changed

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*

1. **Confirm load handling capacity**
   
   Confirm that the conductor loads have been calculated before the conductors are displaced to ensure that the HV live worker will be able to comfortably lift the conductor when using the tag lines.

2. **Displace conductor**
   
   a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
   
   b. The EWP should be positioned to the side of the conductors that the temporary conductor support is attached.
   
   c. Cover the conductor to be moved and all second points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   
   d. Confirm that the temporary or permanent position that the conductor is to be moved to is ready for the conductor.
   
   e. Untie conductors. Follow ‘GB-02 Untie and retie conductors’.
   
   f. The conductor must be held securely at all times.
   
   g. The conductor must be observed in the adjacent spans at all times to ensure conductor clearances are maintained.
   
   h. The conductor must be securely trapped in the wire holder or tied in at the new permanent position. Follow ‘GB-02 Untie and retie conductors’.
   
   i. Clean, wipe down and stow away all equipment.

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
  - GB-02 Untie and retie conductors
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GB-23  Displace conductors – Aichi auxiliary arm

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.

Figures 1: Aichi sub-boom and winch assembly supporting multiple conductors via an auxiliary arm and mast

Parameters
- Maximum combined conductor lift is 175 kg.
- The main boom must be extended to the required length, indicated on the boom extension, to attain and maintain the full insulation value of the EWP.
- The Aichi auxiliary arm must only be used on intermediate poles or in between horizontally configured structures.
- The auxiliary arm and the conductor traps are assembled on the top of the mast and are used to trap the conductors.
- The main boom must not be used to lift the conductors. The sub-boom is used to lift conductors. The winch operates the sub-boom.
- Always cover all second points of contact within reach.
- Only expose and 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>Auxiliary cross-arm and mast</td>
</tr>
<tr>
<td>3</td>
<td>Wire holders – able to be opened by stick operation</td>
</tr>
<tr>
<td>3</td>
<td>33 kV insulators – to provide additional insulation between the auxiliary arm and wire holders</td>
</tr>
<tr>
<td>1</td>
<td>Winch-mounted mast</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 – enough to cover live conductors and second points of contact</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

1. Check auxiliary arm and insulators
   - Carry out a visual inspection of the insulators and auxiliary cross-arm.
   - Check that there is a valid testing label on auxiliary arm.
   - Check that the wire holders work.

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>HV live workers:</td>
</tr>
<tr>
<td></td>
<td>• 2 in the EWP</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
</tr>
<tr>
<td></td>
<td>• 1 ground worker</td>
</tr>
</tbody>
</table>
2. **Displace conductors**
   a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
   b. Fit winch-mounted mast onto EWP.
   c. Position the auxiliary cross-arm, complete with wire holders and release hooks, onto the winch-mounted mast.

   **Note**
   An epoxy insulator must be fitted between the wire holder and the auxiliary arm when working on 22 kV and 33 kV systems.

   d. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   e. Position and raise the auxiliary cross-arm under the conductors, securing the two outer phases in the wire holders.
   f. Untie the two outer phase conductors one at a time. Follow ‘GB-02 Untie and retie conductors’.
   g. Raise auxiliary cross-arm until remaining centre phase conductor is secured in the wire holder.
   h. Untie the centre phase conductor.
   i. Raise auxiliary cross-arm (using the sub-boom only) until 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 mid-span pole is to be installed, lift secured conductors with the EWP to the required position and then install mid-span pole.

   j. Check and reposition insulating covers as required after the conductors have been displaced.

   **Carry out maintenance tasks, e.g. replace cross-arm or pole.**

3. **Reinstate conductors**
   a. Reposition the insulating covers and cover up all secondary points of contact as required.
   b. Lower auxiliary cross-arm so the conductor rests on the centre phase insulator.
   c. Retie-in centre phase conductor. Follow ‘GB-02 Untie and retie conductors’.
   d. Open centre phase wire holder and lower the auxiliary cross-arm until the outer phase conductors are located on the insulators.
   e. Tie-in outer phases one at a time.
   f. Open the two outer phase wire holders and lower the auxiliary cross-arm.
   g. Remove all coverings from the conductors and second point of contact.
   h. Clean, wipe down and stow away all equipment.
References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
  - GB-02 Untie and retie conductors
GB-24  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.

Figure 1: Crane and lifting beam set up for three-phase lift

Parameters
- This procedure must only be used on intermediate structures.
- The lifting beam must be rated and tested and the SWL must be marked on the beam.
- The lifting beam is connected to the crane hook via two 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 three 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 all second points of contact within reach.
- Only expose and work on one potential at a time.
High Voltage Live Work Procedures – Glove and Barrier

Resources

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rated lifting beam</td>
</tr>
<tr>
<td>2</td>
<td>1-tonne web slings</td>
</tr>
<tr>
<td>5 or 2 &amp; 3</td>
<td>33 kV tested and rated polymeric insulators or spiral link sticks or 2 tested and rated polymeric insulators and 3 spiral 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 spiral link sticks</td>
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<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 – enough to cover live conductors and second points of contact</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</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

1. Disconnection
   a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
   b. Cover all second points of contact. Follow ‘GB-01 Apply insulating barriers/cover and mats’.
   c. Set up the lifting arm and attach to the crane boom.
   d. Position the crane boom so that the lifting arm is above the conductors.
   e. Position the conductor gates or rollers directly above the conductors and secure the conductors.
   f. Untie each conductor, working on one conductor at a time, until all the conductors are untied. Follow ‘GB-02 Untie and retie conductors’.
   g. Lift the conductors away from the pole hardware by raising the lifting beam.

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

![Figure 2: Conductors displaced ready for pole change](image)

2. Reconnection
   a. Confirm that all work is complete and all second points of contact have been covered.
   b. Lower the lifting beam, ensuring that the conductors are located in their permanent position.
   c. Tie-in all conductors, working on one conductor at a time. Follow ‘GB-02 Untie and retie conductors’.
d. Remove conductors from the conductor traps and remove the crane boom and lifting arm from the work area and stow equipment and boom away.

e. Remove all insulating coverings from the conductors and second points of contact.

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

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
  - GB-02 Untie and retie conductors
GB-25  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 poles 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 boom-mounted auxiliary arm must only be used on intermediate poles.
- The brace pole assembly may be installed either inline or offset to the conductors.
- The single wire holder is used for heavier conductors or single-phase construction and is installed in place of the cross-arm clamp assembly.
- Keep the mast as near as possible to vertical while holding up the conductors. Avoid pulling the conductors to the side to create, for example, line angles that may tip the boom unit.
- Rotate the arm so it is at a right angle to the conductors.
- The Chance boom-mounted auxiliary arm and mast assembly may only be mounted on a crane boom.
- The Chance 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 sub-boom auxiliary arm and conductor traps are assembled on the boom and are used to trap the conductors.
- The maximum single conductor lift is 90 kg.
- Always cover all second points of contact within reach.
- Only expose and work on one potential on 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>Boom-mounted auxiliary arm and mast</td>
</tr>
<tr>
<td>1</td>
<td>Sub-boom auxiliary arm</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

---

### Table: Equipment and Personnel

<table>
<thead>
<tr>
<th>Amount</th>
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</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Conductor traps</td>
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<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 – enough 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:
  - 2 in the EWP
  - 1 safety observer
  - 1 ground worker
Procedure

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

1. **Crane and lifting arm set up**
   a. The lifting arm should be set up so that it is 90° to the conductor. Where the attachment has a ratchet adjustment, the lifting arm can be adjusted as the conductors are lifted to keep the arm at 90°.
   
   ![Figure 2: Adjustable ratchet](image)

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

   **Note**
   - On flat constructions, all conductors are secured in the wire holders at the same time.
   - The boom-mounted auxiliary pole can be set up to lift a single conductor where:
     - one insulator requires changing, including suspension insulators
     - a single-phase pole change is required

2. **Displace conductors**
   a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
   b. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   c. Set up the auxiliary arm and attach to the crane boom.
   d. Position the crane boom so that the auxiliary arm is below the conductors.
   e. Position the conductor wire holders directly below the outside phase conductors and secure the conductors into the wire holders.
   f. Untie the conductors one at a time. Follow ‘GB-02 Untie and retie conductors’.
   g. Lift the crane boom until the centre phase conductor is trapped in the wire holder.
   h. Untie the centre conductor and raise all the conductors so that the MADs can be maintained to carry out the task.

   Carry out replacement of pole-top hardware or replace pole.
3. **Replacement**
   a. Confirm that all work is complete.
   b. Cover all second points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   c. Lower the crane boom so that the centre phase conductor securely sits on the centre insulator.
   d. Tie-in the centre phase conductor to the insulator. Follow ‘GB-02 Untie and retie conductors’.
   e. Open the wire holder and slowly lower the Chance boom to release the conductor.
   f. Proceed to lower the crane boom so that the outer phase conductors are located securely on their insulators.
   g. Tie-in both conductors.
   h. Open both wire holders and slowly lower the Chance boom away from the live conductors.
   i. Remove all coverings from the conductors and second point of contact.
   j. Clean, wipe down and stow away all equipment.

![Image](image3.png)

**Figure 3: Single-phase lift set up, 90 kg SWL**

**References**

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
  - GB-02 Untie and retie conductors
GB-26  Displace conductors – EWP boom-mounted arm

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

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.
- The arm can be used on three-phase and single-phase systems.
- When the arm is set up on an EWP only one HV live worker is allowed in the bucket. A second EWP must be used to complete the task.
- The HV live worker in the EWP with the arm attached must only use a universal stick to secure and unsecure the conductors into or out of the wire holders.
- While the boom bracket is attached to the EWP:
  - the EWP must be treated as uninsulated
  - glove and barrier work must not be performed from the EWP
  - stick work may be performed from the EWP bucket
- Due to the variances between differing EWPs, the SWL of the mast, arm, wire holders and operators and conductor weight must be determined before the lift commences.
- The lifting EWP must have a rated liner fitted.
- Always cover all second points of contact within reach.
- Only expose and 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>
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<tr>
<td>1</td>
<td>Boom bracket</td>
</tr>
<tr>
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<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>
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<td>Auxiliary arm</td>
</tr>
<tr>
<td>3</td>
<td>Wire holders</td>
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<td>Brace clamp</td>
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<td>1</td>
<td>Brace</td>
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<td>Ratchet</td>
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<td>Rated liner</td>
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<td>varies</td>
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<td><strong>Personnel</strong></td>
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<td>6</td>
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<tr>
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<td>• 2 in the EWP without boom-mounted arm</td>
</tr>
<tr>
<td></td>
<td>• 1 in the EWP with boom-mounted arm</td>
</tr>
<tr>
<td></td>
<td>• 2 safety observers</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

1. Check and fit arm to the boom
   a. Carry out a visual inspection of the insulators and Hastings arm.
   b. Check that there is a valid testing label on auxiliary arm.
   c. 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.

2. Displace conductors
   a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
   b. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   c. Position and raise the boom-mounted arm under the circuit to be worked on, collecting the two outer phase conductors into the wire holders.
   d. Raise auxiliary cross-arm to take the weight of the two outer conductors.
   e. From the second EWP, untie each outer conductor in turn, ensuring the conductors are trapped and locked in the wire holders. Follow ‘GB-02 Untie and retie conductors’.
   f. Raise auxiliary cross-arm until remaining centre phase is collected in its wire holder.
   g. Raise auxiliary cross-arm to take the weight of the centre conductor.
   h. Untie the centre phase conductor and ensure wire holder is in the fully locked position.
   i. Raise boom-mounted arm until conductors are lifted to the required height to allow the maintenance task to be safely carried out outside of any MADs.

   **Note**
   - Check adjacent spans for conductor tightness and clearances.
   - If mid-span pole is to be installed, lift secured conductors with the EWP to the required position and then install mid-span pole.
Carry out replacement of pole-top hardware or replace pole.

3. Replace conductors
   a. Reposition the insulating covers on the new structure and cover up all secondary points of contact. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   b. Using lifting EWP, lower the arm so that the centre conductor is positioned on the centre insulator.
   c. Tie-in centre phase. Follow ‘GB-02 Untie and retie conductors’.
   d. Open centre phase wire holder with a universal stick.
   e. Check to ensure that all secondary points of contact are covered.
   f. Lower the arm using the EWP so that the conductors are positioned on the outer insulators.
   g. Tie-in outer phases one at a time.
   h. Open two outer phase wire holders with a universal stick.
   i. Lower the arm away from the circuit.
   j. Remove all equipment, including insulating barriers and blankets.
   k. Remove boom-mounted arm and bracket from the EWP boom.
   l. Clean, wipe down and stow away all equipment.

References
- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
  - GB-02 Untie and retie conductors
GB-27 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:
- 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.
- Two levels of insulation must be placed between the uninsulated part of the crane hook and live conductor. The insulation can be one of the following:
  - two 33 kV rated and tested polymeric insulators
  - one link stick with a minimum insulation distance of 450 mm
  - two smaller link sticks with a combined minimum insulating distance of 450 mm
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

<table>
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<tr>
<th>Amount</th>
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<td>Equipment</td>
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</thead>
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<tr>
<td></td>
<td>2 tested and rated 33 kV polymeric insulators</td>
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<tr>
<td></td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>1+ link sticks with a minimum insulation distance of 450 mm</td>
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</tr>
<tr>
<td>1</td>
<td>Crane, including portable earth lead</td>
</tr>
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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 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*

Displace and replace conductors
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 stick and attach to the crane hook.
3. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
4. Position the crane hook directly above the conductors.
5. Lower the hook and secure the conductor to the lifting insulators or link stick.
6. Raise the hook and apply a small amount of tension to the conductor.
7. Untie the conductor from the insulator then move the conductor to a position that provides a safe work area to carry out the task. Follow ‘GB-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.
12. If working on a three-phase system, repeat steps 3 to 11 to change pole-top hardware (if required) on the other conductors.
13. 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 stick and attach to the crane hook.
3. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
4. Position the hook directly above the conductors.
5. Lower the hook and secure the conductor to the lifting insulators or link stick.
6. Raise the hook and apply a small amount of tension to the conductor so that the insulator becomes slack.
7. Disconnect the conductor clamp from the insulator

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.
10. Lower the hook so that the tension is applied to the insulators.
11. Disconnect lift insulators or link stick from the conductor and remove crane from the area.
12. 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 – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
  - GB-02 Untie and retie conductors
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GB-28  Displace conductors – pole or cross-arm mounted insulating auxiliary arm

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

Where a free-floating conductor causes a clearance problem, but the nature of the task requires the conductor to be displaced away from the cross-arm and it is not possible to use an auxiliary arm and mast, the use of a temporary pole/cross-arm mounted arm can provide a solution.

Figure 1: Pole-mounted auxiliary arm

Parameters
- Pole-mounted insulating 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.
- Cross-arm mounted extension arms can only be used on steel cross-arms.
- Minimum phase-to-earth distance of 450mm must be maintained when conductors are secured on a temporary cross-arm.
- Minimum phase-to-phase distance of 550mm must be maintained.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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<tr>
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<td>Insulating barriers/COVERS – enough to cover live conductors and second points of contact</td>
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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 and replace conductors
1. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
2. Secure the insulating arm that is being used into position.
3. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
4. Untie one conductor at a time and displace the conductor to the wire holder and close the conductor gates to secure. Follow ‘GB-02 Untie and retie conductors’.
5. Observe the conductors in the adjacent spans whilst the conductor displacement is in progress.
6. Repeat steps 3 to 5 for all other phases, if required.

**Carry out replacement of pole-top hardware**

7. Ensure all second points of contact within reach are covered.
8. Open the conductor gate and displace the conductor back to the insulator and tie-in. Follow ‘GB-02 Untie and retie conductors’.
9. Observe the conductors in the adjacent spans whilst the conductor replacement is in progress.
10. Repeat steps 7 to 9 for all other phases, if required.
11. Remove insulating arm, clean and stow away.
12. Clean, wipe down and stow away all equipment.

**Examples of conductor supports**

**Cross-arm mounted extension arm**

- Can be used on voltages up to 33kV providing the wire holders are fitted with insulators.
- The extension arm is suspended under the cross-arm by brackets to enable the conductor to be removed from the original cross-arm and placed in the wire holder mounted on the extension arm.
- 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 extension arm](image)

**Pole-mounted conductor support**

- Can be used on voltages up to 34.5kV providing the wire holders are fitted with insulators.
- 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 conductor support](image)

**V-arm conductor support**

- Can be used on voltages up to 34.5kV providing the wire holders are fitted with insulators.
- The bi-arm mounting assembly can be fitted to the pole with a chain and chain 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 conductor load must be assessed and the SWL/WLL of the V-arm confirmed to ensure that the load rating is not exceeded.

![Figure 4: V-arm conductor support](image)

**References**

- High Voltage Live Work Manual:
  - Section 2 (Safe work principles)
  - Section 8.2 Rigging conductor support equipment – glove and barrier method
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
  - GB-02 Untie and retie conductors

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4 of 4  GB-28  Displace conductors – pole or cross-arm mounted insulating auxiliary arm  Rev 1, Dec 2015
GB-29  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.

**Parameters**

- 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 to 210 kg.
- The auxiliary arm can be mounted either above or below the conductors. Line deviation over 5° is not permitted when using this rig.
- 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.
- Maximum lift is 68 kg per conductor with two brace arms fitted.
- Insulators must be installed between the arm and wire holder when used on 22 kV and 33 kV systems.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

**Resources**

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<th>Item</th>
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<td>38 mm support beams</td>
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<td>63 mm wire tong saddles</td>
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High Voltage Live Work Procedures – Glove and Barrier

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<tr>
<td>varies</td>
<td>Insulating barriers/covers – enough to cover live conductors and second points of contact</td>
</tr>
</tbody>
</table>

### Personnel

| 3 | HV live workers:  
|   | • 2 in the EWP  
|   | • 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 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*

1. **Position plant and EWP**
   a. Preferred option is for the EWP to be positioned either side of the line. The EWP’s turret may be positioned inline, forward or behind the pole alignment.
   b. The wire holders used will determine the position on the auxiliary cross-arm. The wire holder spacing will need to be a minimum of 550 mm between phases.
2. Installing the auxiliary cross-arm
   a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
   b. Determine if the position of the auxiliary cross-arm is to be above the conductors (C-type wire holder) or below the conductors (fork-type wire holder).
   c. Determine the position around the pole for attaching the lifting beam.
   d. Place one 63 mm wire tong saddle on the pole below the existing cross-arm. The upper wire tong saddle should be fitted to the pole on the opposite side to the existing cross-arm and as high as possible whilst maintaining clearances.
   e. Placing of the second lower 63 mm wire tong saddle should be 1.0 to 1.2 m vertically below the upper saddle.
   f. Secure the 63 mm lifting beam onto the two wire tong saddles ensuring the height of the beam will provide clearance for the wire holders to be used.
   g. Attach the strap hoist to the lower wire tong saddle and to the lifting attachment at the bottom of the 63 mm lifting beam. Apply tension to the strap hoist to support the lifting beam.
   h. The height of the auxiliary arm assembly can be adjusted by loosening off the wire tong pole clamps and operating the strap hoist.
   i. Secure the auxiliary cross-arm to the top of the 63 mm lifting beam. The locking pin must be secured.
   j. Install wire holders to the auxiliary cross-arm (C-type wire holder for conductors below and fork-type for conductors above the auxiliary cross-arm). The wire holders should be positioned on the auxiliary arm to align with the conductor position on the existing cross-arm. A minimum separation of 550 mm phase-to-phase and 450 mm phase-to-earth must be maintained. Ensure the wire holder traps are set to lock the conductor into position.
   k. If the combined conductor weight is greater than 68 kg, attach the two 38 mm support clamps and beams to increase the SWL to 210 kg. Support beams must be installed at a 45° angle or as near the end of the arm as possible.

Figures 3: Auxiliary arm setup
3. **Displace conductor**
   
   a. Cover all second point of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   
   b. Position the auxiliary arm so that the outside conductors can be located into the wire holders and lock the gates on the wire holders, securing the conductors.
   
   c. Untie each outside conductor, working on one conductor at a time. Follow ‘GB-02 Untie and retie conductors’.
   
   d. Raise the conductors using the strap hoist to raise the auxiliary arm to trap the centre conductor.
   
   e. Untie the centre conductor.
   
   f. Raise all three conductors so that the MADs can be maintained whilst carrying out the task.
   
   g. Observe the conductors in the adjacent spans whilst the lift in in progress.
   
   h. Once the conductors have reached the desired height, secure the wire tong saddles.

   Carry out replacement of pole-top hardware.

4. **Replace conductor**
   
   a. Cover all second point of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   
   b. Lower the auxiliary cross arm into a position to replace the centre conductor onto the poles insulator.
   
   c. Retie the centre conductor and open the wire holder gate. Follow ‘GB-02 Untie and retie conductors’.
   
   d. Lower the auxiliary cross-arm until the outside conductors are replaced on to the outside insulators.
   
   e. Retie the conductors back to the insulators, working on one conductor at a time.
   
   f. Open the conductor gates on the wire holders and lower the auxiliary arm.
   
   g. Once clear of the conductors, the auxiliary arm and attachments can be removed.
   
   h. Clean, wipe down and stow away all equipment.

**References**

- High Voltage Live Work Manual
  - Section 2 (Safe work principles)
  - Section 6.4 Conductor support equipment
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
  - GB-02 Untie and retie conductors
GB-30  Displace conductors – anchor to crane boom

Purpose

This procedure describes how to support displaced conductors using a crane lifting boom as a rated anchor point for two conductors while supporting the third conductor on the EWP basket. The middle and outside conductors are manually moved and secured to the crane boom via link sticks and the third conductor is securely held on the EWP basket.

Parameters

- The task must be completed from an EWP.
- The crane boom should be positioned at 90° to the pole, and at a distance that will give sufficient work space once the conductors are displaced and secured.
- The crane operator must stand on an equipotential mat whilst operating the crane when conductors are attached.
- Link sticks with 1.2 m and 450 mm of insulation must be used.
- Minimum ground clearances must be maintained at all times.
- Conductor loads must be calculated before the conductors are displaced to determine that the HV live worker will be able to comfortably lift the conductor.
- 550 mm phase-to-phase clearance must be maintained at all times. This is achieved by using a sling between the two link sticks.
- When manually moving the conductors, clearances must be observed in the adjacent spans at all times.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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Figure 1: All three phases displaced
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**Personnel**

4

**HV live workers:**
- 2 in the EWP
- 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 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

1. Displace conductors
   a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
   b. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
   c. Untie the outside phase conductor then manually move the conductor to the 1.2 m link stick and secure the conductor. Follow ‘GB-02 Untie and retie conductors’. The operating stick must be used to raise the link stick to the working position to maintain MADs.
   d. The crane boom can be adjusted so that sufficient tension is placed on the conductor to maintain ground clearances if required.
e. Untie the middle phase conductor then manually move the conductor to the 450 mm link stick and secure the conductor. The operating stick must be used to raise the link stick to the working position to maintain MADs.

![Operating stick used to raise link stick to work position](image)

*Figure 4: Middle conductor being secured to the 450 mm link stick*

f. Untie the other outside conductor and displace the conductor and securely hold on the EWP basket.

![Figure 5: Outer phase securely held on the EWP basket](image)

2. **Replace conductors**
   
a. Apply insulating covers on the new structure to cover second points of contact.
b. Lower the outer conductor that is secured on the EWP to the outside insulator and tie-in the conductor.
c. Remove the middle phase conductor from the 450 mm link stick and manually move the conductor to the middle insulator and tie-in.
d. Remove the outer conductor from the 1.2 m link stick and manually move the conductor to the outer insulator and tie-in.

e. Remove all equipment, including insulating barriers, blankets and link sticks.

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

References

- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier
  - Safety
  - GB-01 Apply insulating barriers/covers and mats
  - GB-02 Untie and retie conductors
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GB-31 Fit armour rods

Purpose
This procedure describes the fitting of armour rods to overhead distribution lines up to 33 kV.

Parameters
- The conductor to be worked on must be visually inspected, from below and above, for excessive damage such as broken strands. If the damage found is too excessive the task must not commence.
- When applying armour rods, care must be taken as they may unravel and flick back towards the HV live worker.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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<td>Personnel</td>
</tr>
<tr>
<td></td>
<td>HV live workers:</td>
</tr>
<tr>
<td></td>
<td>• 2 in the EWP</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

1. Confirm that all safety requirements, equipment checks and permits have been checked and are in place.
2. Cover all adjacent phases, circuits and second points of contact. Follow ‘GB-01 Apply insulating barriers/cover and mats’.
3. Untie conductors. Follow ‘GB-02 Untie and retie conductors’.
4. Confirm the area of conductor where the equipment is to be fitted is suitably prepared.
5. When installing, the first HV live worker holds one half of the preform against the conductor, whilst the second HV live worker wraps the preform.
6. The second HV live worker then holds the wrapped side of the preform and conductor whilst the first HV live worker finishes wrapping the preform.
7. Retie conductors. Follow ‘GB-02 Untie and retie conductors’.
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 – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/cover and mats
  - GB-02 Untie and retie conductors
GB-32  Change pole-top switch – temporary bypass method

Purpose
This procedure describes how to change a closed pole-top switch (PTS) or switch pole on voltages up to 33kV using the temporary bypass method.

Parameters
- 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. For more on this, see ‘GB-05 Use temporary bypass jumpers’.
- Temporary bypass jumpers must not be used to make or break load.
- The temporary bypass jumper must be of sufficient load carrying capacity.
- The procedure for displacing the conductors must be established before work commences.
- This procedure can be carried out from one EWP but the preferred method is to use two glove and barrier teams working simultaneously from two EWPs on one phase at a time.
- The preferred method is to work on the outside conductor, then the middle conductor and finally the other outside conductor. When reconnecting the conductors, reverse this sequence.
- Always cover all second points of contact within reach.
- Only expose and 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>Insulated EWPs</td>
</tr>
<tr>
<td>3</td>
<td>Temporary bypass jumpers</td>
</tr>
<tr>
<td>3</td>
<td>2m slings</td>
</tr>
<tr>
<td>3 or 6</td>
<td>Strap hoists depending on bypass setup (see Figures 1 and 3)</td>
</tr>
<tr>
<td>6</td>
<td>Come-along clamps or new dead-end wraps suitable for the conductor</td>
</tr>
<tr>
<td>1</td>
<td>Ammeter</td>
</tr>
<tr>
<td>1</td>
<td>Insulated hanger (required when using only one EWP)</td>
</tr>
<tr>
<td>Amount</td>
<td>Item</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>varies</td>
<td>Pegs and cable ties to secure mats and covers</td>
</tr>
<tr>
<td>varies</td>
<td>Insulating barriers/covers – enough to cover live conductors and second points of contact</td>
</tr>
</tbody>
</table>

**Personnel**

<table>
<thead>
<tr>
<th>4 or 7</th>
<th>HV live workers:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2+ (in each basket if two EWPs are used)</td>
</tr>
<tr>
<td></td>
<td>1+ safety observers (2 if two EWPs are used)</td>
</tr>
<tr>
<td></td>
<td>1 ground worker</td>
</tr>
</tbody>
</table>

**Note**

If work is carried out from two EWPs then a 2000mm gap between the EWPs must be maintained and each team will require a safety observer.

---

**Figure 2: Example of single strap hoist and temporary bypass jumper set-up**

**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:
  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 (Safety) in High Voltage Live Work Manual

Remove phases
a. Confirm that all safety requirements, conductor loads, equipment checks and permits have been checked and are in place.
b. Confirm the switch is locked in the closed position.
c. Visually inspect the switch and conductors for any signs of damage or burning.
d. Electrical loads must be taken and verified with Network Operations.
e. Prepare the three bypass jumper setups by applying insulating covers and mats (double insulation as outlined in work practice 8.1 in the High Voltage Live Work Manual). The bypass setup can be:
  • a 2 metre sling and temporary bypass jumper (for dual strap hoist see Figure 1), or
  • a single strap hoist and temporary bypass jumper (see Figure 2)
f. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
g. For the first outside phase, lay the first bypass jumper setup on the PTS frame and secure.
  • This can be on the inside or outside of the switch post insulators as long as it can be secured to prevent movement.
h. Clean conductor and install a temporary bypass jumper to the outside phase. Follow ‘GB-05 Use temporary bypass jumpers’.
i. Remove the solid tap and flexible braid to the male and female contacts of the PTS.
j. Install come-along clamps or dead-end wraps to the conductor each side of the switch (leaving enough room to install new insulators and dead-end wraps). Refer to Figures 1 or 3.
k. Attach one or both strap hoists (depending on method used) between the sling and come-along clamps/dead-end wraps.
l. Take up tension on the strap hoist, enough to allow the old tension insulators to be disconnected.
m. Secure the conductor to the webbing of the strap hoist and/or sling using cable ties both sides of the switch.
n. Disconnect both tension insulators and allow them to drop clear of the conductors.
o. The conductor, including bypass jumper setup, can now be displaced and secured away from the switch using the pre-determined procedure.
• ensure control of the conductor is maintained at all times.

p. Repeat steps f. to o. for the centre and other outside phase, in that order.

**Figure 3: Example of bypassed PTS using single strap hoist and sling setup**

**Replace conductors and reconnect the switch**

a. Confirm the switch is locked in the closed position.

b. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.

c. Re-position the outside phase and bypass setup on the switch frame and secure.

d. Use the strap hoists to take up additional slack (if required) to allow for the new dead-end wraps to be installed in the correct position to ensure correct conductor sag/regulation.

e. Install new tension insulators and dead-end wraps to the conductor both sides of the switch.

f. Release the tension on the strap hoists and remove.

g. Remove the come-along clamps/dead-end wraps used for tensioning from the conductor.

h. Re-connect the solid tap and flexible braid to the male and female contacts of the PTS.

q. Remove temporary bypass jumper. Follow ‘GB-05 Use temporary bypass jumpers’.

i. Remove the bypass jumper setup from the switch frame.

j. Repeat steps b to i for the centre and other outside phase in that order.

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

**References**

• High Voltage Live Work Manual:
  o section 2 (Safe working principles)
  o work practice 8.1 (Double insulation)

• High Voltage Live Work Procedures – Glove and Barrier:
  o Safety
  o GB-01 Apply insulating barriers/covers and mats
  o GB-05 Use temporary bypass jumpers
  o GB-13 Change pole-top switch or switch pole
GB-33  Change RDA pole

Purpose
This procedure describes how to change a distribution RDA pole up to 33kV.

Figure 1: RDA pole change

Parameters
- The crane must be used to ensure control of the new pole during this procedure. Two cranes may be required depending on the assessment of the old pole.
- 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 that the 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 all second points of contact within reach.
- Only expose and 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>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>4</td>
<td>HV live workers:</td>
</tr>
<tr>
<td></td>
<td>• 2 in the EWP</td>
</tr>
<tr>
<td></td>
<td>• 1 safety observer</td>
</tr>
<tr>
<td></td>
<td>• 1 ground worker</td>
</tr>
</tbody>
</table>
Table 1: Maximum permitted bay lengths for voltage and construction type

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Pole construction either side of RDA</th>
<th>RDA pole construction</th>
<th>Maximum bay length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>22kV</td>
<td>DCSH: H01-1 Standard cross-arm</td>
<td>DCSH H6 - RDA 900mm</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>DCSH: H01-1 Standard cross-arm</td>
<td>DCSH H7 - RDA 1200mm</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>DCSH: H01-3 Anti-swan cross-arm with long raiser</td>
<td>DCSH H6 - RDA 900mm</td>
<td>175</td>
</tr>
<tr>
<td></td>
<td>DCSH: H01-3 Anti-swan cross-arm with long raiser</td>
<td>DCSH H7 - RDA 1200mm</td>
<td>200</td>
</tr>
<tr>
<td>33kV</td>
<td>DCSH: H01-1 Standard cross-arm</td>
<td>DCSH H6 - RDA 900mm</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>DCSH: H01-1 Standard cross-arm</td>
<td>DCSH H7 - RDA 1200mm</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>DCSH: H01-3 Anti-swan cross-arm with long raiser</td>
<td>DCSH H6 - RDA 900mm</td>
<td>150</td>
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<tr>
<td></td>
<td>DCSH: H01-3 Anti-swan cross-arm with long raiser</td>
<td>DCSH H7 - RDA 1200mm</td>
<td>175</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

1. Position pole and plant
   a. The new pole must be installed to the side of the existing pole.
   b. It is easier to replace the pole if the new pole is taller than the existing pole.
   c. The old pole should be checked to see if it is plumb. If the pole is leaning, the new pole should be planted on the side that the old pole is leaning away from.
   d. The crane must be positioned at the back or to the side of the poles.
   e. The EWP can be positioned on the inner angle of the RDA.

Figure 3: Top phase secured on new and existing pole
2. Pole change

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

b. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/cover and mats’.

c. Using the crane, lean the new pole towards the covered conductors.

d. Work must start on the top phase first.

e. Fit new armour rod at the new conductor clamp position. Follow ‘GB-31 Fit armour rods’. If possible, the old armour rod should be left in position.

f. Using an insulated stick lift the new phase strain insulator and conductor clamp toward the conductor.

g. Attach the new conductor clamp to the conductor and re-apply mats and covers.

Repeat steps e. to g. for the centre phase and then the bottom phase of the RDA.

h. Attach the new RDA stay wire or wires to the new stay rod or rods using a chain puller and stay wire clamp.

Note

If there is more than one stay, then both must be attached before proceeding

i. Begin to pull the new pole back using the chain puller or pullers. Maintain clear communication with the crane operator and work with them to take care not to pull against the crane during the operation.

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

k. The crane can now be removed from the new pole and used to support the old pole.

l. Keep pulling the new pole back until the insulators on the old pole begin to collapse.

m. Once collapsed disconnect the old conductor clamps from the insulators and allow the old insulator to fall towards the old pole.

n. Remove the old conductor clamps from the conductors.

o. Remove the old pole ensuring MADs are maintained.

p. Use the chain puller to ensure the new pole is plumb, and then make-off the stay wire or wires.

q. 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

- Distribution Construction Standards Handbook, Part 4 High voltage overhead (DM# 4831000v29):
  - H06 Running disc angle or vertical termination (900mm spacing)
  - H07 Running disc angle or vertical termination (1200mm spacing)

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

- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/covers and mats.
  - GB-31 Fit armour rods
GB-34  Remove conductor sample mid-bay

Purpose
This procedure describes how to remove a conductor sample mid-bay on voltages up to 33kV.

Figure 1: Drawing of equipment and conductor set up

Parameters
- Temporary bypass jumpers must not be used to make or break load.
- The temporary bypass jumper must be of sufficient load carrying capacity.
- Conductor samples are to be restricted to a maximum length of 3m.
- Work must only take place on one potential at a time.
- The effects of the increased tension applied to the conductor and fittings being worked on must be considered.
- Consideration must be given to the increase or decrease of the conductor sag.
- The preferred method is to take the sample from the outside conductor.
- Always cover all second points of contact within reach.
- Only expose and work on one potential at a time.

Resources

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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>
<tr>
<td></td>
<td>2 Strap hoist</td>
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<tr>
<td></td>
<td>4 Come-along clamps</td>
</tr>
<tr>
<td></td>
<td>3 Lengths of conductor – same conductor type and size as existing</td>
</tr>
<tr>
<td></td>
<td>2 Full-tension joints</td>
</tr>
<tr>
<td></td>
<td>1 Crimping tool</td>
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<tr>
<td></td>
<td>1 Ammeter</td>
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<tr>
<td>varies</td>
<td>Pegs and cable ties to secure mats and covers</td>
</tr>
<tr>
<td>varies</td>
<td>Insulating barriers/covers – enough to cover all second points of contact</td>
</tr>
</tbody>
</table>

|        | **Personnel**                                                        |
|        | 3 HV live workers:                                                   |
|        |   2 in the EWP                                                       |
|        |   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

1. Ensure that all safety checks, equipment checks and permits (including the peak load and voltage) are in place prior to commencing.
2. Visually inspect the conductors for any signs of damage or burning.
3. Electrical loads must be taken and checked against peak loads supplied by Network Operations.
4. Cut and prepare a suitable length of replacement conductor.
5. Cover all second points of contact within reach. Follow ‘GB-01 Apply insulating barriers/covers and mats’.
6. Secure the new conductor to the existing conductor ensuring that it is controlled at all times.
7. Using a strap hoist with a come-along attached at each end, attach one come-along to the existing conductor and one to the new conductor.
   - Ensure there is no slack in the strap hoist and that the handle is secured.
8. Clean and attach a temporary bypass jumper to the new and existing conductors. Follow ‘GB-05 Use temporary bypass jumpers’.
9. Repeat steps 7 to 8 at the other end of the new replacement conductor.
10. Using the ammeter, check the load in the existing conductor, then check the load in the temporary bypass jumpers to confirm that they have picked up some load.

11. Tension can now be taken up on the strap hoists to allow for the conductor sample to be removed.

12. The existing conductor can now be cut and joined to the new conductor at each end.
   - Ensure all conductors are cleaned prior to joining.
   - Ensure the correct full-tension joint is used.

13. The existing conductor sample can now be removed from the line.
   - Ensure that the conductor sample is controlled at all times while removing.

14. Remove both temporary bypass jumpers.

15. Release tension on both strap hoists and remove the strap hoists and clamps from the line.

16. Remove all insulating covers from the line where applicable.

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

References
- High Voltage Live Work Manual, section 2 (Safe work principles)
- High Voltage Live Work Procedures – Glove and Barrier:
  - Safety
  - GB-01 Apply insulating barriers/cover and mats
  - GB-05 Use temporary bypass jumpers
GB-Support-01  Displace and replace return wire

Purpose

This supporting 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.

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 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>Equipment</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>
### Personnel

<table>
<thead>
<tr>
<th>Amount</th>
<th>Item</th>
</tr>
</thead>
</table>
| 3      | • HV live workers:  
 |       |   o 2 in EWP  
 |       |   o 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 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 – Glove and Barrier*
- 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. Once repairs are complete remove the bypass jumper, strap hoist and come-along clamps.

10. The return wire can now be displaced using a pre-determined HV glove and barrier procedure.

11. 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 glove and barrier 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).
- High Voltage Live Work Procedures – Glove and Barrier, ‘Safety’ section.