

HV Live Work - Mid Span Isolator Maintenance Guideline

This guidance note has been developed by the Victorian Electricity Supply Industry (VESI) HV Live Work Committee.

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July 2021	1.0	INITIAL VERSION
July 2021	1.1	 Update to include: Compliance date in Scope Appendix A – Method for installation/removal of mid span isolators Appendix B – VESI Memo re this Guideline
August 2021	2.0	Update to include: 1. Section 5.3 Field inspection and maintenance torque setting for components
February 2024	3.0	Update to include: 1. Section 6.4 Annual MSI maintenance, Step 8. Inspect the spring-loaded catch roll pin.



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1 INTRODUCTION

Mid Span Isolators (MSI) are installed on energised High Voltage (HV) conductors to provide a temporary isolation point. The maximum rated breaking current for an MSI fitted with arc chutes is 400 amps.

2 PURPOSE

The purpose of this document is to provide consistency across the Victorian industry regarding the ongoing and routine maintenance of MSI units. It does not cover off the electrical connections required as that is an individual VESI Distribution Business (DB) decision. This guideline applies to MSI's fitted with or without arc chutes

3 SCOPE

This guideline applies to all VESI network operators, employers and Live HV lineworkers who perform HV Live Work and establishes the requirements for the inspection and maintenance of MSI's.

4 GENERAL

Always inspect MSI units prior to removal and if the condition of an in-service MSI is suspect, procedures exist that involve the use of a tensioning device, (e.g., Lugall) to bypass the entire mechanical load taken by the MSI and turnbuckles, thus allowing its safe removal. Refer to Appendix A

5 REFERENCE

VESI	Minimum Rules for carrying out HV Live Work
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6 INSPECTION & MAINTENANCE OF MID SPAN ISOLATORS

6.1 MSI ELECTRICAL CERTIFICATION

MSI's are electrically tested and certified by the High Voltage Test Laboratory and retested at the VESI Distribution Companies prescribed test intervals.

6.2 MSI MECHANICAL CERTIFICATION

Switches should be mechanically tested and certified by an approved testing facility prior to use and retested at intervals not exceeding 12 months. Switches shall be visually inspected for defects to the insulator and endcaps prior to

switches shall be visually inspected for defects to the insulator and endcaps prior to undergoing mechanical testing.

The test should be conducted in a horizontal plane with the round holes in line with the insulator at either end of the switch used to test pull to 15kN.

Correct turnbuckle alignment in line with the insulator

Correct turnbuckle alignment

Turnbuckle and straining devices are inline with the insulator







6.3 FIELD INSPECTION AND MAINTENANCE

MSI units have a duty cycle that varies with the currents broken. In addition to the scheduled electrical testing, the following inspection & maintenance shall be carried out on the switchgear.

This includes inspecting the units for:

- General appearance and cleanliness; contacts for signs of overheating or local arc damage.
- Moving contacts and jaws to confirm suitable pressure remains after lubrication
- Condition and alignment of the arc control devices for breakages, wear, heat, or arc damage.
- Condition of covered leads and connection points, particularly for heat damage or fraying.
- Condition of clamps, including heat or arc damage on the inside of the jaws, and free operation of threads.



6.4 ANNUAL MSI MAINTENANCE

Records of annual maintenance should be available for crew or stickers indicating when due for next annual maintenance is to be completed.

	HV MSI Mai	ntenance
Step	Description	
1.	Moving Parts Check	 a. Check that the spring-loaded catch is operating correctly. b. Lubricate the moving parts with light machine oil.
2.	 a. Check that the blade does not open unless the operating ring loop is pulled. b. The underneath catch should operate freely when the ring is pulled and prevent opening if the ring is not pulled. 	
3.		Check the contacts for pitting on the blade. The open end. Note: If the blades are pitted replace the unit.
4.	a. When closed the blade should be parallel with the contact (contact area to have consistent pressure)b. Clean and apply a small amount of conductive grease to the contact points	



	HV MSI Maintenance		
Step	Description		
5.		 Lubricate the hinge bolt Check tension on the hinge bolt "Fixed Contact" Tighten to a torque of <i>3.4 Newton Metres</i> using a small tension wrench. 	
	 b. Now adjust the tension on the hinge bolt so a force of <i>5.4-6.8 kgs</i> of pull is required to move the blade to open position after disengaging the contact. Note: Use a spring scale, hooked into the ring pulling at 90° to the latch. 		
6.		 The tension of the ¼" bolt is pre-set. If the force measured on the scale to disengage the contact is high, then the ¼ - inch bolt may need to be adjusted using the following steps: This ¼ - inch nut must not be torqued. 1. With contact in open position, the nut is hand tightened onto the bevelled washer and then torqued by half a turn (180 degrees). 2. Apply thread locking glue to secure nut in place. 3. Do not flatten the bevelled washers as they form part of the spring pressure onto the contact when closing the switch. Note: Bevelled washers are needed to ensure smooth blade operation. Note: Use Loctite Thread lock to secure the nut from accidental loosening. 	
		The bevelled washer under the ¼ - inch nut must still have the bevelled shape when fixed in place.	

Refer to Figure1 for MSI torque settings.













Inspect the spring-loaded catch roll pin. If the roll pin is broken or missing tag the MSI out of service and arrange for the MSI to be repaired immediately by a qualified third party.

Warning: Roll pins that are damaged or missing missing from the blade compromise the functionality of the MSI.

Refer to the images below indicating damaged or missing roll pins.

8.





6.5 ARC CHUTE INSPECTION

	Arc Chute Inspection	n
Step	Description	
1.	Check the arc chute is not broken. Look for fractures and replace if required.	
2.	Check that the arc break blade aligns in the middle of the arc chute.	
3.		
	When the switch is closed the flicker blade sha the arc chute.	Il be underneath the catching pin in
	Note: This provides the arc break capability of	the unit.



	Arc Chute Inspecti	on
Step	Description	
4.	For correct operation of the unit the flicker blade will remain engaged until the main contact is opened approximately 120mm.	
5.	Replacement arc chutes are fitted by undoing these two bolts and replacing the arc assembly. Note: Slots allow for correct alignment of the flicker blade.	

6.6 INSULATOR INSPECTION

	Insulator Inspection		
Step	Description	on	
1.			
	a. Check that the insulator is in good condition.	neck tha	
	b. Clean the sheds so they are free of contaminants.	ean the	
	c. Inspect the end cap fittings to ensure that the epoxy resin is not cracked.	spect the	
	d. HV test sticker (In date).	/ test sti	
	e. Lifting tackle inspection (in date).	ting tacl	



6.7 TURNBUCKLE INSPECTION

Inline turnbuckle Mechanical Certification

- a. Turnbuckles shall be mechanically tested and certified by an approved testing facility prior to use and retested at intervals not exceeding 12 months.
- b. Turnbuckles shall be visually inspected for defects to the turnbuckle and threaded section prior to undergoing mechanical testing. Refer to Figures 6 & 7.
- c. The test should be conducted in a horizontal plane with the round holes in line with the insulator at either end of the switch used to test pull to 15kN

	Turnbuckle Inspe	ction		
Step	Description			
1.	Two types of ratchetting turnbuckle have been supplied:			
	Townley (Figure 2) and Noble and sons (Figur	e 3).		
	 It was identified that the Noble and Sor than the Townley version. 	ns turnbuckle threaded section is looser		
	 Replace turnbuckles with loose threade turnbuckle 	ed sections with the Townley brand of		
	Figure 2	Figure 3		
2.	Ratchet turnbuckles must have adequate welds to prevent the threaded eye completely unscrewing from the body of the turnbuckle.	<image/> <caption></caption>		
3.	Ensure the turnbuckle operates freely. Lightly oil the thread.	Figure 5		







7 APPENDIX A - METHOD FOR INSTALLING AND REMOVING MSI GLOVE & BARRIER METHOD

Note: The steps detailed in this section are to be used as a guide to install and remove MSI's and shall be undertaken in accordance with each VESI DB's HV Live Work Manuals.

Step	Description		
1.	Planning & JSA		
	a. Complete Tool box JSA		
	b. Appoint a Safety Observer		
	 Contact the Control room to obtain permission to proceed and to suppress auto reclose and enable work tag or live line sequence. 		
2.	Inspect the MSI's prior to installation to ensure that they are fit for service:		
	 a. General appearance and cleanliness including contacts for signs of overheating or local arc damage. b. Condition and alignment of the arc control devices for breakages, wear, heat, or arc damage. c. Condition of covered leads and connection points, particularly for heat damage or fraving 		
	 d. Condition of clamps, including heat or arc damage on the inside of the jaws, and free operation of threads e. Correct latching of jaws f. In electrical test date g. Turnbuckles are aligned with the switch and fitted to correct position, (see page 5) 		
3.	Technique		
	 Identify where insulating barriers will be fitted (including the "drop zone", adjacent circuits and assets). 		
	 From below commence fitting the insulating barriers (when fitting insulating barriers always commence fitting to the nearest conductive structure or conductor). 		
	c. When installing MSI's on a horizontal three phase circuit, consideration should be given to staggering the centre phase isolator by 1.5 metres to enable for the easy matting/covering of the adjacent phase conductor (i.e. application of hard covers causes less sag and sway issues that become apparent if flat mats are applied over the isolators).		
4.	Install MSI's		
	 Position the MSI in the span as close to the crossarm as practicable to minimise conductor sway. 		
	b. Confirm the MSI blade is closed.		
	c. Position MSI against and hook onto conductor. Isolator blades to be positioned so blades open towards the de-energised / isolated side.		
	d. Take up the tension with a tensioning device creating a shallow loop and secure the isolator to the conductor using the installed termination (e.g. preformed dead-ends or bolted clamps).		



	e.	Clean the conductor and make the lead connections from each end of the MSI to the main conductor beyond the helical grip eyes.
	f.	Confirm with the Safety Observer everything is in order to proceed
	g.	Cut the shallow loop of conductor and secure the tails back along the line. The isolator is now ready for operation as required.
	h.	Repeat the process for other phases.
5.	Remo	ve MSI's
	a.	Inspect the MSI units prior to removal to ensure that the units can be removed safely.
	b.	Check MSI blades are fully closed.
	C.	Identify where insulating barriers will be fitted (including the "drop zone", adjacent circuits and assets).
	d.	From below commence fitting the insulating barriers (when fitting insulating barriers always commence fitting to the nearest conductive structure or conductor).
	e.	Fit a tensioning device across the conductor break and take some weight to enable the sleeving of the conductors.
	No tur the	ote: A tensioning device is a Live Line webbing strap (e.g. Lugall brand) or a nbuckle. A Lugall type tensioning device can be installed to completely bypass MSI, this is similart to repairing damaged conductor using G&B method.
	f.	Untie the secured conductor ends and prepare conductor for compression jointing.
	g.	Check sag of conductors and clearance to subsidiary circuits (if applicable).
	h.	Install full tension compression sleeve/splice.
	i.	Note: Full tension sleeves and dies need to be selected specifically for the conductor to be joined.
	j.	Slowly remove tension from the tensioning device.
	k.	Note: Unwinding the helical termination to slip the cable through until cable tension is taken is not permitted.
	Nc thr de rer Lu	te: When removing an MSI with turnbuckles fitted it is possible to run out of read before full tension is applied to the conductor. In such cases a Lugall type vice shall be fitted across the MSI bypassing the MSI unit The MSI shall be moved and weight transferred onto the conductor and sleeve/splice via the gall.
	I.	Seek approval from the Safety Observer to remove the jumpers/leads and MSI from the conductor.
	m.	Remove the mid span isolator from conductor.
	n.	Repeat the process for the other installed MSI's
	0.	Remove tools and equipment
6.	Contac auto re	ct System Control Centre and advise that all work has been completed and eclose protection can be restored to normal