



# MONTHLY ELECTRICAL INCIDENTS

**ASP Manufacturing**

**February 2023**



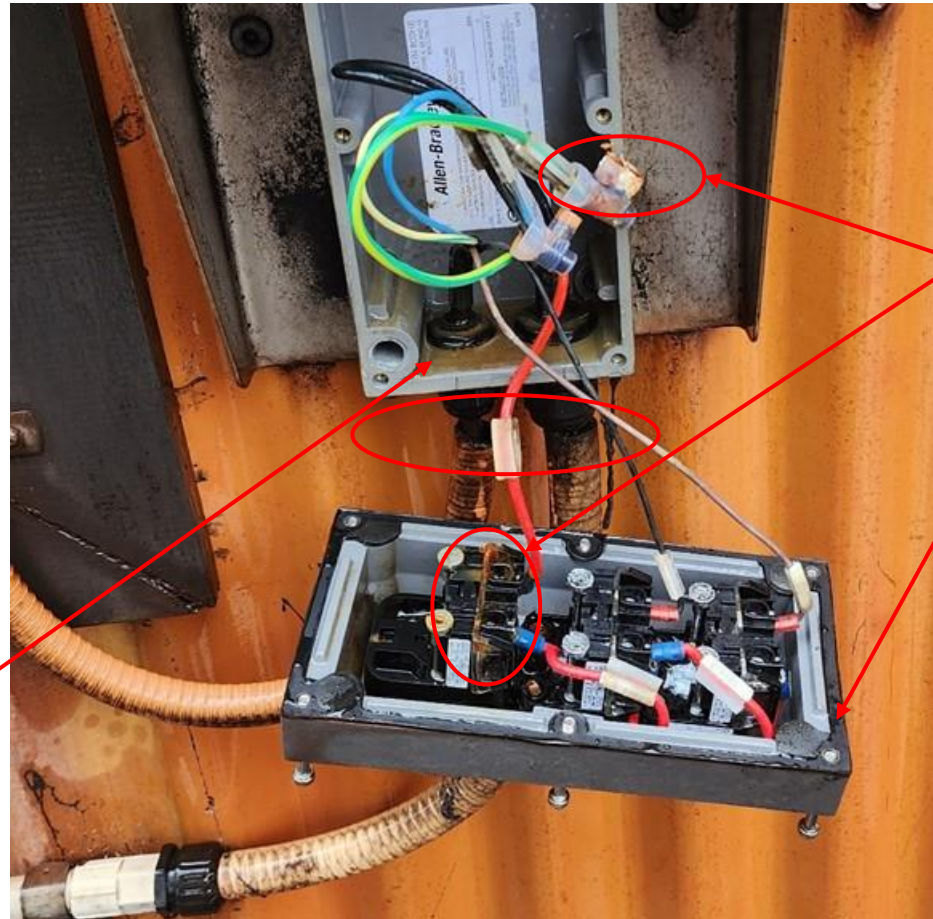
A delivery person received an **Electric shock** to the right hand when pressing pushbuttons on an outdoor IP66 rated pushbutton station, which was wet following a heavy rain storm. An electrician tested the enclosure surface, pushbuttons and the heads of screws which secure the cover for voltage to earth and measured between 90 and 110V ac on the screw heads. This circuit is supplied at 240V and is protected by a 6amp fuse with no earth leakage protection. The pushbutton station was found to be half full of water, with corrosion on the contact blocks and an earth BP connector. Further testing using a hose revealed water was able to enter the enclosure through the seal between pushbutton and enclosure. Water has compromised insulation of active conductors providing a tracking path to the external pushbutton area and screws.

The push button station needs to remain in this location for functional reasons and has been converted to Extra Low Voltage to reduce the risk of electric shock.

As per Electrical Safety Directive 2017-01 field mounted operator control stations are to be installed in accordance with specifications to ensure the required IP rating is achieved. Installations require an effective inspection and maintenance strategy to ensure installation integrity is maintained. Use of Extra Low Voltage operator controls considerably reduces risk of serious electric shock.



The pushbutton station as found, installed with a weather shroud, IP66 rated enclosure and buttons, bottom entry, compression cable glands and flexible conduit cut off short of the glands.



The pushbutton station once opened to find it is half full of water.

The amount of corrosion of the back of the buttons and earth BP connector are evident.

Surrounding rubber gasket was saturated with water on all surfaces.

The front cover securing screws are all connected by the gasket even though they are insulated from each other by the insulative material of the station.





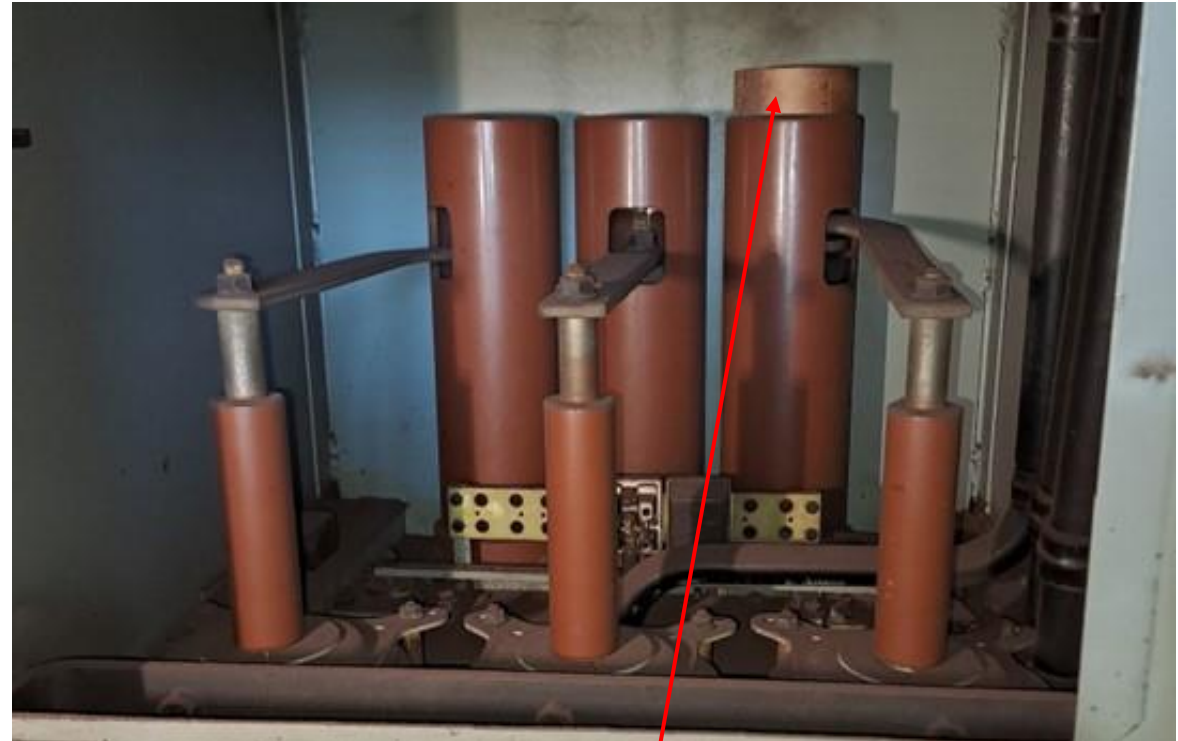
High voltage maintenance were called for assistance following several failed attempts to start No.2 Ore Unloader 6.6kV Sync motor via the remote panel. After replacing both the UV and trip coils the breaker was successfully tested offline. The circuit breaker was then racked in and closed, smoke immediately starting coming from the HVCB. The HVCB failed to trip electrically via the remote and local controls. The CB was then tripped by operating the mechanical trip mechanism at the HVCB. The operator was wearing full PPE.

An investigation found the red phase spout contact and bus connector had been pushed up out of position, preventing the breaker from making adequate contact. There was evidence of arcing and deposits of molten copper debris left on the breaker below the spout.

**Key Learning** - Never locally operate a high fault level switch or circuit breaker showing physical signs of damage or failure, use remote controls or alternate switchgear instead. During normal switching operations the correct PPE is to be worn by the operator and anyone in the vicinity should be out of line of fire by being more than 5 metres away.

The removable circuit breaker section with the six insulating posts which are inserted inside the fixed section of the HV board.

The red phase post showing signs of an arc flash and burning.



Inside the fixed section of the HV board where the removable circuit breakers posts are inserted when the breaker is racked in. This photo clearly shows the red phase busbar and spout contact have been lifted up, which resulted in circuit breaker post not making sufficient contact inside the switchboard.

An electrician and an apprentice have found a control circuit to be incorrectly wired as per the circuit diagram by conducting Test Before You Touch correctly. After isolating CF1 and N/L1 as per schematic 240V ac was found on circuit to be worked on. Rev 1 of the schematic circuit used for isolations had been modified with the hand marked up version found in the field j-box. However, even this version was not what was actually wired. CF1 was not actually in the circuit any more with the control circuit fed directly from the "Padlockable Isolator Switch".

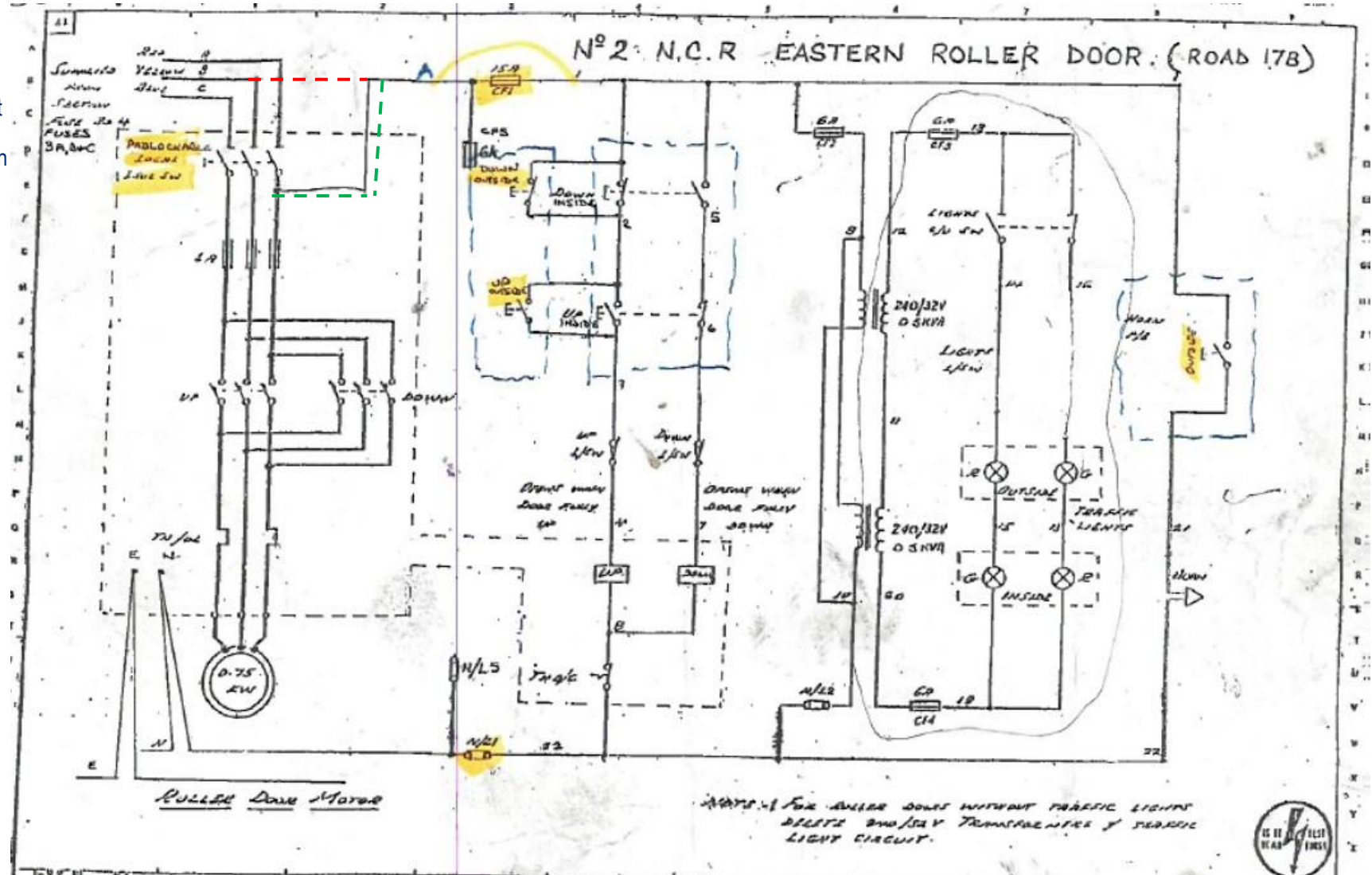
Test Before You Touch conducted correctly as per the procedure is the only method electrical workers can verify all exposed conductors are effectively isolated.

Accurate circuit diagrams are essential to correct operation, maintenance, fault finding and isolation. It's imperative modifications are appropriately reviewed and approved and accurate drawings are maintained.

The circuit schematic found in the field j-box. The red dotted line is where the control circuit was originally fed from.

The green dotted line is where the control circuit was found to be fed from.

Also the yellow bridge over the top of CF1 was found to remove CF1 from the circuit.





An operations person noticed a USB charger pack in a desk mounted media outlet was sitting at an odd angle. An electrician investigated and found the charger had separated from an adapter used to convert the charger for use on Australian sockets. The adapter cover was damaged effectively leaving the pins inserted into the 240V outlet exposed to any unsuspecting person to touch.

All USB charging devices used should only be proprietary items supplied by the manufacturer and certified fit for Australian conditions. Alternatively USB charging outlets integrated into 240V outlets should be used to eliminate the need for USB chargers., which comply to IEC 60884-3-1:2021 Plugs and socket-outlets for household and similar purposes - Part 3.1 Particular requirements for socket-outlets incorporating USB power supply.



Front and back views of the USB charger with adapter attached.

The adapter detached from the charger

2 views of how the adapter was found with the top cover separated from the base leaving the pins exposed



The desk mounted multi media outlet

An example of USB charging outlets integrated into a standard 240V outlet.



Cracked neutral links were found during a routine maintenance of Motor Control Centres. These MCCs were manufactured in 2011. The boards have been maintained and inspected every two years, with no sign of cracking in 2021. It is believed the cracking is not heat related due to the adjacent Red Spot style fuses showing no signs of cracking.

As per Electrical Safety Manual section 1.4.22 all electrical panels and installations should be regularly inspected and maintained to ensure the safety and satisfactory operation of electrical installations and articles.



Other neutral link holders with different signs of cracking. Some parts of the holders have broken away exposing the internal conductors.

One of the neutral link holders found in the MCC with signs of cracking as opposed to the red spot fuse holder which is in good working order

On a routine inspection of switchrooms an engineer has discovered the main earth pile in a poor condition. This earth pile is the main earth for the switchroom and is connected to earthing system of the switchroom 415V distribution. The pile was discovered in an unused section of the switchroom, with the cover plate and the pile heavily corroded and the pit full of debris. The pile did not have a registration number and was not included in a scheduled maintenance plan.

Earth piles are an integral part of the earthing system of the BSL distribution network. They must be registered, tested, kept clean and in good condition and regularly inspected by the owners. As per DIV-ENG-ET-008 for Electrical Stations and Field panels.



The earth pile cover lifted to show the pit full of debris and no indication of the condition of the earth pile below

The earth pile busbar which runs along the wall of the switchroom. This should be cleaned and painted green

The earth pile cover in the corner of the switchroom with busbar connected to the wall





Water has entered a control panel due to poor installation practice. The installation uses top cable entry, glands were not installed correctly and were not tightened. The supply cable has been installed with Rhino style flexible conduit run to the outside of the building from above the panel. The conduit on the outside has been left open allow water to collect in the conduit and run to the top of the panel.

Field panels should be installed with only top cable entry, refer to Electrical Installation Manual section 4.5.1. Conduits must be arranged to avoid water collection and allow any trapped water to escape before reaching cable glands.



The top of the panel as found covered in water with top entry cables and loosely fitted glands



The inside of the panel with the main isolator straight below where the water was entering

The outside installation of the power supply cable in the flexible conduit with water entering from above



The power supply cable installed to the top of the panel

