



MONTHLY ELECTRICAL INCIDENTS

ASP Manufacturing

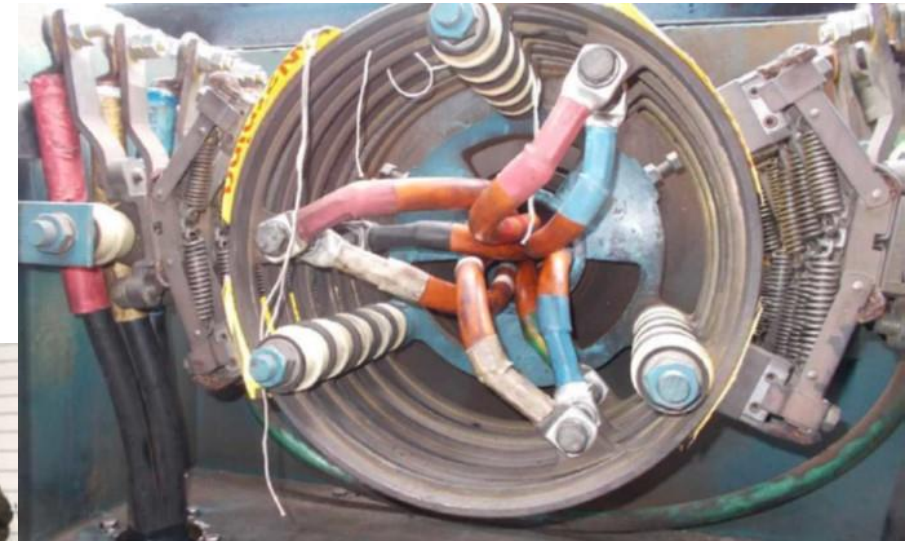
September 2022



Operators of the Stacker/Reclaimer reported the machine had lost power and stopped by itself. Power Control found the white phase 63amp fuse of the 6.6kV trailing cable had blown. Further investigation found the tension spring of a 415V ac slip ring brush arm had failed resulting in a short circuit between the white and blue phases. The white and blue phase 500amp fuses of the 415 V ac supply were also found to have blown.



The arrangement of the 415V ac slip rings.
The failed spring after it has caused the short circuit



The front view of the 415V ac slip rings for the machine

The damaged brush arms with the failed spring

An electrician had to open the electrical access points of a number of lighting towers while fault finding. A tower which had recently been replaced was found to have wiring installed that does not comply with AS3000 protection requirements. A 50 A circuit breaker provides supply to a 16mm² 4C+E supply cable which loops in and out of each tower pole. At one of the poles, the 2.5 mm² single insulated cables to the lights at the top of the tower were BP connected directly to the 16mm² cores of the supply cable without additional circuit protection to suit the reduced conductor size.

Licensed electricians are responsible for ensuring the safety and compliance of electrical installations satisfy the requirements of AS3000 to protect persons from electric shock.



The two 2.5 mm² red active conductors connected via a BP connector to the white phase 16 mm² supply core with no short circuit protection.

A crane driver witnessed a large arc flashover from the live rail collector gear when travelling west with No.1 Turntable crane. The top collector had broken off the insulator mounts allowing the collector shoe to contact the phase below and create a phase to phase short circuit. The fault was temporary as the collector fell free and the 500 A live rail supply protection did not trip. The top and middle rails and collector shoes were extensively damaged. The fault occurred near a joint and the rail was bowed. The mounting failure is being reviewed with the collector manufacturer.



The middle phase collector shoe with both supporting insulators cracked and failed. Note all the melted pig-tails and burnt arms



The bottom phase collector shoe and arc marks



The damaged AC live rails

An electrician investigating the loss of basement lighting found one of the lighting outlets had water dripping from it. An IP56 rated socket outlet and plug are mounted on the ceiling with side entry cable conduit. Water has leaked into the basement and tracked across the ceiling to the outlet, eventually making its way into the outlet and plug connection. This created a high resistance short circuit between the active and neutral pins, damaging the connections and eventually tripping the 10 A RCD circuit breaker supply.

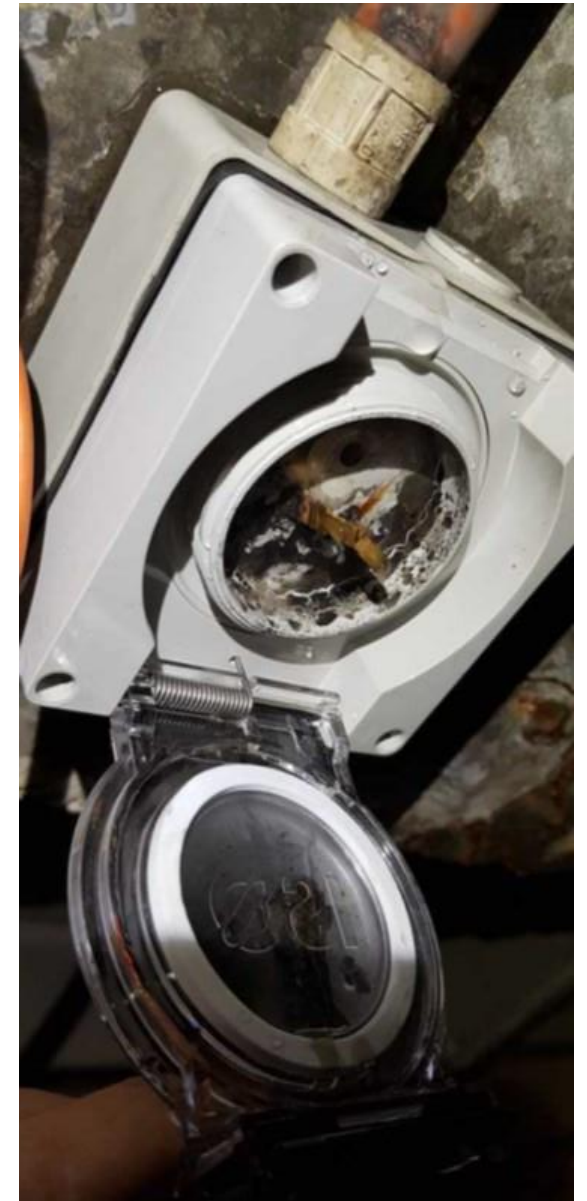
Suitably IP rated equipment must be selected and correctly installed in environments subject to water. This includes securing locknuts, conduit/cable entry points, mounting screw and covers so that the integrity of the IP rating is maintained for all components of the installation.



The IP56 rated plug with both the active and neutral pins missing, showing the heat affected areas



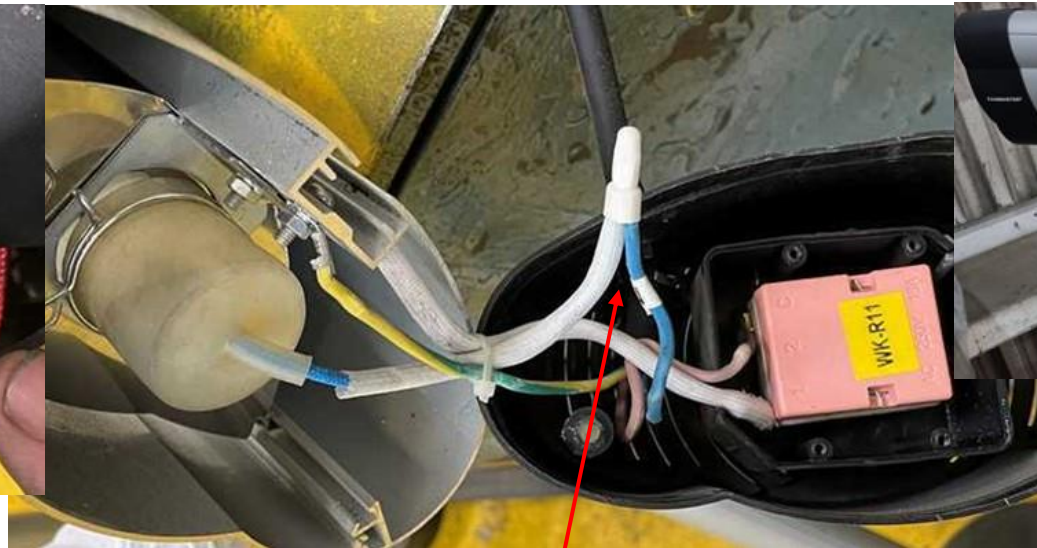
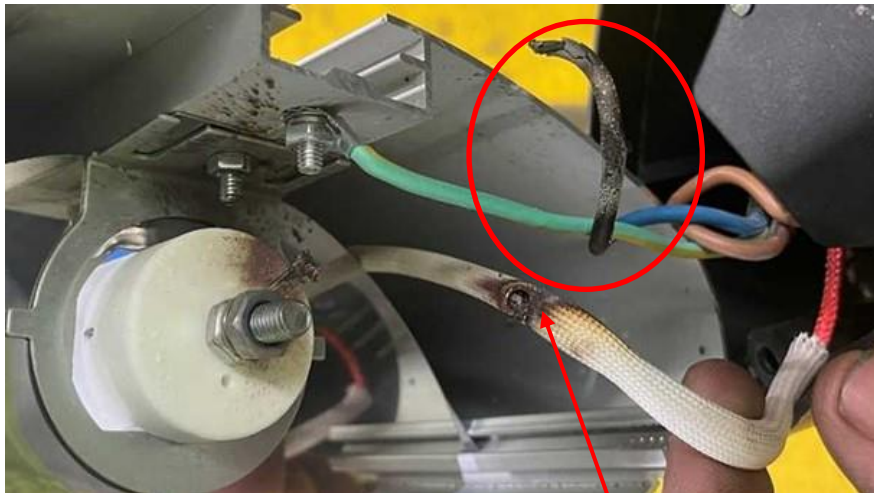
The inside of the socket outlet where the water has created a short circuit and hot joint between the active and neutral connections



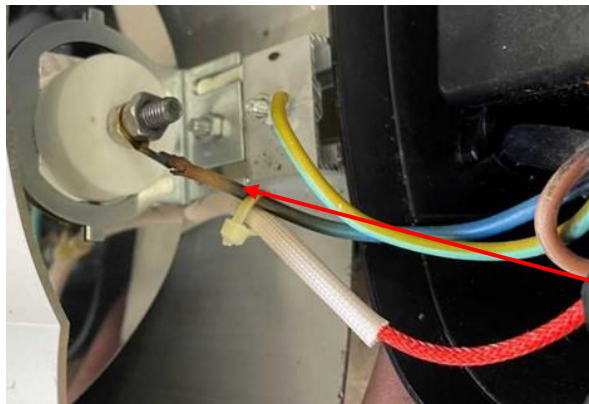
The ceiling mounted IP56 rated socket outlet showing signs of water. The pins of the plug are still embedded into the socket.

A follow up audit to incidents I2142440 and I2164101 identified two additional heaters with insufficiently rated or protected wiring for the internal operating temperature. One neutral had been completely burnt off, the second was in very poor condition. Three other units were found with high temperature wire and heat resistant sleeving installed on the active and neutral conductors. These modifications had been made either by the manufacturer or supplier, however a product recall notice has not been issued for the defective model. All units have now been removed from service at Western Port and the incident is being reviewed with the supplier (Blackwoods).

Anyone owning these heaters should either remove the unit from service or have it inspected by a licensed electrician to confirm if the unit is safe for use.



The pedestal fan and details



Examples of heat damaged neutral conductors on two different heaters:

1. The neutral reached a temperature where it has burnt through the active conductor insulation, created a short circuit and become detached from its connection point.
2. The heater has been opened up before the wiring has failed to find the neutral conductor already heat effected.

A heater with modified wiring.

Note 1, both the active and neutral conductors have high temperature rated insulation and additional heat resistant sleeves.
Note 2, the incoming PVC neutral conductor is kept clear from the heat source with the use of an inline connector

A damaged earth cable was found during routine maintenance inspection of a metal cable chain used on a roll grinder. The PVC insulation had become rigid and brittle, cracking in localised points, which then caused acute flexing at those points along the cable and eventually leading to conductor breakage. The insulation of other cables installed in the chain was found to be in good condition. These were correctly rated for flexible use and the oily working environment. The earth cable while flexible was constructed from standard PVC insulation which is not suitable for oily environments.

Cables must be selected and installed to suit the operating environment. In service inspections are required to ensure safety and integrity of the installation is maintained. This inspection restored the equipment protective earth, very important pick up.



The metal cable chain, power cables and hydraulic hoses (bottom).
Cables installed in the chain are normally exposed to oil.

A section of the earth cable with failed insulation.
The cable is regularly flexed, insulation failed after becoming brittle.



An electrician walking through switchroom A-11 brushed against a CFS board causing the end cover to dislodge. The cover was only retained by a single bolt and the high fault level busbars were exposed. Further inspection of the CFS board found the securing bolts of both end plates to be either very loose or missing.

Incorrectly or inadequately maintained electrical installations and articles can create situations or conditions, which expose personnel to electric shock or arc blast and flash risks. Undertaking certain work on live LV distribution equipment may introduce the risk of electric shock or arc blast and flash burn injury from inadvertent interference with the high fault level busbar system. Isolate and verify the isolation before removal or reinstating busbar covers, bolts or screws. Refer to Electrical Safety Manual clauses 1.4.3.6 and 1.4.22.



The CFS board after the end plate was dislodged and energised busbars exposed



A close up view of the energised busbar and how close to the end plate they are.



A side view of the CFS board busbar after isolation and covers were removed to secure the end plates