BlueScope

Electrical Incidents

Key Learnings

ASP Manufacturing

September 2023

Location: BOS, Port Kembla – WTP Switch Room

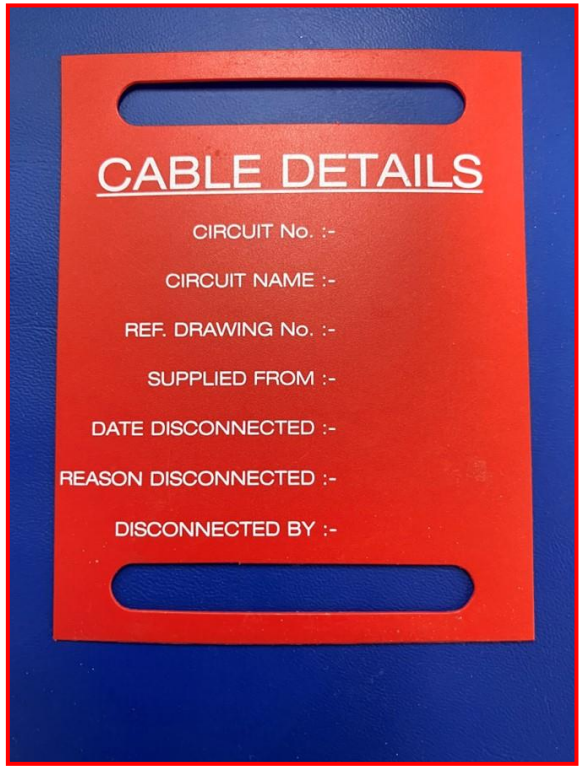
Reference: i2357637 – Electric Shock from Redundant Cable

- Whilst terminating a new MCC Panel, an electrician reported a minor shock to their forearm after contacting exposed cores of a cable that had been thought redundant.
  The cable did not correlate with any equipment supplied from the MCC and was not part of the MCC isolation.
  After the incident, it was discovered the cable was still connected to a 24VDC PLC DI supply.

- The cable was not identified as a potential hazard.
- Approx. 15 years ago, the circuit was made redundant, but was not disconnected from the supply leaving exposed cores still energised.

- We need to consider all cables in our work area as potential hazards.
- If we make circuits redundant, we need to follow the Management of Disconnected Cables Procedure (BSL Document DIV-ENG-009);
  Refer to this for details on isolation, bonding of conductors, tagging and capping of cable ends.

- Following the Test Before You Touch process on any exposed conductors in the work area will help us find traps like this.
- To help identify redundant cables that have not yet been removed, use a “Cable Details” tag filled out using a permanent marker pen, include all relevant information, and attach to cable ends using cable ties.



Polypropylene 100mm x 80mm tags

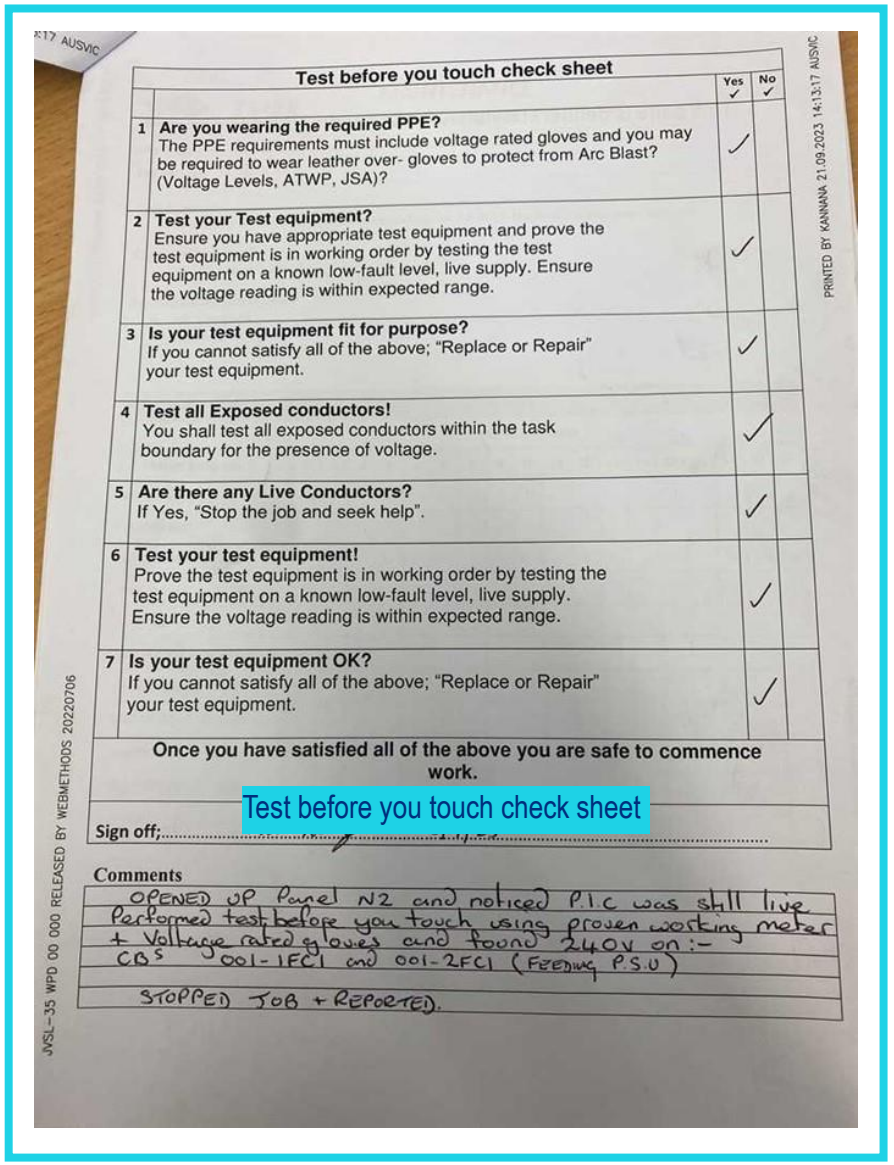
BlueScope – SAP Material No. 10100968

Location: Pack Line, Western Port – Electrical Panel

Reference: i2366189 – 240V AC detected by Testing Before Touch

- Before commencing maintenance on an electrical panel, an electrician performed a test before you touch process using their meter and detected an energised 240V AC circuit. The job was stopped, the incident reported, and an investigation began.
- It was found that due to recent wiring changes, the isolation for the task was now incorrect. At the time of the wiring mods, isolations were identified as needing review & updating. This one was not updated yet. Marked up drawings of the wiring changes were still being processed too.
- The Test Before You Touch process worked, and a potential hazard was identified.
- Steps in the change process were not complete yet.
- Temporary signage or drawings on modified equipment help highlight the changes to people working on them.
- Steps in the change process need to be reviewed to confirm they are completed correctly and in a timely manner.

Example of Test Before You Touch



Test before you touch check sheet

Test before you touch check sheet

		Yes ✓	No ✓
1	**Are you wearing the required PPE?** The PPE requirements must include voltage rated gloves and you may be required to wear leather over- gloves to protect from Arc Blast? (Voltage Levels, ATWP, JSA)?	✓	
2	**Test your Test equipment?** Ensure you have appropriate test equipment and prove the test equipment is in working order by testing the test equipment on a known low-fault level, live supply. Ensure the voltage reading is within expected range.	✓	
3	**Is your test equipment fit for purpose?** If you cannot satisfy all of the above; "Replace or Repair" your test equipment.	✓	
4	**Test all Exposed conductors!** You shall test all exposed conductors within the task boundary for the presence of voltage.	✓	
5	**Are there any Live Conductors?** If Yes, "Stop the job and seek help".	✓	
6	**Test your test equipment!** Prove the test equipment is in working order by testing the test equipment on a known low-fault level, live supply. Ensure the voltage reading is within expected range.	✓	
7	**Is your test equipment OK?** If you cannot satisfy all of the above; "Replace or Repair" your test equipment.	✓	

Once you have satisfied all of the above you are safe to commence work.

Sign off;.....

Comments

OPENED UP Panel N2 and noticed P.I.C was still live. Performed test before you touch using proven working meter + Voltage rated gloves and found 240V on :- CB's 001-1FC1 and 001-2FC1 (FEEDING P.S.U)

STOPPED JOB + REPORTED.

JVSL-35 WPD 00 000 RELEASED BY WEBMETHODS 20220706

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Location: Springhill, Port Kembla – 33kV Substation

Reference: i2362079 – 110V DC Closing Supply Battery Failure

- A battery which formed part of a 110V DC closing supply for High Voltage Circuit Breakers failed under load, when a circuit breaker was being closed remotely. The brand of battery is only used at two locations, and they have been in service for 3 to 4 years but have recently started to fail. Newer replacement batteries of the same brand have failed also.

- Regular maintenance is done on the batteries and a root cause of these failures is yet to be determined.

- Key Learnings – Even well maintained batteries have the potential to fail catastrophically (especially under load).

  When switching HV circuit breakers, it is important to stand clear of the breaker as well as the closing supply battery enclosures.

- By ensuring battery enclosure doors are closed, we will limit exposure to these types of failures.

Same Battery type from another incident

Battery from this incident

Location: Plate Mill, Port Kembla – Roll Shop Grinder

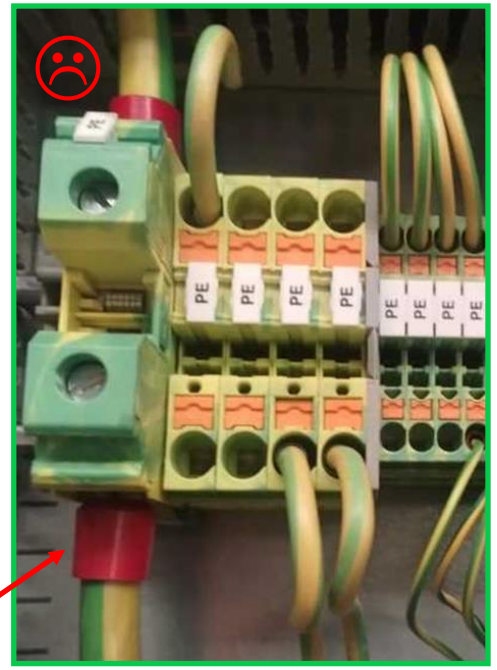
Reference: i2357820 – Loose Main Earth on DIN rail terminal connector

- During fault finding of a large industrial grinding machine, an electrician found the Main Earth Wire was loose in the Earth terminal that they were using as a test point for their meter. The Grinder had been in service for less than a year after commissioning.

- The DIN rail style earth terminal failed to maintain tension on the earth wire.

- The BlueScope Electrical Installation Manual (Rev3) states '4.7.6 - Earth terminal strips should only be used for Extra Low Voltage applications and for terminating spare cores. All power distribution and multicore motor cable earth cores shall be terminated at panel earth bars.'

- This sort of incident could be avoided by ensuring we specify Double Screwed Earth Bars from our suppliers of new equipment, and retrofitting bars where we find Low Voltage Earth terminals in service.



Earth Wire that was found loose

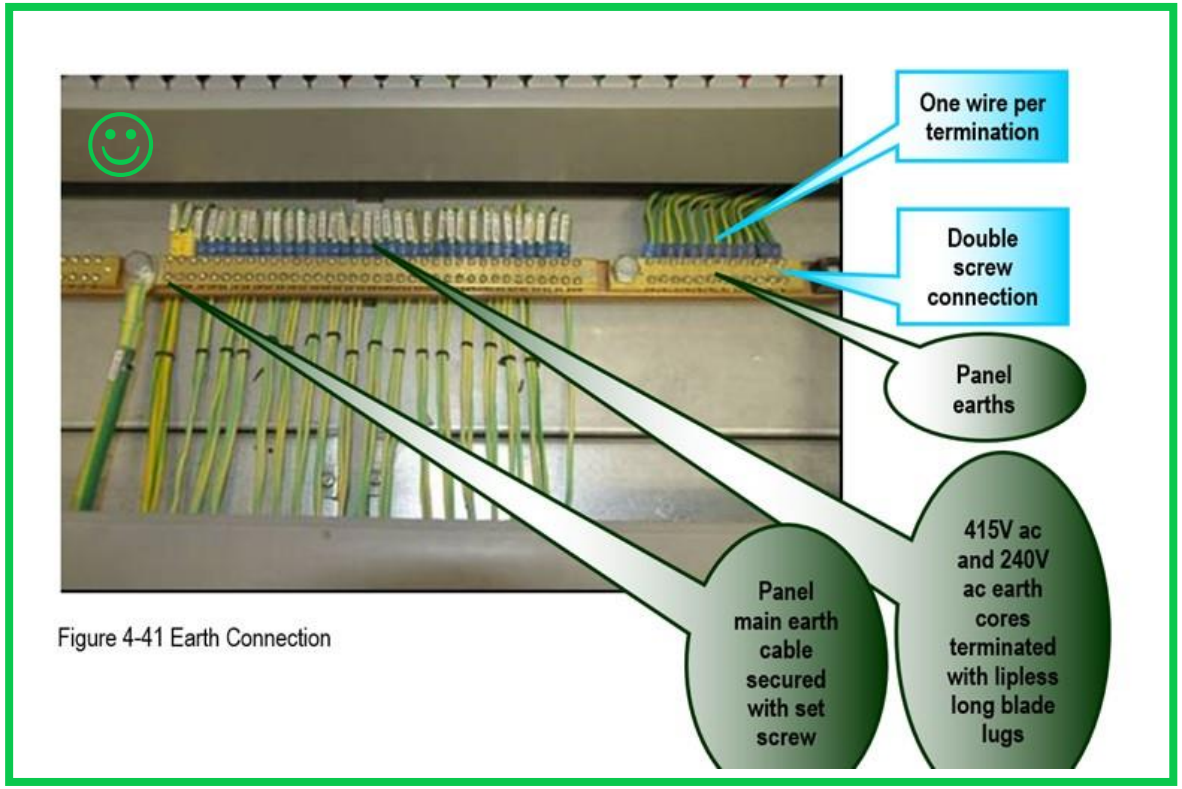


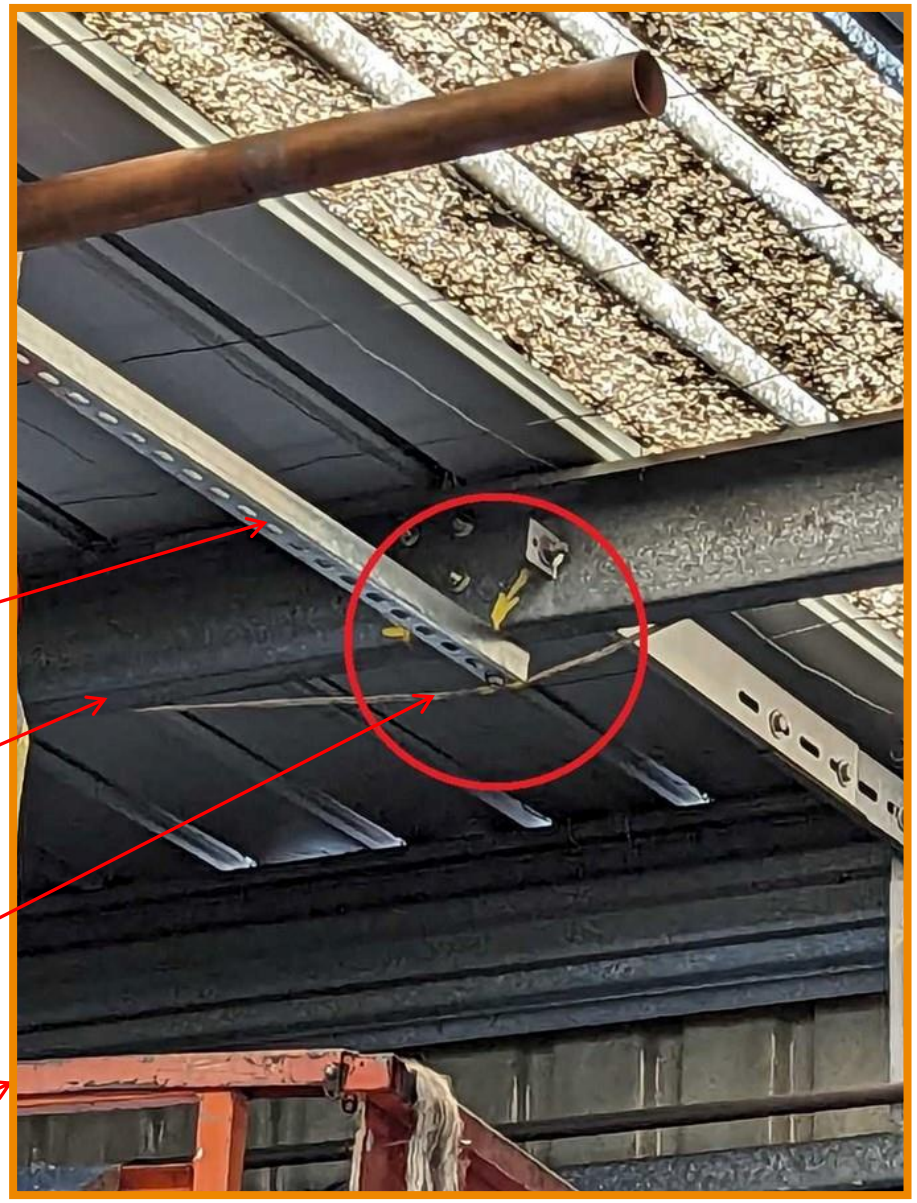
Figure 4-41 Earth Connection

Extract from the BSL Electrical Installation Manual Rev3
MA-ENG-INS-001 – showing correct use of panel earth bars

Location: Innovation Labs, Port Kembla – CRM Building 3

Reference: i2364318 – Plumber Drills through Energised Cable

- Whilst installing brackets between roof purlins to support some copper pipes, a plumber has accidentally drilled into an electrical cable that powered the ceiling lights. They did not feel any electric shock, the drill was double insulated and the Elevated Work Platform they were in, had rubber tyres. It appears the circuit protection tripped due to the drill bit being a short circuit between the damaged cable and the building frame.
- The initial JSEA for the job did not identify the possibility of electrical hazards.
- When planning all jobs, even non-electrical tasks, we need to consider the potential electrical hazards near or even hidden from view in the area we are working. Drilling into wall or ceiling cavities is another common task, where cables may be present but not clearly visible.
- A more thorough pre-inspection of the work area and seeking the advice of an electrician would have helped prevent this.



Location: Electrical Shop, Port Kembla – Electric Motor Load Testing Facility

Reference: i2360381 – Good Housekeeping Audit helps eliminate Fire Hazard

- While performing an audit on an Electric Motor Load Test Facility, it was noticed that there was a build-up of leaves & paper under some resistor banks outside of the Electrical Workshop. These resistor banks are installed outside and behind a wire mesh enclosure to dissipate the large amount of heat generated during motor tests.

  Recent heavy winds had blown the debris into this area, creating a potential fire hazard.

- The open design required for this enclosure has allowed debris to enter.

- We have many wire mesh enclosures around electrical equipment on site, especially for our High Voltage transformers.

- Regular auditing like this, will help us keep this hazard to a minimum.