



MONTHLY ELECTRICAL INCIDENTS

ASP Manufacturing

August 2021



The 400 A main isolator of a 150kW motor starter failed resulting in an arc flash incident during commissioning of a replacement motor. The switch was initially closed to bump test the motor direction and then isolated to correct the direction. Once rectified the switch was again closed and the motor remotely started from PLC control. As the motor was running up to speed the starter began to make arcing and crackling noises, it was then stopped remotely but the arcing was heard to continue.

No one approached the MCC and the 800 A ACB supplying the MCC tripped before attempts were made to isolate the remotely. The arcing fault within the switch was contained inside the MCC cell due to the design of the board and the cell door being secured correctly.

As per electrical safety manual 1.4.3.7 performing operating work in close proximity to live equipment may result in arc blast and flash burn injuries. Always wear the correct PPE when performing switching operations, never approach a board under fault conditions and if attempting to isolate ensure the switchgear is rated for operation under fault current conditions. Use remotely operated switchgear where available.



The inside of the MCC starter where the arc fault was contained



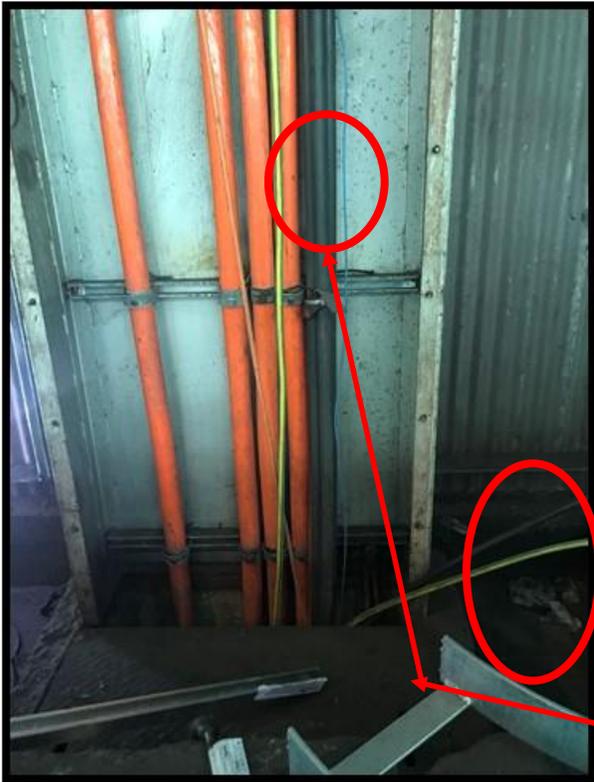
The internals of the main switch showing clear damage to the pins on the white phase. These pins make contact with a sliding plate when the switch is operated. This is where the arc fault originated.

The top of the main switch showing a blow out on the top of the arc shield of the white phase

Electricians found a 150mm² SDI and 70mm² earth cable with exposed, rough cut ends, after removing covers from a cable launder. Inspection of the cable racking above the cable launder found the same cables cut approximately 50 metres away, the cut cables are believed to be part of an attempted copper thief.

The cut cables were confirmed to be the neutral and earth conductors of the supply to a main distribution board, the three phase supply was still in service. A number of single phase loads supplied from this switchboard remained operational despite the neutral being disconnected due to incorrect earth neutral bridging within a light fitting.

As per AS3000 ensure all neutral conductors are only bonded to earth at one point, the Neutral Earth connection, as close as possible to the source of supply and ensure a continuous electrical earthing conductor is connected to all devices of an electrical installation.



The rough cut 150mm² SDI cable



The SDI cable cut on the cable racking above

The two cut cables hanging from the cable launder. Above are the other 3 SDI cable for the 3 phases of this circuit

Inside the distribution board where the neutral and earth cables were terminated and where 5.3V ac was measure between the two bars.

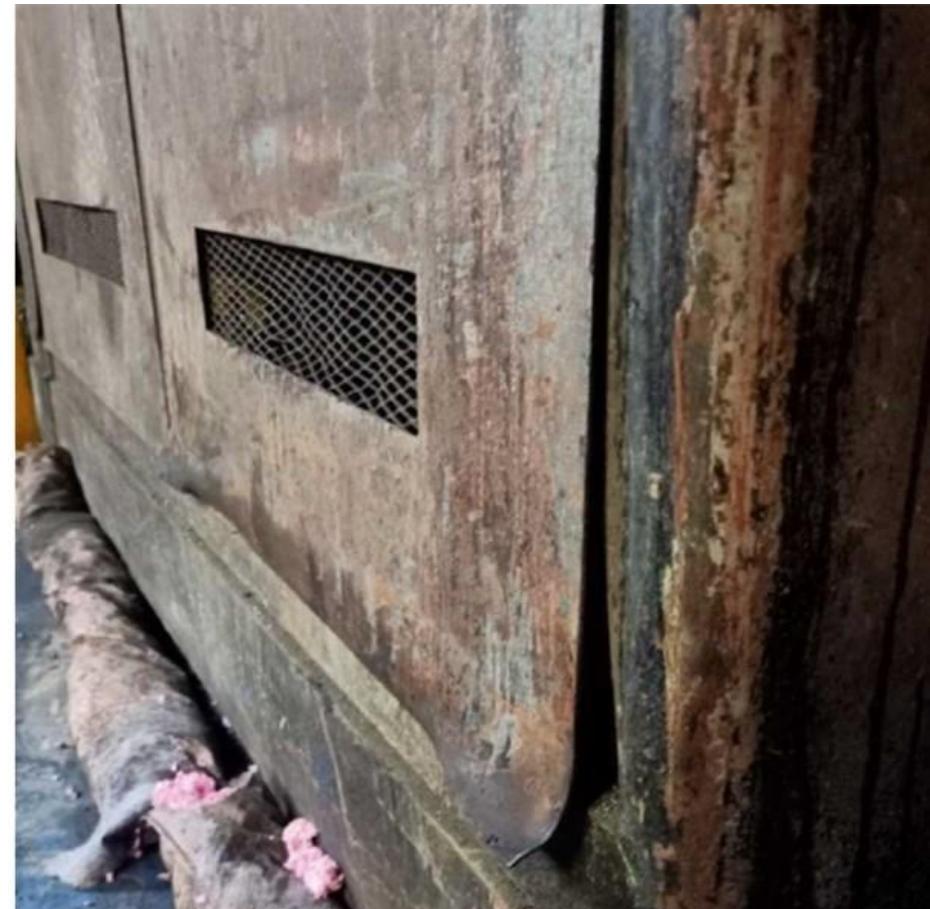


A fitter noticed the rear door of the pre-melt pot panel had become dislodged and was leaning inside towards the exposed energised 415V busbar, the panel cover was only 50mm from the high fault level busbar. The cover looks to have been either knocked or pushed from its securing position as the base section is bent out. The panels are in the basement of the MCL with the rear doors facing a walkway used infrequently by operators.

As per electrical safety manual 1.4.2.3 and 1.4.8.1, to ensure persons do not accidentally or inadvertently gain access to high fault level electrical equipment all removable covers shall be permanently secured correctly to the manufacturers design and are appropriately and uniquely labelled. All electrical stations and field panels shall be secured against unauthorised access



The rear door of the panel leaning into the panel with energised exposed busbars in close proximity



The damaged to the bottom of the rear door

The outlets in two modular office cubicles had no voltage despite the 20 A supply being energised. The outlets are supplied from a TPS cable and plug, and then looped within ducting of the wall units through connectors at each outlet group. An electrician found the plug at the first outlet had come away from the socket resulting in a hot joint, melting the pin on the plug and creating an open circuit in the active conductor. Fortunately the fault did not lead to a fire.

The design of these modular units is four 10amp outlets per desk with two desks connected together all protected by a 20amp RCD breaker. Three large computer servers which pull over 5amps each, plus monitors and personal items were connected to the outlets, the total load was close to or exceeded the 20amp circuit protection.

Supply capacity should be checked before installation of heavy loads. Office furniture, with in built power circuits are designed for standard loads and diversity, outlets may need to be audited to confirm circuits are not excessively loaded.



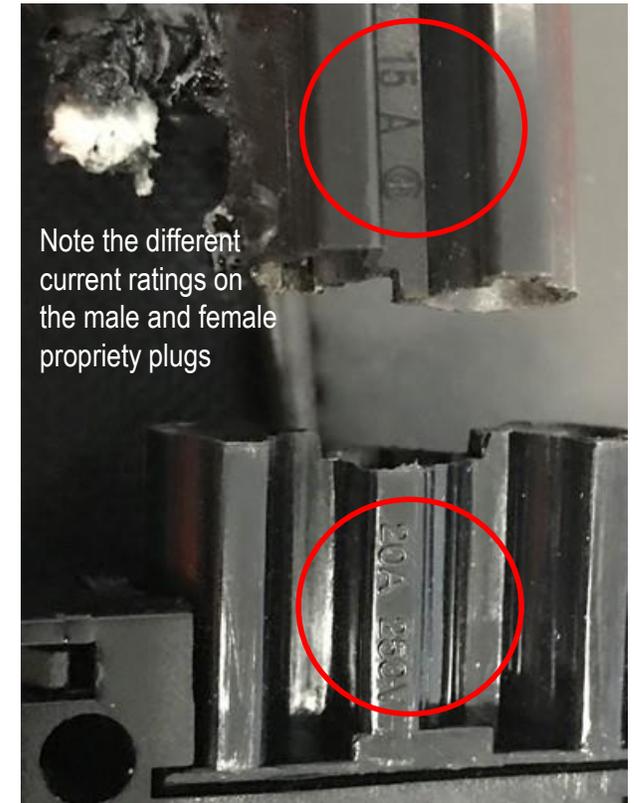
The office modular outlets supplied with the wall units, as found before opening up



A close up of the damage to the male and female plugs



The top and bottom view of the damaged outlet with the female plug connected. Note the melted pin and open circuit in the active conductor



Note the different current ratings on the male and female proprietary plugs

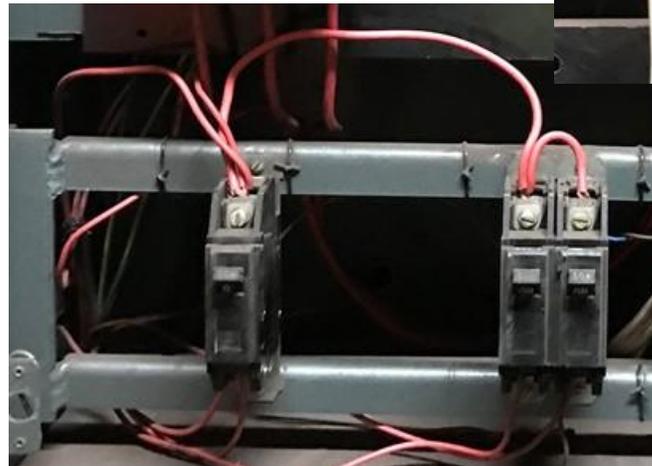
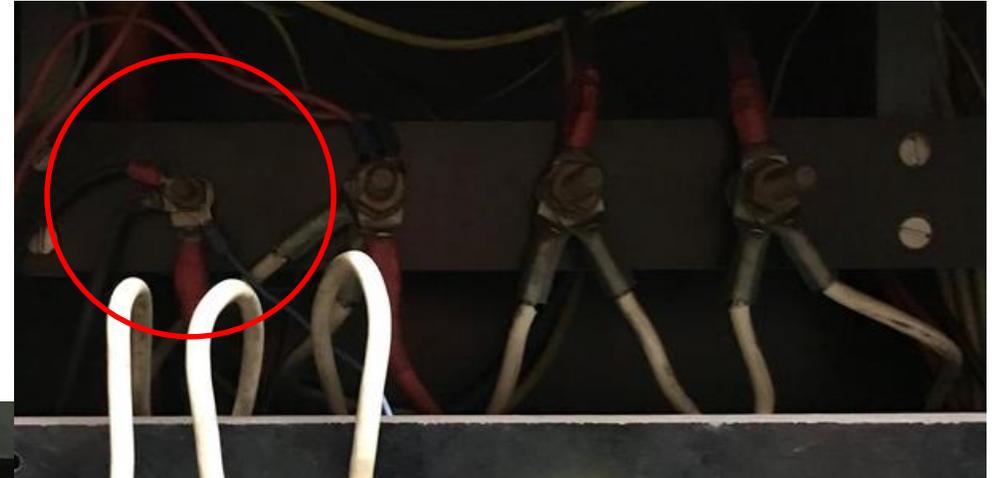
After upgrading a lighting distribution board one of the RCD breakers tripped during testing and commissioning. The cable for this circuit was traced to the main isolator panel for the lift at the No.2 Power house, inside this panel are three breakers for light and power inside the lift well. The active conductor of the cable traced terminated at the first circuit breaker and looped to the others, however all the neutral conductors were connected to the main neutral stud for the 3 phase main supply for the lift. With the 3 phase supply still energised and the lift in service the neutrals connected together formed a common bond which was sensed by the RCD breaker. This common neutral set up a trap for the electricians working on the lighting distribution board.

As per Electrical Safety Manual section 1.4.3.3 neutral conductor current sources cannot always be identified and isolated. All exposed neutral conductors shall be considered as live until all neutral conductor current sources are identified, isolated and the isolation verified or it is guaranteed the neutral conductor will remain at earth potential.



The lift main isolator panel with the control light and power circuit breakers.
Note no labelling to indicate these are fed from a different supply to the lift power supply

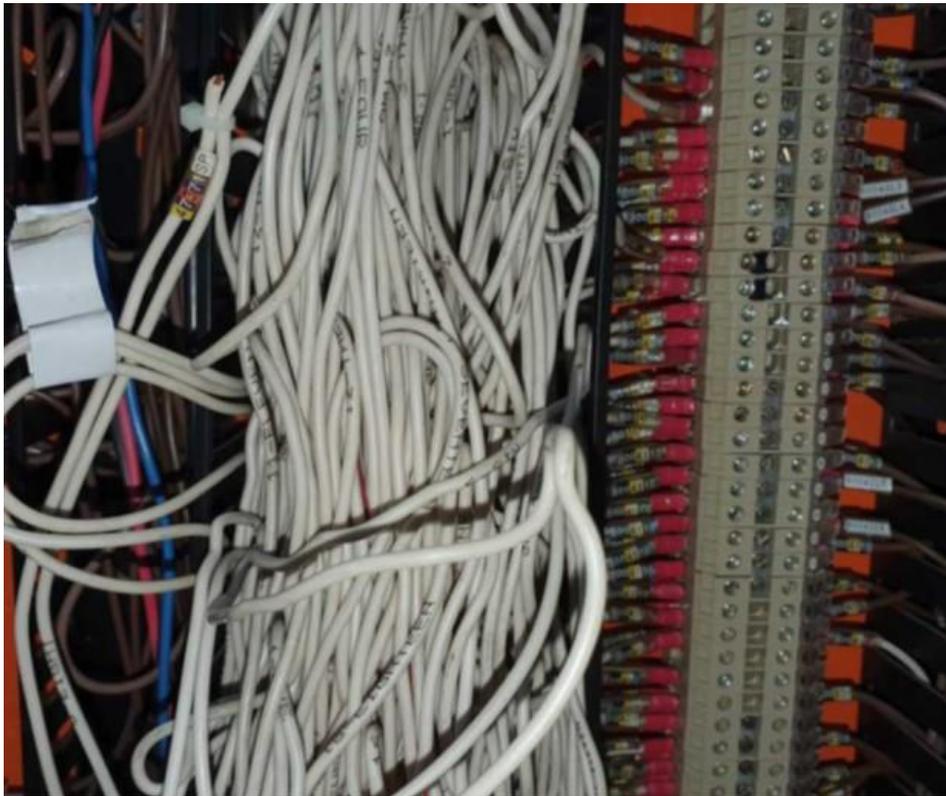
The wiring to the circuit breakers with the active conductor from the lighting board connected



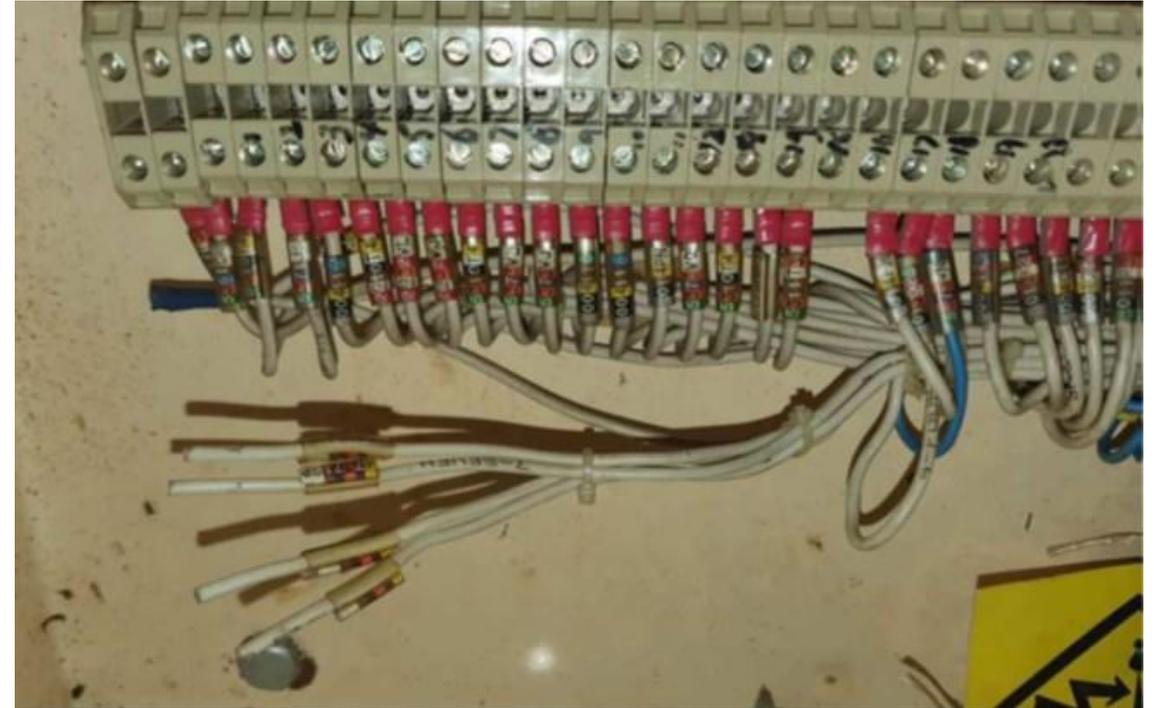
The main incoming connection studs for the lift main three phase power supply.
The stud on the left hand side is for the neutral with numerous wires terminated including the loads from the control circuit breakers

Unterminated control wires were discovered during commissioning of a PLC upgrade at DCL3. Duplicated wire numbers were identified on two cables between E-Stop panel & Exit Tower jog station, as recorded on cable schedules. Three cores of cable 47371 were connected to the PCS circuit in the E-Stop panel, but were not terminated at the Exit Tower jog station. The cores were hidden behind & between the cable loom and the terminal strip with the ends approximately level with the top terminal. The ends of the cores were not insulated, however there was no bare copper protruding from the insulation. This left a potential for one of these core when energised to contact each other or an earthed surface which may have crash stopped the process line.

As per Electrical installation manual section 4.7.7 all spare cores of control cabling shall be bonded to earth at the supply end of the cable and insulated from earth and each other at the load end of the cable.



The terminal strip in the e-stop panel with the wiring wrongly doubled on the terminals

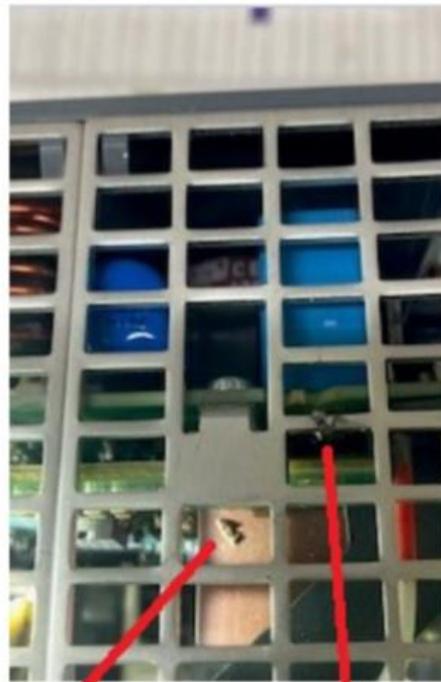


Inside the jog station with the spare cores left cut off and uninsulated. They were found tucked inside the cable loom

An electrician working in a remote I/O panel placed two terminal blocks (insulation facing down) on top of a SITOP 24V dc power supply, which resulted in the 24V power supply failing and tripping circuit breakers within the panel. A piece of conductive swarf was found on the power supply components after the power supply was removed. It is believed this had been sitting on the power supply cover since the initial installation, and placing the terminal blocks on top of the unit has dislodged the swarf causing it to short the internal components.

Before energisation of any installation all devices are to be cleaned of all conductive swarf or filings to ensure it is safe and fit for duty.

As per electrical safety manual 1.3 and 2.4.5 a minimum safe working distance of 500mm must be maintained if an electrical worker is considering work near live conductors or equipment where there is a possibility the worker, or any object the worker may handling may contact live parts or initiate an arc fault. A risk assessment must be conducted and adequate controls such as protective barriers put in place before work can commence.



Swarf piece

Short area

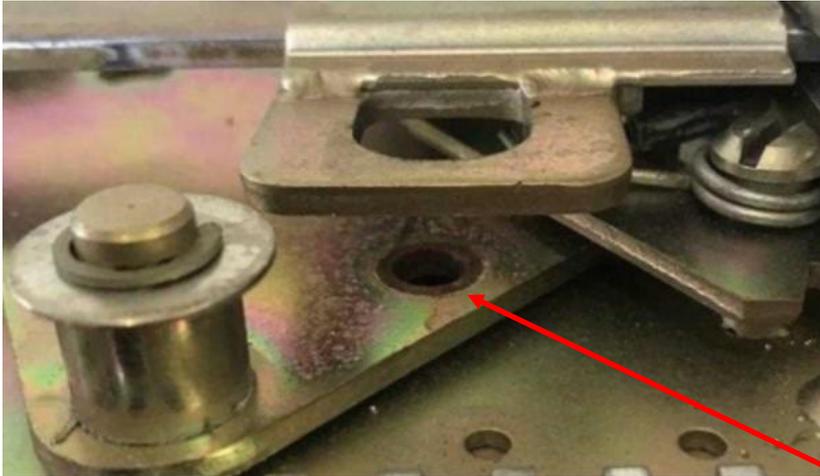
The power supply



The top of the power supply with the swarf clearly evident

During de-isolation of a 100amp CFS unit an electrician has noticed the switch has failed to close. The switch has failed internally and the fuse cartridge became jammed and could not be removed. When the board was isolated the switch was removed to reveal the drive pin for the switch handle had broken away from drive plate rendering the switch inoperable. This is a similar failure of this style CFS unit from previous incidents which are being investigated.

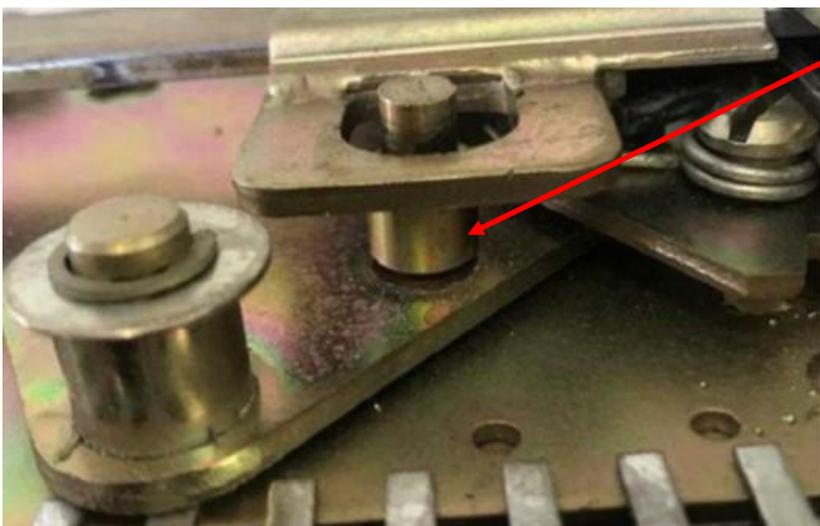
This is a reminder for all BSL owners of this style of 100Amp or 200Amp CFS unit manufactured after 2005 to investigate if their switches potentially have this failure point.



The loose pin



The style of CFS board



The drive plate without the pin in position and with the pin where it should be.

Note neither the drive pin or the holding pin have an evidence of welding on the top of the drive plate

The name plate of the CFS switch



A roofing contractor supervisor returned a 15amp lifeguard power board because his firm could not use it due to the plug being 15amp and there only being 10amp outlets on site. The electrical supervisor with whom the board was returned noticed the 15amp earth pin of the plug had been modified. It seems an attempt had been made to reduce the size of the earth pin to fit into a 10amp outlet. The attempt failed when the cut in the pin was only on the shaft of the pin not the top part of pin, still not allowing the pin to be inserted in the 10amp socket. No one has admitted to modifying the pin.

Incorrect modifications to or repair of an electrical appliance may result in an electric shock or arc blast and flash injury. All appliances should be visually inspected by a competent person every time they are used and tested as fit for duty on a regular basis.



Two views of the earth pin of the 15amp plug. Clearly the pin has been modified and reduced in size at the base of the pin, however, the top of the pin has not be reduced

