



Safety Advice 09-2009 (NZ)

Arc Flash Burns During Visual Inspection of In-Service 11kV Circuit Breaker

1. What happened?

While a visual inspection of an in service, 11,000 volt circuit breaker (CB) was in progress, the CB 'flashed over' and a Maintenance Switcher received first and second degree arc flash burns to the left hand and face.

2. How did it happen?

A work party had previously completed maintenance on an 11,000 volt indoor CB. On completion of the work, the CB was placed in position for reinstalling into the switchgear cubicle, when the supervisor of the work party noticed an oil drip on the "A" phase module. He wiped it clean, then left the CB unattended to assist with concurrent work elsewhere on site, with the intention to recheck the CB in half-an-hour.

In the meantime the Maintenance Switcher, who was not a member of the original work party that serviced the CB and was unaware that the CB was under observation, returned the CB to service.

On the return of the work party supervisor, it was noted that the CB had been racked into position and had been returned to service. He mentioned his concerns about the possible oil leak to the Maintenance Switcher and a discussion arose about possible actions to take, including removing the CB from service again. Instead a decision was made to remove the lower front panel of the CB in order to perform a visual inspection to ascertain if the oil was still dripping from the "A phase module".

The members of the work party (including the Maintenance Switcher) were aware that by removing the panel it would expose live high voltage switchgear but were confident that they would be outside the Minimum Approach Distance (MAD) for 11kv (300mm) providing the inspection was for **visual purposes only**.

Whilst carrying out this inspection, there was a flashover in the CB compartment resulting in flash burn injuries to the Maintenance Switcher. The Buszone protection operated and cleared the 10,000 amp fault in 80 milli-seconds.

3. Causes

- The decision to remove a panel off the Circuit Breaker whilst in service with the intention of exposing live High Voltage was a poor one, considering that it was entirely possible to isolate the circuit breaker prior.
- The CB was returned to service without clear communication between the work party supervisor and the Maintenance Switcher.
- The most probable cause of the arc 'flash over' was an inadvertent breach of the MAD by the Maintenance Switcher's hand whilst manoeuvring into position to undertake the visual inspection.



4. Preventing Future Occurrences

- Implement work procedures surrounding equipment that is under repair (irrespective of whether it is covered by an Access Permit), to ensure that it is not returned to service prematurely.
- Forbid the removal of any panels/covers from in service switchgear that requires the use of a tool (designed to prevent access during the normal course of operations).

5. Learning's relating to site emergency response

The burns victim injuries were immediately assessed by another employee who then promptly escorted the victim to the shower on site where he remained until the ambulance arrived on site. This prompt action to cool the burns minimised the harm suffered by the victim.



Circuit Breaker racked in (*with lower panel removed*)



Circuit Breaker cubicle. (*Note arc flash marks to busbar shutters at left-hand side of cubicle – left-hand side module was the module that was suspected to be leaking oil*)



Circuit Breaker phase modules as viewed when lower panel removed
(Note that when racked in and in-service the phase modules are live)

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