

SAFETY ALERT

SWITCHBOARD INTERNAL SEGREGATION AND IP RATING

May 2014

BACKGROUND

There has been a recent serious incident involving a large arc event caused by material falling through an opening in a switchboard enclosure. The switchboard enclosure did not comply with the relevant Australian Standards, in particular AS/NZS 3000:2007 and AS/NZS 3439.1:2002.

On investigating this incident, it has become a matter of concern to Energy Safe Victoria (ESV) that there appears to be confusion in the industry as to the IP rating requirements of switchboards and a lack of understanding of the responsibility for compliance.

It is also of concern to ESV that the potential for incorrect switchboard design, construction and installation, and subsequent electrical incidents, is not being recognised within the broader industry.

DETAILS OF INCIDENT

The incident involved two electrical workers who were working in a switchboard enclosure, forming part of a large switchboard, fitting a lug to the end of a cable. Lock out, tag out procedures were used and in place. A tinned copper lug fell through a 23mm gap at the rear of the switchboard enclosure. The lug fell onto a live electrical busbar enclosure which was below the switchboard enclosure being worked on. The lug came into contact with the live busbars causing a short circuit and subsequent arc event which resulted in extensive switchboard damage.

The 23mm gap at the rear of the switchboard enclosure is non-compliant, was not obvious and was not picked up by the:

- switchboard designer;
- switchboard supplier;
- switchboard builder;
- switchboard installer;
- Registered Electrical Contractor (REC);
- Licensed Electrical Workers (LEW); or
- Licensed Electrical Inspector (LEI).

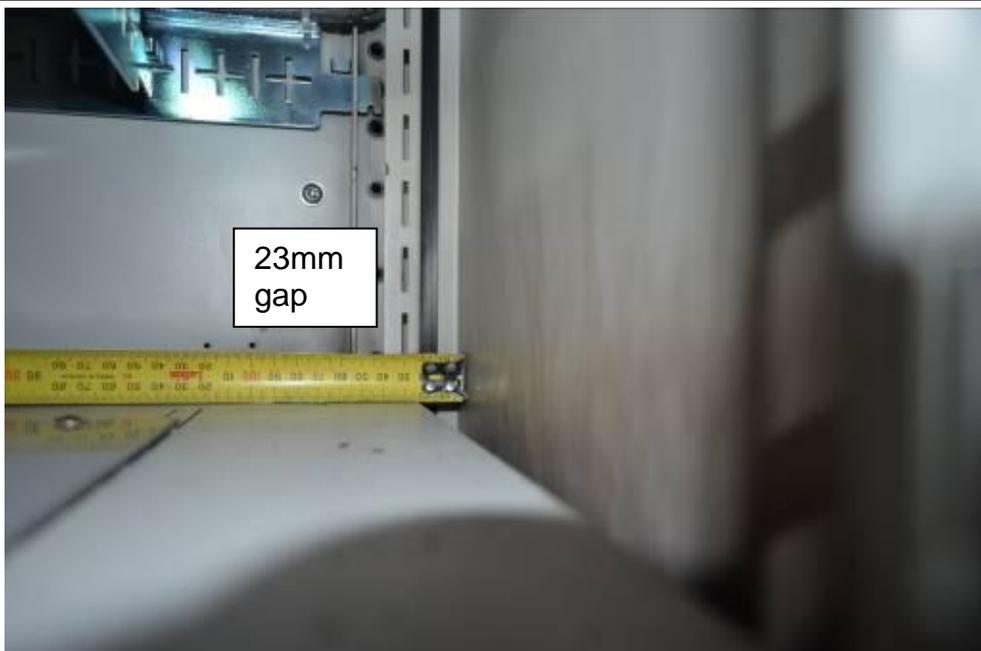
This particular type of switchboard is a modular system. The switchboard manufacturer 'Type Tests' the modular switchboard system. Compliance is then achieved by the manufacturer's instruction being followed by the switchboard suppliers, builders and installers. In most cases with modular systems, the design of the required switchboard is submitted to the switchboard supplier to generate the required parts. The switchboard is then built to the manufacturer's instructions (manual). Switchboard compliance is reliant on the initial design along with the construction and installation.

The onus of ensuring compliance of the switchboard, when installed, lies with (but may not be limited to) the LEW, REC and LEI, who carried out the work and signed off on the relevant Certificate of Electrical Safety.

In this instance the design, construction and installation of the switchboard failed to meet the requirement of the IP2X rating from one enclosure to another.



Switchboard enclosure



23mm gap at rear of SB enclosure

COMPLIANCE

Clause 2.9.3.2 of **AS/NZS 3000:2007, Wiring Rules – Suitability:**

Switchboards shall be suitable to withstand the mechanical, electrical and thermal stresses that are likely to occur in service.

Switchboards complying with the relevant requirements of the AS/NZS 3439 series of standards are considered to meet the requirements of this Clause 2.9.3.

Section 7 – Design and Construct of **AS/NZS 3439.1:2002 – Low-voltage switchgear and control gear, Assemblies Part 1: Type-tested and partially type tested assemblies (IEC 60439-1:1999 MOD):**

Clause 7.7 – Internal separation of ASSEMBLIES

Upon agreement of the form of internal separation between manufacturer and user, verification of internal separation shall be in accordance with 8.2.7.

NOTE: The above relates to the form requirements agreed upon i.e. Form 4A.

Section 7 – Design and Construct of **AS/NZS 3439.1:2002:**

Clause 7.7.1 – By barriers or partitions (standard construction)

One or more of the following conditions can be attained by dividing ASSEMBLIES by means of partitions or barriers (metallic or non-metallic) into separate compartments or enclosed protected spaces

- *Protection against contact with hazardous parts belonging to the adjacent functional units. The degree of protection shall be at least IPXXB;*
- *Protection against the passage of solid foreign bodies from one unit of an ASSEMBLY to an adjacent unit. The degree of protection shall be at least IP2X. Unless otherwise stated by the manufacturer, both conditions shall apply.*

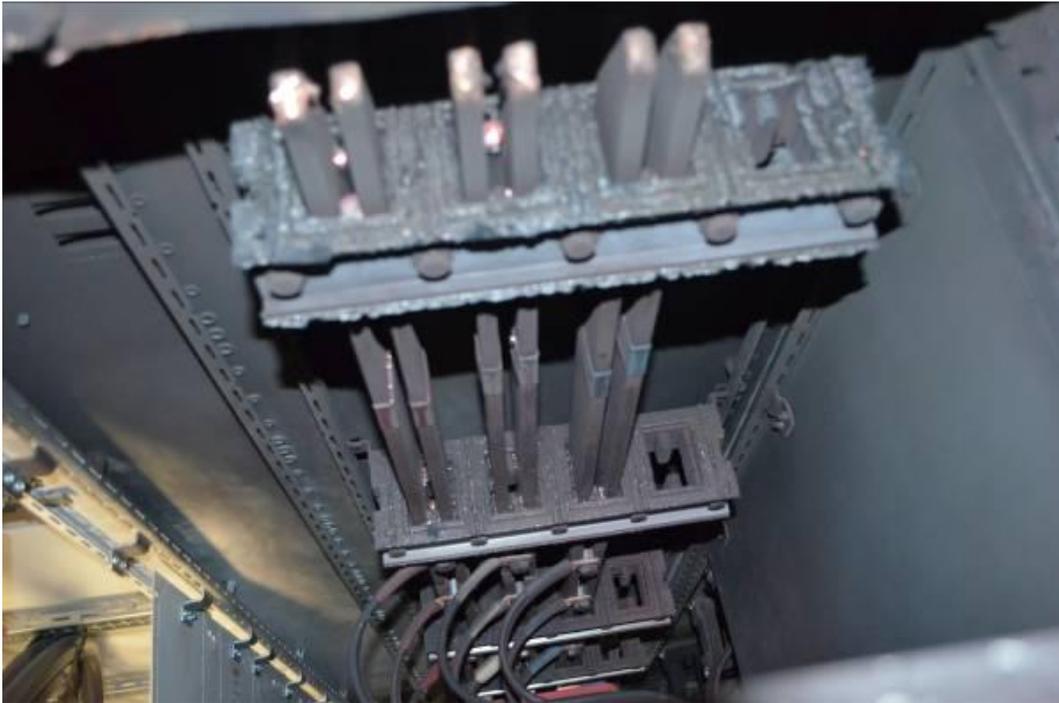
NOTE: The degree of protection IP2X covers the degree of protection IPXXB.

The above means that the degree of protection required between compartments or enclosures is IP2X and if IP2X is met then so is IPXXB.

AS 60529:2004 – Degrees of protection provided by enclosures (IP Code) states the following in relation to achieving the degrees of protection against contact with hazardous parts and the passage of solid foreign bodies:

- Degrees of Protection against Hazardous Parts (First characteristic numeral 2)
 - Protection against access to hazardous parts with a finger. The finger is defined as having a 12 mm diameter and 80 mm length and shall have adequate clearance.
- Degrees of Protection against Solid Foreign Objects (First characteristic numeral 2)
 - Protection against solid foreign objects of 12.5 mm diameter and greater. The object probe, a sphere of 12.5 mm diameter, shall not fully penetrate.

The test finger shall not be able to contact live parts from one enclosure to another and the test sphere shall not be able to penetrate from one enclosure to another.



Damage to adjacent SB enclosure

SAFETY OUTCOME

The two workers involved in this incident were not injured; however this could have resulted in very serious injuries. ESV wants to alert all switchboard manufacturers, suppliers, installers, electrical workers and electrical inspectors to this hazard.

The non-compliance of this switchboard was not identified until after the incident had occurred.

RELEVANT LEGISLATION

The Electricity Safety Act 1998 – Part 3

37 Obligations on registered contractors

A registered electrical contractor must not permit a person to carry out on the contractor's behalf, or direct a person to carry out, any electrical installation work that does not comply with this Act or the regulations.

*Penalty: In the case of a natural person, 50 penalty units;
In the case of a body corporate, 250 penalty units.*

44 Compliance and testing of electrical installation work

*(1) A licensed electrical installation worker must ensure that all electrical installation work carried out by that worker—
(a) complies with this Act and the regulations;*

Penalty: 40 penalty units.

45 Inspection of electrical installation work

- (4) *A licensed electrical inspector must not sign a certificate of inspection of any prescribed electrical installation work unless the certificate—*
- (a) *describes the work; and*
 - (b) *states that the inspector has inspected the work; and*
 - (c) *states whether or not the work complies with this Act and the regulations; and*
 - (d) *contains any other details in relation to the work required by the regulations.*

Penalty: 50 penalty units.

The Electricity Safety Act 1998 Part 4- Electrical Equipment

54 Standards of Electrical Equipment

A person must not supply or offer to supply electrical equipment unless-

- (a) *The equipment complies with the minimum standards prescribed for equipment of that class.*

*Penalty: In the case of a natural person, 40 penalty units;
In the case of a body corporate, 200 penalty units.*

At the time of writing, one penalty unit equated to approximately \$145.00.

Put simply, get it right!

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