ACA
Australian Cablemakers Association

21 May 2013
Energy Safe Victoria
Level 5 Building 2
4 Riverside Quay
Southbank VIC 3006

Attn: Adam Murdoch
Manager, Equipment Safety and Efficiency

Further information to the presentation given at the Australian Cablemakers Association ("ACA") meeting dated 16 May 2013

Thank you for attending the ACA meeting held on 16 May 2013. Our members found your presentation and comments on the Approved Cables Initiative of significant value, and we look forward to working with Energy Safe Victoria on non-compliance matters in the future.

Further to the meeting on 16 May 2013, please see at enclosure 1 to this letter, an analysis to support the opinion of the Approved Cables Initiative committee that product 2.5mm^2 2C+E Flat BW manufactured by Infinity Cable poses a safety risk in the near to medium term future.

Within the report, a photo of the brittle conductor is included.

Should you have any further queries, please contact myself in the first instance.

Regards

Andrew Davenport
Secretary
Australian Cablemakers Association
Enclosure 1: Copy of ACI Service life analysis for Infinity Cable

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Approved Cables Initiative

Service Life of Infinity Brand Building Wire

The Australian Cablemaker's Association (ACA) has, through its sub-committee the Approved Cables Initiative (ACI), undertaken testing on samples of Infinity brand low voltage building wire. The cable samples were obtained from the retail chain, Masters.

The cable tested was a 2.5mm^2 2C+E Flat BW that is typically used in the power circuits of a domestic dwelling. The relevant Australian Standard for this cable is AS/NZS 5000.2 and this sets out the minimum performance criteria for use in Australia and New Zealand.

Testing has revealed that the cable fails to meet the minimum criteria defined in the Standard in three important areas as detailed below.

While initial testing was undertaken within ACA member laboratories, the ACI also sought to commission an independent NATA accredited laboratory (TÜV Rheinland Australia Pty Ltd) to repeat test the parameters which the ACA labs had found to be deficient. The findings of TÜV aligned very well with internal testing.

The table below outlines the areas of non-conformance based on the TÜV test results:

Manufacturer: Infinity Cable

Product: 2.5mm^2 2C+E Flat BW

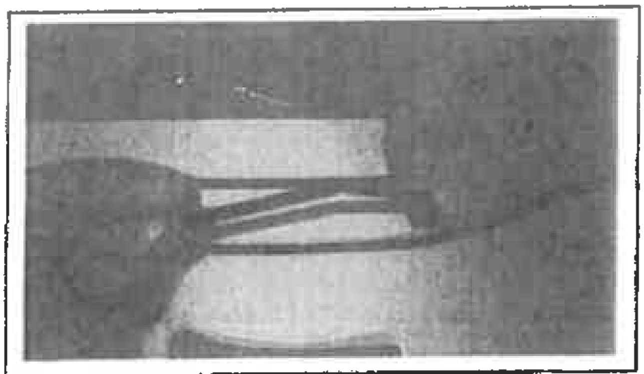
Non-compliances:

Aspect	Specification Requirement	Actual Result
Conductor Resistance	d.c. resistance ≤ 7.41 ohm/km	G/Y 7.97 ohm/km (+8%) Red 7.82 ohm/km (+6%) Black 7.84 ohm/km (+6%)
Insulation Ageing	Elongation after ageing ≥ 65% of un-aged elongation	Too brittle to measure
Sheath Ageing	Elongation after ageing ≥ 65% of un-aged elongation	Too brittle to measure

In analysing the possible impacts from a safety perspective then the following considerations can be made:

1. The increased conductor resistance will, at a given load, cause an increase in conductor temperature due to the increased power dissipation within the conductor. However, our calculations indicate that this temperature rise will be relatively small, in the order of 2-3°C, and unlikely to make any material difference to the performance of the cable.

2. The insulation and sheath deterioration after ageing suggests that the PVC material used for



these critical protective layers is simply inadequate for local conditions. Our internal testing, confirmed by TÜV, demonstrated that, after the ageing test, the PVC insulation and sheath tested became brittle to the point it could be fractured very easily through bending (please refer photo below).

3. In consideration of domestic dwellings, the typical installation locations for subject cable are in wall cavities and the roof space. Once the cables become brittle then any physical disturbance could cause the insulating materials to fracture and then expose the live conductors. Over time, such disturbances could occur either through re-work of the electrical system (a power point is added or relocated) or, in the case of a roof space, through walking or crawling over the cables that are typically simply laid across the roof supports. These scenarios could easily represent enough movement to fracture the insulation and expose the live conductors presenting an electrocution hazard.

4. Australian Standard AS/NZS 5000.2 requires (via other related Standards) to undertake accelerated ageing tests on both insulation and sheath to ensure that these materials do not deteriorate with time and through exposure to the high ambient temperatures typically experienced in this country. The standard quantifies the 'flexibility' of the insulation and sheath materials through undertaking an elongation at rupture test which measures the amount the material can be elongated before it breaks. Furthermore, the Standard requires that after ageing, the material shall retain a minimum of 65% of the elongation value achieved on the un-aged sample to ensure the materials do not become brittle and liable to fracture. The ageing condition is 504 hours in an air oven at a temperature of 115°C. It was found that the subject cable became extremely brittle to the point elongation measurement was not possible after conclusion of the ageing process.

5. In order to assess the length of time that is equivalent to the accelerated ageing time then a simplified Arrhenius extrapolation using the 10-degree rule may be considered. In simple terms this rule states that where accelerated ageing is employed, for every 10 degrees increase in temperature above the operating temperature (under which the product is maintained during service) then the effective ageing time doubles. If we take a hypothesis that in roof space the temperature may be, say, 65°C for 6 hours per day. The difference between the operating temperature and the ageing temperature is 50°C (or 5 times 10°C). So with an ageing period of 504h we get the following evaluation:

$$Teq = 504 \times 2^{(115-65)/10}$$

From the equation above Equivalent time (Teq) is 16,128 hours.

Now assume the cable is present in the elevated temperature for only 6 hours per day and we ignore the ageing effect of the increased temperature at other times of the day we can say that Teq, from an equivalent lifetime perspective is 16,128/6 hours = 2,688 days or 7.4 years.

6. It is no doubt true to say that failures in the subject cable may not have been observed in the field as yet due to the limited time that the product has been sold in the Australian market but the above considerations do suggest a scenario where failures, and potential safety issues, are likely to occur in the near to medium term future.

Infinity Orange Circular

In addition to the TPS which forms the subject of this overview, one member of the ACI has observed that 0.6/1kV Orange Circular cable of the same brand has the same insulation and sheath performance issues as the TPS. This cable is typically utilised in commercial premises and industrial applications for the provision of three phase supplies. The ACI is of the belief that this product also represents a safety risk and urges that it also should be reviewed from a safety perspective.

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