

## **The effect of UV radiation on cables.**

For any cable that is exposed to direct sunlight the following should be considered:

- 1) The effect on the current rating of the cable.
- 2) The effect on the physical properties of the cable sheath.

### **Current Ratings**

Cables are normally rated taking into account the maximum standard ambient temperature for the given installation. However cables exposed to direct sunlight should be rated in accordance with the maximum Black Bulb temperature. This can be typically 10°C above standard ambient in the UK and can be much higher elsewhere in the world. This increased temperature may necessitate the need for a larger sized conductor. A method for calculating the current rating when exposed to solar gain is set out in IEC 60287 which is the international standard for calculation of current ratings in electric cables. This method takes into account for the absorption coefficient of solar radiation for the cable surface (sheath material) and the intensity level of the solar radiation. Shielding of cable from direct sunlight will usually alleviate the need to correct the cable rating further for solar gain.

### **Physical properties of the sheath.**

UV radiation in sun light can affect the properties of cable sheaths in two ways.

- Colour fading.
- Degradation of the physical properties of the sheath material.

There are no test requirements defined within the manufacturing standards for UV resistance. All polymers will degrade eventually with time and UV radiation will contribute to this, even those cable sheaths that have resistance to UV.

It should be noted that even UV stable cable sheaths can suffer from colour fade. The fading is only a cosmetic effect and does not indicate deterioration of the properties of the sheath.

For any non UV resistant sheath, following the initial colour loss, the sheath will continue to prematurely age. The rate of this aging will depend upon many factors such as the specific location, the degree of shading, proportion of sunny/cloudy days in the year etc. The reduction in mechanical properties that result from this aging are likely to lead to premature failure of the sheath, often seen in the form of cracking in extreme cases. Deterioration in the sheath properties might have limited impact on existing installations where cables are securely fixed and not subject to movement or mechanical stress. However, if exposed to the weather, any cracking will likely lead to water ingress.

Should there be concerns regarding UV exposure the cables should be shielded from direct sunlight. This shading may take the form of a canopy, or alternatively by enclosure in trunking. It should be noted that moving the cable into a trunking system might exacerbate existing sheath cracking and might not be considered advisable.

Black sheaths will contain high carbon black content and so will inherently offer the best UV resistance and the best resistance to colour fade.

### **Building Wires**

These are cables designed primarily for internal installation (e.g. Twin Flat cables) and will offer limited resistance to UV exposure. Similarly conduit cables will offer limited resistance. Note that whilst black insulation/sheath is superior, it is uncommon in these cable types.

### **Unarmoured Fire Performance Cables**

These cables are designed for both internal and external installation and therefore include UV protection in their sheaths. White or black sheaths are inherently more UV resistant, although black is not a common colour for these types. Red sheaths are also more susceptible to fading.

Although there is UV protection in the sheaths of these cables, significant exposure will inevitably reduce the life of the sheath and hence may be the determining factor in the ultimate cable life. The life expectancy of the cable will in this case be extended by shading.

### **LV and MV armoured Cables including Fire performance.**

Prysmian armoured cables are designed for external installation and include UV protection in their sheaths. This applies to all colours, although black sheaths are inherently more resistant. Red sheaths are also more susceptible to fading. Although there is UV protection, significant exposure will inevitably reduce the life of the sheath and hence may be the determining factor in the cable life. The life expectancy of the cable will in this case be extended by shading.