ON SITE TESTING GUIDELINES FOR MV CABLES

The object of testing is to establish if the cable or joint has been damaged in any way during installation. Not all installers test at installation as the cables are of course tested in the factory before supply.

INSULATION TESTING

Direct guidance is given within BS6622/BS7835.

In the guidance provided in cable standard (BS 7870-4.11/4.10), it recommends following IEC 60502-2 for after installation testing.

The test criterion for AC or DC testing is specified in IEC 60502-2. Either Voltage method is acceptable and is detailed below. As the manufacturer we don't have a recommendation for a particular test.

AC Testing

Clause 20.3.1 in IEC 60502-2 references IEC 60060-3 and advises one of three tests can be used:

1	15 minute test with phase to phase voltage(U), at a frequency between 20HZ to 300Hz, applied between the conductor and the metal screen or sheath
2	24 hour test with the normal U_o rated voltage of the system
3	15 min test with the RMS rated voltage of $3U_0$ at a frequency of 0,1Hz applied between the conductor and the metallic screen/sheath.*

*this test is also referred to as VLF (Very Low Frequency) testing

DC Testing

Clause 20.3.2 in IEC 60502 provides guidance for an alternative DC test of the insulation. The voltage should be applied gradually to the full value, in this case 4 x U_o (DC) and maintained continuously for 15 minutes. No breakdown should be observed. This test voltage is intended for cables immediately after installation, and not for cables that have been in service. Guidance on reduced Voltage levels is given in the Annex at the end of this document.

This information is based on a straight cable installation. If there were any cable joints in the system, verification would need to be made with the manufacturer as to what test voltage they can withstand.

It is not recommended to do a large numbers of DC tests on cable insulation, as a DC test can endanger the insulation under test.

MV INSULATION RESISTANCE TESTING

Insulation resistance measurements are not required as part of the routine testing requirements of MV cable standards such as BS 7835/6622 or BS7870-4.10. Whilst customers may well carry out such tests, we would not provide guidance on the methods used. We would however comment that in isolation, insulation resistance values might not be meaningful.

If measurements are made, we would expect values to be in excess of 10,000 MΩ.km at 20°C and 10 MΩ.km @ 90°C.

SHEATH TESTING

A DC voltage test can be performed after installation. This test requires that the over sheath has an outer "electrode" which may be a semi-conductive layer or moist backfill (wet ground). This is only to be attempted if the joints are suitably insulated from earth; otherwise the test should be performed on the cable prior to jointing.

Clause 20.2 in IEC 60502-2 references IEC 60229 in order to establish the test voltage and test duration. The requirement is for 4kV/mm of specified oversheath thickness up to a maximum of 10kV for 1 minute duration, applied between the underlying metallic layers and the outer electrode without any failure.

Note: All metallic layers under the over sheath shall be connected together.

For MV Cables, the applicable manufacturing standards give further detail.

BS6622 (PVC sheath): Apply 8kV (total) for 1min between the semi-conductive layer and the over sheath. No breakdown should occur.

BS7835 (LSOH sheath): Apply 5kV (total) for 1min between the semi-conductive layer and the over sheath. No breakdown should occur.

BS7870-4.10: guidance for voltage testing after installation references IEC 60502-2

Guidance on tests after installation – taken from Annex B of IEC 60229

Both before and after installation, testing of cable sheaths which have a conductive coating is being performed more frequently. These tests are often performed on the drum of cable before installation, as well as after installation, as part of the commissioning tests.

In recognition of this, and to ensure that those conducting these tests do so in a safe and responsible manner, Annex B: Guidance on testing after installation, is included and the following points should be taken into consideration:

1. The conducting layer should be removed from the cable ends to prevent any tracking/flashover when the test is being conducted.

2. It should be noted that the use of some solvents and cleaners to remove the conducting layer may have a detrimental effect on the physical properties of the over sheath material.

3. The conducting layer must be adequately earthed when the test is being performed.

4. Steps should be taken to avoid a charge build-up in other metallic components within the cable and surrounding metallic objects during the test (all metallic layers under the over sheath shall be connected together).

5. Safety protocols should ensure restricted access to the test site when the test is being conducted.

6. Upon completion of the test, the cable should be earthed for a suitable period following the test to ensure any residual charge is removed.

7. The value of the test current may be taken for engineering information only.

MAINTENANCE / ON-GOING TESTING

Cables once installed do not require any maintenance or regular testing.

ANNEX

RECOMMENDATIONS FOR INSULATION TESTING OF CABLES IN SERVICE

REPAIRED INSTALLATIONS

When cable has been in service for a period of time, we would recommend that any testing be carried out at a reduced level, as follows:

Age of cable (years)	Test voltage level (% of "new" level)
0 - 2	75 % (DC) for 15 minutes
2 -10	50 % (DC) for 15 minutes
over 10	Uo (Ac) for 24 hours