Standards – Paper Lead and XLPE cable

Paper lead cables AS/NZS1026:2004 Electric cables – Impregnated paper insulated for working voltages up to and including 19/33 (36) kV

XLPE cables AS/NZS1429.1:2006 Electric cables – Polymeric insulated for working voltages 1.9/3.3 (3.6) kV up to and including 19/33 (36) kV

HB242-2007 – High Voltage Mining Equipment for use underground
Tests after installation

What the standards say

Paper lead

AS/NZS 1026:2004 B3
Any voltage test after installation should be made with direct current, the value of the voltage being that specified in Table B3. When making the test, the voltage should be increased gradually to the full value and maintained continuously for 15 minutes between conductors and between each conductor and sheath. No breakdown should occur.
Where switchgear can not readily be isolated from Terminals, the test voltage is a matter of agreement between the parties concerned.

### AS/NZS 1026:2004  Table B3

**Test Voltages After Installation**

<table>
<thead>
<tr>
<th>Cable Designation</th>
<th>Between Conductors (Belted Cables Only) kV</th>
<th>Between All Conductors and Sheaths kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6/1 (1.2)</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>3.8/6.6 (7.2)</td>
<td>20.0</td>
<td>15.0</td>
</tr>
<tr>
<td>6.35/11 (12)</td>
<td>34.0</td>
<td>25.0</td>
</tr>
<tr>
<td>11/11 (12)</td>
<td>34.0</td>
<td>34.0</td>
</tr>
<tr>
<td>12.7/22 (24)</td>
<td>-</td>
<td>50.0</td>
</tr>
<tr>
<td>19/33 (36)</td>
<td>-</td>
<td>75.0</td>
</tr>
</tbody>
</table>
Tests after installation

What the standards say

XLPE

AS/NZ1429.1: 2006

APPENDIX F

(Informative)
F1 SCOPE

This appendix sets out the recommendations for tests after installation. The d.c. testing of the primary insulation is not recommended. The testing of the system after installation is not a requirement of this Standard.
F2 HIGH VOLTAGE A.C. TEST
AFTER INSTALLATION

An a.c. voltage test at power frequency should be applied for 24h with the normal operating voltage of the system.

Alternate higher voltage a.c. tests at lower than power frequency could be applied, as agreed between purchaser and installer.
F3  ADVICE CONCERNING TESTS AFTER INSTALLATION

A test after installation should be carried out to detect defects caused during installation and application of accessories.
F4 SHEATH INTEGRITY TEST

A sheath integrity test (e.g. 1,000 V minimum insulation resistance tester) should be applied between the outermost metallic layer and earth, to identify any after installation damage.
Tests after installation

What the standards say

Paper Lead

HB242-2007

8.2.3 HV testing
**Areas of application of tester and test voltages**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable Designation</td>
<td>Test Voltages* d.c.</td>
<td></td>
</tr>
<tr>
<td>11kV</td>
<td>Phase to earth</td>
<td>Phase to phase</td>
</tr>
<tr>
<td>New equipment</td>
<td>25kV</td>
<td>25kV</td>
</tr>
<tr>
<td>Installed equipment</td>
<td>18kV</td>
<td>18kV</td>
</tr>
</tbody>
</table>
Accessories that affect test results

In underground installations there are multiple cables, isolators, high tension enclosures, inline joints, couplers and connecting pins.
Accessories that affect test results

High leakage and system faults will generally not be in the cable unless there has been physical damage caused by mobile machinery or change in conditions.
Accessories that affect test results

The faults are generally in the accessories, eg. isolators, high tension enclosures, inline joints, couplers and connecting pins.
Factors that affect test results

- Length of run under test.
- Quantity of accessories.
- Number of parallel paths.
- Age of system.
- Frequency of maintenance.
- Environmental conditions.
Summary

Test voltages from standards

- HB242-2007 – 25kV new – 18kV installed
- AS/NZS1026 – Installation – 34kV D.C – Cable
- AS/NZS1300 – Manufacturers 2x + 2kV (couplers)
- AS/NZS1429.1 – Installation – supply voltage
- AS/NZS1747 – 28kV D.C. (couplers)
- AS/NZS3000 – System – 2x + 2kV
RECOMMENDED KYORITSU 3124 TESTING CONNECTIONS (IF IN DOUBT, ASK!)

ITEM UNDER TEST SHOULD BE CONNECTED TO A LOW IMPEDANCE SYSTEM EARTH (EARTH CONNECTIONS! FIRST ON, LAST OFF)

PHASE UNDER TEST

SPARE CLAMP TO BE PLACED ON PHASE UNDER TEST AFTER TESTING IS COMPLETED

JUMPER SET

30kV DC DISCHARGE STICK

ALWAYS HOLD BELOW HANDGRIP

Ph 02 4932 7344

Drawing - 3124-01 (Revision 0, 5/3/2008)
Recommended connections
BAUR HiPot tester

RECOMMENDED BAUR PGK25
TESTING CONNECTIONS
(IF IN DOUBT, ASK!)

RETURN LEAD
(RED OR CLEAR)

HV (BLACK)
-26kV MAX

PHASE UNDER TEST

SPARE CLAMP TO BE PLACED ON PHASE UNDER TEST AFTER TESTING IS COMPLETED

LOW IMPEDANCE SYSTEM
EARTH CONNECTION
(FIRST ON, LAST OFF)

JUMPER SET

30kV DC DISCHARGE STICK

ALWAYS HOLD BELOW HANDGRIP

Drawing - BPGK01 (Revision 0, 14/11/2007)
Recommendations (paper lead)

- Insulation at 5kV for 60 seconds – P/P & P/E.
- DC HiPot test – P/P & P/E 15 minutes.
- Insulation at 5kV for 60 seconds – P/P & P/E.
Recommendations (XLPE)

- Insulation at 5kV for 60 seconds – P/P & P/E.
- VLF test – P/P & P/E 15 minutes.
- Insulation at 5kV for 60 seconds – P/P & P/E.
- Sheath integrity test (minimum 1kV D.C.)