# Technical Specification for Low Voltage Aerial Bundled XLPE Insulated Cables

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1. Purpose and Scope

This specification sets out the requirements for low voltage aerial bundled XLPE insulated aluminium cables for use as mains and services on overhead electricity distribution systems in a totally exposed environment.

Cables covered by this technical specification, are listed as follows:

<table>
<thead>
<tr>
<th>ITEM No.</th>
<th>DESCRIPTION</th>
<th>STOCK CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mains Cables - Aluminium (50 mm² cross-section and above):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>CABLE, Power, Electrical, Aerial, 0.6/1kV, 2 x 50mm² Al ABC</td>
<td>2401168</td>
</tr>
<tr>
<td>2</td>
<td>CABLE, Power, Electrical, Aerial, 0.6/1kV, 4 x 50mm² Al ABC</td>
<td>2401169</td>
</tr>
<tr>
<td>3</td>
<td>CABLE, Power, Electrical, Aerial, 0.6/1kV, 2 x 95mm² Al ABC</td>
<td>1420036</td>
</tr>
<tr>
<td>4</td>
<td>CABLE, Power, Electrical, Aerial, 0.6/1kV, 4 x 95mm² Al ABC</td>
<td>1420001</td>
</tr>
<tr>
<td><strong>Service Cables - Aluminium (Less than 50 mm² cross-section):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CABLE, Power, Electrical Aerial, 0.6/1kV, 2 x 25mm² Al ABC</td>
<td>1420045</td>
</tr>
<tr>
<td>6</td>
<td>CABLE, Power, Electrical Aerial, 0.6/1kV, 3 x 25mm² Al ABC</td>
<td>1420048</td>
</tr>
<tr>
<td>7</td>
<td>CABLE, Power, Electrical Aerial, 0.6/1kV, 4 x 25mm² Al ABC</td>
<td>1420051</td>
</tr>
<tr>
<td><strong>Service Cables - Copper</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CABLE Power, Electrical Aerial, 0.6/1kV, 2 x 6mm² (7/1.04) HD Cu ABC, XLPE Insulated</td>
<td>1420068</td>
</tr>
</tbody>
</table>

2. References

2.1 Applicable Standards

All items shall be designed, manufactured and tested with the relevant parts of the following Standards and all amendments issued from time to time except where varied by this specification.

<table>
<thead>
<tr>
<th>STANDARD</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 2857-1986</td>
<td>Timber Drums for insulated electric cables and bare conductors</td>
</tr>
<tr>
<td>AS/NZS 3560.1</td>
<td>Electric cables - XLPE insulated - Aerial bundled - For working voltages up to and including 0.6/1(1.2) kV – Aluminium Conductors</td>
</tr>
<tr>
<td>AS/NZS 3560.2</td>
<td>Electric cables - XLPE insulated - Aerial bundled - For working voltages up to and including 0.6/1(1.2) kV - Copper Conductors</td>
</tr>
<tr>
<td>AS 3983</td>
<td>Metal Drums for insulated electric cables and bare conductors</td>
</tr>
</tbody>
</table>
3. **Drawings**

3.1 **Drawings by the Purchaser**
There are no drawings attached to this specification.

3.2 **Drawings by the Tenderer**
The Tenderer shall supply with the tender, detailed drawings of the items tendered.

4. **Service Conditions**
The items will be exposed to the following environmental conditions:

| **Temperatures** | 45°C summer day time  
-5°C winter night time |
| **Solar Radiation Level** | 1100 W/m² with high ultraviolet content |
| **Precipitation** | Tropical summer storms with gust winds above 160km/h, and an annual rainfall in excess of 1500mm |
| **Humidity** | Extended periods of relative humidity in excess of 90% |
| **Pollution** | Areas of coastal salt spray and/or industrial pollution with equivalent salt deposit densities in the range 2.0 to 3.0 g/m² |

5. **Design and Construction**

5.1 **Conductors**
Items 1 to 7 shall be of stranded compacted circular aluminium and comply with Clause 2.1 of AS/NZS 3560.1. Item 8 shall be of stranded non-compacted circular plain hard drawn copper and comply with Clause 2.1 of AS/NZS 3560.2

5.2 **Insulation**
The insulation shall be cross-linked polyethylene (XLPE) in accordance with Clause 2.3 of AS/NZS 3560.1.

The grade of insulation shall be X-90.
All cable insulation shall be black in colour. The pigmentation shall be chosen so as to afford long term stability under ultra-violet radiation and shall include a minimum content of 2% by weight of carbon black evenly distributed throughout the insulation and shall not be detrimental to the insulation levels.

5.3 Identification of Cores
Individual cores of the cable shall be identified by longitudinal continuous raised ribs, numerals and letters as specified in Clause 2.4 of AS/NZS 3560.1. The markings shall not degrade the insulation level.

5.4 Metre Marking
The cables shall be metre marked in accordance with Clause 2.5 of AS/NZS 3560.1.

5.5 Drawings
Tenderers shall provide detailed drawings of the cross-section of the items offered.

6. Performance Testing

6.1 Testing
The cable shall be tested in accordance with Section 3 of AS/NZS 3560.1.

6.2 Type Tests
Certificates for Type Tests conducted in accordance with the requirements of AS/NZS 3560.1, shall be submitted with the offer.

The following cables shall be type tested:

- 4 x 95 mm²;
- 4 x 25 mm²
- 2 x 6 mm² Cu

6.3 Routine Test Certificates
A certificate of compliance shall be provided with each delivery. Routine test certificates shall be held by the Tenderer and provided to the purchaser on request within one working day.

6.4 Carbon Black Test
Carbon black content of the outer sheath shall be tested in accordance with ASTM D1603. Test certificates are not required to be despatched with each delivery of cable but shall be made available to the purchaser when requested, within 1 working day.

6.5 Test Report - Adhesion of the Insulation
The Tenderer shall submit results of the test for "Adhesion of the Insulation to the Conductor" with the offer.
6.6 Comments on Adhesion of the Insulation

The Tenderer shall specifically comment on their ability to consistently produce test results for insulation adhesion complying with the requirements of AS/NZS 3560.1.

6.7 Discharge of Cable after AC Spark Test

The Tenderer shall provide evidence in the offer of the procedures adopted to ensure that cables are fully discharged after the completion of all electrical testing.

7. Risk Assessment

There is no requirement for manufacturer provided safety risk assessments for the items covered by this specification.

8. Quality Assurance

8.1 Purchasers Policy

It is the Purchaser’s policy to procure goods, equipment and services from sources that demonstrate the ability to supply quality products.

8.2 Documentary Evidence

Documentary evidence shall be provided concerning the level of quality system certification associated with the Tenderer and/or Manufacturer. This documentation shall include the Capability Statement associated with the Quality System Certification.

Quality Certification It is expected that the Tenderer and manufacturer will have a quality system certified to ISO 9001 in operation.

9. Samples

9.1 Production Samples

When requested, Tenderers shall submit a production sample of each item offered as part of the tender package.

10. Packaging and Marking

10.1 General

The mains cable may be supplied on steel complying with the requirements of AS3983 or wooden drums complying with the requirements of AS2857.

Operational difficulties are anticipated with the use of timber drums manufactured in accordance with AS 2857-1996. Hence this specification is based on cables supplied on timber drums manufactured in accordance with the requirements of superseded standard AS 2857-1986.
Service cables shall be supplied on timber drums complying with the requirements of AS2857 -1986.

Mains and service cables shall be supplied on drum sizes and in the lengths as detailed in Appendix A.1 to this specification.

The cable shall be in one (1) length on each drum.

10.2 Lagging

For timber drums, the outer layer of cable shall be protected by circumferential timber battens in accordance with AS 2857.

For metal drums, the outer layer of cable shall be protected by at least two (2) layers of sheet form wrapping (with an overlap) located between the inner faces of the flanges.

The Tenderer shall provide details of the method of lagging protection which is proposed to be used.

10.3 Drum Durability

The cable drums shall be sufficiently robust to ensure that the cable is delivered undamaged, giving due consideration to the method of transportation and the distances involved.

All drums must be of suitable quality to withstand a minimum of twenty-four (24) months exposure to all types of weather conditions during outdoor storage without deterioration.

10.4 Sealing of Cores

The ends of the individual cores of the cables shall be sealed against the ingress of moisture by means of heat shrink end caps or other approved methods.

10.5 Fixing of Cable End

The inner end of the cable shall be secured to the drum to ensure that the cable end will not flick off the drum barrel when the cable is being run out.

10.6 Drum Marking

Drums shall be marked in accordance with the requirements of Clause 2.11 of AS/NZS 3560.1. In addition the following information shall be provided indelibly and legibly marked directly on both flanges:

(a) The name of the electricity supply corporation and the relevant stores item identification number shown in the main specification.
(b) Contract number
(c) Purchase Order Number
(d) Manufacturer’s traceability number – derived from Manufacturer’s first letter, hyphen, batch number, hyphen, drum number for this batch.
10.7 Quarantine Requirements

Should the items offered be supplied from overseas manufacturers, then it is mandatory that all conditions and inspections required by the Australian Quarantine Act be met and that all these costs be included in the tendered price. In particular, any timber component associated with the drums must be fumigated with methyl bromide with a concentration of 48 grams per cubic metre for 24 hours at 21°C. The Tenderer shall ensure that the procedure does not produce any deleterious effects to the conductor or stay wire supplied on the drum.

11. Service Performance

Tenderers shall state:

(a) the period of service achieved by the items offered within Australian service conditions;
(b) Australian electricity supply authorities who have a service history of the items tendered; AND
(c) Contact names and phone numbers of relevant employees of those supply authorities who can verify the service performance claimed.

12. Reliability

12.1 Service Life

Tenderers are required to comment on the reliability of the equipment and the performance of the materials offered for a service life of 35 years under the specified system and environmental conditions.

12.2 Evidence in Support of Reliability

Such comments shall include evidence in support of the reliability and performance claimed including information on failure mode and effect analysis.

13. Training

Training material in the form of drawings, instructions, technical papers and/or audio visuals shall be provided for the items accepted under this offer within one month on request.

This material shall include, but is not limited to, the following topics:

- Handling (especially during installation)
- Storage
- Application (particularly in areas of heavy coastal pollution)
- Installation
- Maintenance
- Electrical performance
- Mechanical performance (including conductor creep)
- Disposal
14. Environmental Considerations

14.1 Environmental Comments
Tenderers are required to comment on the environmental soundness of the design and the materials used in the manufacture of the items offered. In particular, comments should address such issues as recyclability and disposability at the end of service life.

15. Information To Be Provided

15.1 Specific Technical Requirements
The specific technical requirements for the items shall be as stated in Attachment 1 of this specification. The Tenderer shall fill in all data requested by Attachment 1 and shall guarantee such data.

15.2 Checklist of Supporting Documentation
Attachment 2 details a checklist of supporting technical documentation which is required to be submitted with the tender.
16. Appendix A.1 – Drum and Packaging Details

**DRUMS FOR MAINS CABLES (50 mm² CROSS-SECTION AND ABOVE)**

<table>
<thead>
<tr>
<th>Drum Designation</th>
<th>Nominal Length (m/drum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A 1400/700/750</td>
<td>2 x 50 500</td>
</tr>
<tr>
<td>N/A 1400/700/750</td>
<td>4 x 50 500</td>
</tr>
<tr>
<td>N/A 1400/700/750</td>
<td>2 x 95 500</td>
</tr>
<tr>
<td>N/A 1600/800/750</td>
<td>4 x 95 500</td>
</tr>
</tbody>
</table>

**DRUMS FOR SERVICE CABLES (LESS THAN 50 mm² CROSS-SECTION)**

<table>
<thead>
<tr>
<th>Drum Designation</th>
<th>Nominal Length (m/drum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>700/400/400 N/A</td>
<td>2 x 25 250</td>
</tr>
<tr>
<td>700/400/400 N/A</td>
<td>3 x 25 200</td>
</tr>
<tr>
<td>700/400/400 N/A</td>
<td>4 x 25 150</td>
</tr>
<tr>
<td>700/300/400 N/A</td>
<td>2 x 6 400</td>
</tr>
</tbody>
</table>
17. Attachment 1 – Technical Details

**NOTE:** A separate schedule is to be provided for each item offered except for details common to all items which only needs to be provided once.

<table>
<thead>
<tr>
<th>PARTICULARS</th>
<th>UNITS</th>
<th>ITEM No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer's Name and Address</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place of Manufacture</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cable Details:**

- Maximum DC Resistance: $\Omega$/km @ 20°C
- Voltage Drop: SEE NOTE 1 mV/Amp.m
- Current Rating in Air: SEE NOTE 2 Amps @ 80°C conductor temperature
- Grade of insulation
- Mass of cable: kg/m
- Cable Breaking Load: kN

**Packaging Details:**

- Type of Drum
- Australian Standard Drum Designation
- Spindle Hole Diameter: mm
- Method of Lagging
- Length of Cable per Drum: m
- Gross Mass of Drum, Cable and Protective External Lagging: SEE NOTE 3 kg

**SIGNATURE OF TENDERER:** _________________________________
**GENERAL DATA FOR CONDUCTOR**

<table>
<thead>
<tr>
<th>Calculated value of co-efficient of linear expansion (per °C)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical value of the Modulus of Elasticity (7 strand cable)</td>
<td></td>
</tr>
<tr>
<td>Practical value of the Modulus of Elasticity (19 strand cable)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 1:** Voltage drop shall be stated at a conductor temperature of 40°C as follows:

<table>
<thead>
<tr>
<th>Number of Conductors</th>
<th>Voltage Drop Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Conductor cables</td>
<td>Single phase voltage drop.</td>
</tr>
<tr>
<td>3 Conductor cables</td>
<td>Equivalent single phase voltage drop assuming equal load on phases.</td>
</tr>
<tr>
<td>4 Conductor cables</td>
<td>Three phase voltage drop.</td>
</tr>
</tbody>
</table>

**NOTE 2:** Current rating in air shall be based on the following conditions:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>35°C</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>1100 W/m²</td>
</tr>
<tr>
<td>Wind speed (normal to cable)</td>
<td>1.0 m/sec</td>
</tr>
</tbody>
</table>

**NOTE 3:** Net Mass of Steel Drums:

<table>
<thead>
<tr>
<th>Drum Size</th>
<th>Mass (kgs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600/800/750</td>
<td>270 kgs</td>
</tr>
<tr>
<td>1400/700/750</td>
<td>220 kgs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CLAUSE Ref.</th>
<th>PARTICULARS</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Have full and comprehensive details been submitted WITH the tender documents associated with each of the following items?</td>
<td></td>
</tr>
<tr>
<td>Error! Reference source not found.</td>
<td>Type Test Certificates</td>
<td>Yes/No</td>
</tr>
<tr>
<td>6.5</td>
<td>Test report on &quot;Adhesion of Insulation to the Conductor&quot;</td>
<td>Yes/No</td>
</tr>
<tr>
<td>6.6</td>
<td>Ability to reproduce test results concerning insulation adhesion</td>
<td>Yes/No</td>
</tr>
<tr>
<td>6.6</td>
<td>Discharge of cable</td>
<td>Yes/No</td>
</tr>
<tr>
<td>8.2</td>
<td>Documentary evidence of the Quality System Certification of BOTH the TENDERER and the MANUFACTURER (including Capability Statement)</td>
<td>Yes/No</td>
</tr>
<tr>
<td>10.2</td>
<td>Method of lagging protection</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Error! Reference source not found.</td>
<td>Service Performance</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Error! Reference source not found.</td>
<td>Reliability</td>
<td>Yes/No</td>
</tr>
<tr>
<td>13</td>
<td>Training materials</td>
<td>Yes/No</td>
</tr>
<tr>
<td>14</td>
<td>Environmental considerations</td>
<td>Yes/No</td>
</tr>
<tr>
<td>15</td>
<td>Completed Attachment 1</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

NAME OF TENDERER: 

ADDRESS OF TENDERER: 

SIGNATURE: ______________________ FOR AND ON BEHALF OF TENDERER

DATE: ______________________