



Ergon Energy Corporation Limited

Technical Specification for Low Voltage Aerial Bundled HDPE Insulated Cables

ETS03-01-04

Technical Specification for Low Voltage Aerial Bundled HDPE Insulated Aluminium Cables

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1. Purpose and Scope

This specification sets out the requirements for low voltage aerial bundled HDPE 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 below:

ITEM No.	DESCRIPTION	STOCK CODE
Mains Cables - Aluminium:		
1	CABLE, Power, Electrical, Aerial, 0.6/1kV, 2 x 95mm ² Al ABC, HDPE Insulated	2426062
2	CABLE, Power, Electrical, Aerial, 0.6/1kV, 4 x 95mm ² Al ABC, HDPE Insulated	2401151
Service Cables - Aluminium:		
3	CABLE, Power, Electrical, Aerial, 0.6/1kV, 2 x 25mm ² Al ABC, HDPE Insulated	0104592
4	CABLE, Power, Electrical, Aerial, 0.6/1kV, 4 x 25mm ² Al ABC, HDPE Insulated	0104593
Service Cables - Copper		
5	CABLE, Power, Electrical, Aerial, 0.6/1kV, 4 x 10mm ² (7/1.35) HD Cu ABC, HDPE Insulated	0104147

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.

STANDARD	TITLE
AS 2857 -1986	Timber Drums for insulated electric cables and bare conductors
AS/NZS 3560.1	Electric cables - XLPE insulated - Aerial bundled - For working voltages up to and including 0.6/1(1.2) kV - Aluminium Conductors
AS/NZS 3560.2	Electric cables - XLPE insulated - Aerial bundled - For working voltages up to and including 0.6/1(1.2) kV - Copper Conductors
AS3808	Insulating and sheathing materials for electric cables
AS 3983	Metal Drums for insulated electric cables and bare conductors
AS / NZS ISO 9001	Quality Management Systems – Requirements
ASTM D1603	Standard Test Method for Carbon Black Content in Olefin Plastics

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STANDARD	TITLE
IEC 60811-605	Electric and optical fibre cables – Test methods for non-metallic materials – Part 605: Physical tests – Measurement of carbon black and/or mineral filler in polyethylene compounds
IEC 60811-607	Electric and optical fibre cables – Test methods for non-metallic materials – Part 607: Physical tests – Test for the assessment of carbon black dispersion in polyethylene and polypropylene

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 or pamphlets of the items offered.

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/m ² with high ultraviolet content
Precipitation	Tropical summer storms with gust winds above 160 km/h, and an annual rainfall in excess of 1 500 mm
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/m ²

The cables will be used in areas where the LVABC with XLPE insulation have a history of failures due to attack by insects.

5. Design and Construction

5.1 General

The construction of the cable shall comply with the requirements of AS/NZS 3560.1 for aluminium conductor and AS/NZS3560.2 for copper conductor, except for the cable insulation. The cable insulation shall be high density polyethylene as detailed in clause 5.3.

5.2 Conductors

Items 1 to 4 shall be of stranded compacted circular aluminium and comply with Clause 2.1 of AS/NZS 3560.1 Item 5 shall be of stranded non-compacted circular plain hard drawn copper and comply with Clause 2.1 of AS/NZS 3560.2

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5.3 Insulation

The insulation shall be high density poly ethylene (HDPE) in accordance with AS 3808.

The HDPE insulation shall have a minimum shore D hardness of 60.

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.

5.4 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.

5.5 Metre Marking

The marking of cables shall be in accordance with Clause 2.5 of AS/NZS 3560.1.

5.6 Drawings

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

6. Performance and 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.

6.3 Sample and Routine Tests

Sample and Routine 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.

6.4 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.

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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.

9. Samples

9.1 Production Sample

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

Mains cable shall be supplied on steel drums manufactured in accordance with the requirements of AS 3983

Service cable shall be supplied on timber drums manufactured in accordance with the requirements of AS 2857 -1986. 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.

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.

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10.2 Lagging

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

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

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 Purchaser and the relevant stores item identification number.
- (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.

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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 offered; 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.

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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.

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16. Appendix A.1 – Drum and Packaging Details

DRUMS FOR MAINS CABLES AND SERVICE CABLES

AS 2857-1986 Drum Designation	Cable Size	Nominal Length (m/drum)
1400/700/750	2 x 95	500
1600/800/750	4 x 95	500
*700/400/400	2 x 25	250
*700/400/400	4 x 25	150
*700/300/400	4 X 10	250

* **Note:** The maximum acceptable width shall be 490mm inclusive of bolt projections, (Refer Clause 10.1.3)

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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.

PARTICULARS	UNITS	ITEM No.
Manufacturer's Name and Address		
Place of Manufacture		
Cable Details:		
Maximum DC Resistance	$\Omega/\text{km @ } 20^{\circ}\text{C}$	
Voltage Drop SEE NOTE 1	mV/Amp.m	
Current Rating in Air SEE NOTE 2	Amps @ 80°C conductor temperature	
Cable insulation		
Shore D Hardness of insulating material		
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	kg	

SIGNATURE OF TENDERER: _____

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18. Attachment 1 – Technical Details (cont'd)

GENERAL DATA FOR CONDUCTOR

Calculated value of co-efficient of linear expansion (per °C)	
Practical value of the Modulus of Elasticity (7 strand cable)	
Practical value of the Modulus of Elasticity (19 strand cable)	

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

2 conductor cables	Single phase voltage drop
4 conductor cables	Three phase voltage drop

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

Ambient temperature	35°C
Solar radiation	1 100 W/m ²
Wind speed (normal to cable)	1.0 m/sec

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19. Attachment 2 – Technical Document Checklist

CLAUSE Ref.	PARTICULARS	UNITS
Have full and comprehensive details been submitted WITH the tender documents associated with each of the following items?		
6.2	Type Test Certificates	Yes/No
6.5	Test report on "Adhesion of Insulation to the Conductor"	Yes/No
6.6	Ability to reproduce test results concerning insulation adhesion	Yes/No
6.7	Discharge of cable	Yes/No
8.2	Documentary evidence of the Quality System Certification of BOTH the TENDERER and the MANUFACTURER (including Capability Statement)	Yes/No
10.2	Method of lagging protection	Yes/No
11	Service Performance	Yes/No
12	Reliability	Yes/No
13	Training materials	Yes/No
14	Environmental considerations	Yes/No
15	Completed Attachment 1	Yes/No

NAME OF TENDERER:

ADDRESS OF TENDERER: _____

SIGNATURE: _____ FOR AND ON BEHALF OF TENDERER

DATE: _____