



Ergon Energy Corporation Limited

**Technical Specification for
Insulated Low Voltage Single Core
Copper Cable**

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Technical Specification for Insulated Low Voltage Single Core Copper Cable



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1. Purpose and Scope

This specification sets out the requirements for insulated low voltage single core copper cable for use on electricity distribution systems in a totally exposed environment.

The items covered by this technical specification are listed below:

ITEM No.	DESCRIPTION	Stock Code
Hard drawn Copper XLPE insulated aerial cables :		
1	Cable, Electrical; Aerial; Copper, Hard Drawn; 16 sq. mm (7/1.70 mm); 0.6/1Kv; XLPE insulated; black single core	1313013
2	Cable, Electrical; Aerial; Copper, Hard Drawn; 25 sq. mm (19/1.35 mm); 0.6/1kV; XLPE insulated; black single core	2401130
3	Cable, Electrical; Aerial; Copper, Hard Drawn; 35 sq. mm (19/1.53 mm); 0.6/1kV; XLPE insulated; black single core	1313021
4	Cable, Electrical; Aerial; Copper, Hard Drawn; 50 sq. mm (19/1.78 mm); 0.6/1kV; XLPE insulated; black single core	1313028
5	Cable, Electrical; Aerial; Copper, Hard Drawn; 70 sq. mm (19/2.14 mm); 0.6/1kV; XLPE insulated; black single core	1313048
Annealed Copper cables – XLPE and PVC Insulated		
6	Cable, Electrical; 16 sq. mm (7/1.70 mm); annealed copper; 0.6/1.0kV; XLPE insulated; black; single core	1543095
7	Cable, Electrical; 16 sq. mm (7/1.70 mm); annealed copper; 0.6/1.0kV; XLPE insulated; red; single core	2400210
8	Cable, Electrical; 50 sq. mm (19/1.78 mm); annealed copper; 0.6/1.0kV; XLPE insulated; black; single core	2401190
9	Cable, Electrical; 70 sq. mm (19/2.14 mm); annealed copper; 0.6/1.0kV; XLPE insulated; green/yellow; single core	1543184
10	Cable, Electrical; 70 sq. mm (19/2.14 mm); annealed copper; 0.6/1.0kV; XLPE insulated; black; single core	1543176
11	Cable, Electrical; 95 sq. mm (37/1.78 mm); annealed copper; 0.6/1.0kV; XLPE insulated; black; single core	2402818
12	Cable, Electrical; 120 sq. mm (37/2.03 mm); annealed copper; 0.6/1.0kV XLPE insulated; black; single core	1543192
13	Cable, Electrical; 150 sq. mm (37/2.25 mm); annealed copper; 0.6/1.0kV XLPE insulated; black; single core	1543133
14	Cable, Electrical; 185 sq. mm (37/2.52 mm); annealed copper; 0.6/1.0kV XLPE insulated; black; single core	1543140
15	Cable, Electrical; 240 sq. mm (61/2.25 mm); annealed copper; 0.6/1.0kV XLPE insulated; black; single core	2401198
16	Cable, Electrical; 70 sq. mm (19/2.14 mm); annealed copper; 0.6/1.0kV; PVC insulated; green/yellow; single core	2425874

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17	Cable, Electrical; 120 sq. mm (37/2.03 mm); annealed copper; 0.6/1.0kV PVC insulated; green/yellow; single core	2401127
18	Cable, Electrical; 150 sq. mm (37/2.25 mm); annealed copper; 0.6/1.0kV; PVC insulated; green/yellow; single core	2425882

2. References

2.1 Applicable Standards

The cable shall be designed, manufactured and tested in accordance with the following Australian Standards and all amendments issued prior to the date of closing of tenders except where varied by this specification:

STANDARD	TITLE
AS 1125	Conductors in Insulated Electric Cables and Flexible Cords
AS 1574	Copper and Copper Alloys - Wire for Electrical Purposes
AS 1660	Methods of Test for Electric Cables, Cords and Conductors
AS 1746	Hard-Drawn Copper Conductors for Overhead Power Transmission Purposes
AS 2857 - 1986	Timber Drums for Insulated Electric Cables and Bare Conductors
AS 3198 (superseded)	Approval and test specification-Electric cables - XLPE insulated - For working voltages up to 0.6/1kV
AS/NZS 5000.1	Electric Cables - Polymeric Insulated for Working Voltages up to and Including 0.6/1kV.
AS/NZS 3808	Insulating and sheathing materials for electric cables
AS / NZS ISO 9001	Quality management systems – Requirements
ASTM D1603	Standard Test Method for Carbon Black Content in Olefin Plastics

Should inconsistencies be identified between standards and/or this specification, the Tenderer shall immediately refer such inconsistencies to the Purchaser for resolution.

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 tendered.

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4. Service Conditions

The cable will be installed outdoors and will be exposed to the following environmental conditions:

Temperatures	45 ^o C Summer day time -5 ^o C Winter night time
Solar Radiation Level	1100 Wm ² with high ultra violet content
Precipitation	Tropical summer storms with high winds up to 160 km/hr and an annual rainfall in excess of 1500 mm
Humidity	Extended periods of relative humidity in excess of 90% RH
Pollution	Areas of coastal salt spray and/or industrial pollution with equivalent salt deposit densities in the range 2.0 to 3.0 gm ²

5. Design and Construction

5.1 Conductors

All aerial cables shall be of stranded, circular plain hard-drawn copper conductors manufactured in accordance with AS 1125. Compressed and compacted conductors are not acceptable for cable sizes 120 mm² and above.

All other cables shall be of stranded, circular plain annealed copper conductors manufactured in accordance with AS 1125. Compressed and compacted conductors are not acceptable for cable sizes 120 mm² and above.

5.2 Insulation

The insulation material on all cables except item 7, 17, 18 and 19 shall be X-90-UV complying with AS/NZS 3808. The insulation on item 7 shall be X-90 complying with AS/NZS 3808. The insulation on items 17, 18 and 19 shall be V-90 complying with AS/NZS 3808.

The thickness of the cable insulation shall be in accordance with table 11.2 of AS 3198.

All cable insulation shall be black in colour, except for item 7, 17, 18 and 19 which shall be as specified in the item description.

5.3 Marking of Cables

The cables shall be clearly marked with the following information in accordance with clause 16 of AS/NZS 5000.1:

- (a) Registered name/trade mark of the manufacturer.
- (b) Year of manufacture.
- (c) Designation of insulation
- (d) The words, "Electric Cable, V-90, X-90 or X-90-UV as applicable" followed by "0.6/1kV".
- (e) Word "Aerial" on cables using hard drawn copper conductors.
- (f) Cross sectional area of the conductor in sq. mm.
- (g) Metre markings at 1 metre intervals for the purpose of indicating the length of the cable remaining on partially used drums. It is not essential but the

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sequence of numbering commences at zero. However, start and finish numbers shall be included in the information to be provided on the drum flange. The lower number of the metre markings sequence shall correspond to the end attached to the drum flange.

The height of the letters and numerals shall comply with clause 6.4.4(b) of AS / NZS 5000.1.

6. Performance and Testing

6.1 Testing

The cable shall be tested in accordance with Clause 17 of AS / NZS 5000.1.

6.2 Type Tests

Certificates for Type Tests conducted in accordance with clause 17 of AS / NZS 5000.1 shall be submitted with the tender.

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. A certificate of compliance shall be provided with each delivery.

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.

7. Risk Assessment

There is no requirement for the Tenderer to provide a safety risk assessment 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

Tenderers are required to submit evidence that the design and manufacture of the cable is in accordance with AS/NZS ISO 9001 and shall include the Capability Statement associated with the Quality System Certification.

8.3 Quality Management Certification

If the Tenderer is a non-manufacturing supplier, the documentary evidence shall include the quality system certifications of both the supplier and the manufacturer/s.

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9. 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 Cable Length

The cable shall be supplied in 250 metre lengths unless specified otherwise by the Purchaser. The cable shall be in one length on each drum.

10.2 Drum Sizes

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.

The cable length/drum size combinations shall be in accordance with **Attachment 1** of the specification.

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 cable drums shall withstand a minimum of twenty-four (24) months exposure to all types of weather conditions during outdoor storage, without deterioration.

10.4 Lagging

The outer layer of cable shall be protected by a sheet form wrapping (with an overlap) located between the inner faces of the flanges.

10.5 Marking of Drums

The marking of information on the cable drum shall be in accordance with Clause 16.3 of AS / NZS 5000.1. In addition, the following information shall be provided indelibly and legibly marked directly on both flanges:

- a) 'Ergon Energy' and the relevant stores item identification number shown in the main specification.
- b) Contract number.
- c) Manufacturer's traceability number – derived from Manufacturer's first letter, hyphen, batch number, hyphen, drum number for this batch.
- d) Order release authority or purchasing order number.

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10.6 Quarantine Requirements

Should cable be supplied from overseas manufacturers then it is mandatory that all conditions and inspections required by the Australian Quarantine Act are met and that all these costs are included in the tendered price. In particular, timber 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 cable supplied on the drum.

11. Service Performance

The Tenderers shall state:

a)	The period of manufacture of XLPE insulated cables for use within Australian service conditions.
b)	Electricity supply authorities within Australia that have a service history of the items offered; AND
c)	Contact names and telephone 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 cable and the performance of the materials offered for a service life of 25 years under the specified service 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 (1) 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.

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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 recycling and disposal at the end of service life.

15. Information to Be Provided

15.1 Specific Technical Requirements

The Tenderers shall complete **Attachments 2.1 and 2.2** of the specification and guarantee all the details provided.

15.2 Checklist of Supporting Documentation

Attachment 3 details a checklist of supporting technical documentation, which shall be submitted with the tender.

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16. Attachment 1 – Drum Details

The table below sets out the drum sizes and cable length combinations with which delivered cable must comply.

ITEM NO.	CABLE SIZE (MM ²)	CABLE LENGTH (M)	DRUM REFERENCE NO. AS 2857	WIDTH (EXCLUDING BOLT PROJECTION) (MM)
1, 6, 7	Single-core 16	250	P450/250/300	330
2	Single-core 25	250	P450/250/300	330
3	Single-core 35	250	P550/300/350	384
4, 8	Single-core 50	250	P550/300/350	384
5, 9,10,16	Single-core 70	250	P700/400/400	434
11	Single-core 95	250	800/400/350	420
12, 17	Single-core 120	250	800/400/350	420
13, 18	Single-core 150	250	800/400/450	520
14	Single-core 185	250	900/500/600	690
15	Single-core 240	250	900/500/600	690

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17. Attachment 2.1 – Technical Details: Aerial Cable

ITEM NO.	DESCRIPTION	MASS PER METRE	MAX. DC RESISTANCE Ω/KM @ 20°C	VOLTAGE DROP mV/A.m *	CABLE BREAKING LOAD (kN)	CURRENT CARRYING CAPACITY (AMPS) AT 75°C	
						IN AIR #	IN CONDUITS UNDER-GROUND
1	Cable, Electrical; Aerial; Copper, Hard Drawn; 16 sq. mm (7/1.70 mm); 0.6/1kV; XLPE insulated; black single core						
2	Cable, Electrical; Aerial; Copper, Hard Drawn; 25 sq. mm (19/1.35 mm); 0.6/1kV; XLPE insulated; black single core						
3	Cable, Electrical; Aerial; Copper, Hard Drawn; 35 sq. mm (19/1.53 mm); 0.6/1kV; XLPE insulated; black single core						
4	Cable, Electrical; Aerial; Copper, Hard Drawn; 50 sq. mm (19/1.78 mm); 0.6/1kV; XLPE insulated; black single core						
5	Cable, Electrical; Aerial; Copper, Hard Drawn; 70 sq. mm (19/2.14 mm); 0.6/1kV; XLPE insulated; black single core						

* Voltage drop shall be quoted at a conductor temperature of 40° as follows:

- For single conductor cables, voltage drops shall be quoted as single phase with spacing between cables of 0.4 m.

Note that the calculation of "Voltage Drop" shall be in accordance with the method stated in AS 3000.

Ambient temperature 35°C, solar radiation 1100 W.m⁻², wind speed 0.5 m.s.⁻¹ normal to cable.

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18. Attachment 2.1 – Technical Details: Aerial Cable (cont'd)

GENERAL DATA OF COPPER	
Calculated value of co-efficient of linear expansion:	Cu _____ per °C
Practical value of modulus of elasticity:	Cu _____ GPa

MANUFACTURER'S NAME & ADDRESS

PLACE OF MANUFACTURE

NAME OF TENDERER

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19. Attachment 2.2 – Technical Details: Single Core Annealed Copper Cable

The Tenderer shall complete this Schedule and shall guarantee the particulars as set out.

ITEM NO.	DESCRIPTION	MASS PER METRE	DC RESISTANCE Ω/KM @ 20°C	VOLTAGE DROP mV/A.m *	CURRENT CARRYING CAPACITY (AMPS) AT 75°C	
					IN AIR #	IN CONDUITS UNDER-GROUND
6	Cable, Electrical; 16 sq. mm (7/1.70 mm); annealed copper; 0.6/1.0kV; XLPE insulated; black; single core					
7	Cable, Electrical; 16 sq. mm (7/1.7 mm); annealed copper; 0.6/1.0kV; XLPE insulated; red; single core					
8	Cable, Electrical; 50 sq. mm (19/1.78 mm); annealed copper; 0.6/1.0kV; XLPE insulated; black; single core					
9	Cable, Electrical; 70 sq. mm (19/2.14 mm); annealed copper; 0.6/1.0kV XLPE insulated; green/yellow; single core					
10	Cable, Electrical; 70 sq. mm (19/2.14 mm); annealed copper; 0.6/1.0kV XLPE insulated; black; single core					
11	Cable, Electrical; 95 sq. mm (37/1.78 mm); annealed copper; 0.6/1.0kV XLPE insulated; black; single core					

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ITEM NO.	DESCRIPTION	MASS PER METRE	DC RESISTANCE E Ω/KM @ 20°C	VOLTAGE DROP mV/A.m *	CURRENT CARRYING CAPACITY (AMPS) AT 75°C	
					IN AIR #	IN CONDUITS UNDER-GROUND
12	Cable, Electrical; 120 sq. mm (37/2.03 mm); annealed copper; 0.6/1.0kV XLPE insulated; black; single core					
13	Cable, Electrical; 150 sq. mm (37/2.25 mm); annealed copper; 0.6/1.0kV XLPE insulated; black; single core					
14	Cable, Electrical; 185 sq. mm (37/2.52 mm); annealed copper; 0.6/1.0kV XLPE insulated; black; single core					
15	Cable, Electrical; 240 sq. mm (61/2.25 mm); annealed copper; 0.6/1.0kV XLPE insulated; black; single core					
16	Cable, Electrical; 70 sq. mm (19/2.14 mm); annealed copper; 0.6/1.0kV; PVC insulated; green/yellow; single core					
17	Cable, Electrical; 120 sq. mm (37/2.03 mm); annealed copper; 0.6/1.0kV PVC insulated; green/yellow; single core					
18	Cable, Electrical; 150 sq. mm (37/2.25 mm); annealed copper; 0.6/1.0kV; PVC insulated; green/yellow; single core					

* Voltage drop shall be quoted at a conductor temperature of 40⁰ as follows:



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- For single conductor cables, voltage drops shall be quoted as single phase with spacing between cables of 0.4 m.

Note that the calculation of "Voltage Drop" shall be in accordance with the method stated in AS 3000.

Ambient temperature 35⁰C, solar radiation 1100 W.m⁻², wind speed 0.5 m.s.⁻¹ normal to cable.

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20. Attachment 2.2 – Technical Details: Single Core Annealed Copper Cable (cont'd)

GENERAL DATA OF COPPER	
Calculated value of co-efficient of linear expansion:	Cu _____ per °C
Practical value of modulus of elasticity:	Cu _____ GPa

MANUFACTURER'S NAME & ADDRESS

PLACE OF MANUFACTURE

NAME OF TENDERER

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21. Attachment 3 – Technical Documentation Checklist

Have full and comprehensive details been submitted **WITH** the tender documents associated with each of the following items?

CLAUSE	PARTICULARS	UNITS
6.2	Type Test Certificates	Yes / No
8.2	Documentary evidence of the Quality System Certification of BOTH the TENDERER and the MANUFACTURER (including Capability Statement)	Yes / No
10.4	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 2.1 and 2.2	Yes / No

NAME OF TENDERER:

ADDRESS OF TENDERER: _____

SIGNATURE: _____ FOR AND ON BEHALF OF TENDERER

DATE: _____