Ergon Energy Corporation Limited

Technical Specification for PVC Insulated Low Voltage Neutral Screened Copper Cable

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Ergon Energy Corporation Limited ABN 50 087 646 062

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1. Purpose and Scope

This specification sets out the requirements for PVC insulated low voltage neutral screened copper cable for use on underground distribution systems in Queensland.

The items covered by this technical specification are listed below:

ITEM No.	DESCRIPTION	Stock Code
1	CABLE ELECTRICAL UNDER GROUND 0.6/1kV, 2 Conductor, 4mm2 (7/0.85) Cu Neutral screened PVC Insulated, PVC Sheathed Nylon Jacket	2400260
2	CABLE ELECTRICAL UNDER GROUND, 0.6/1kV, 2 Conductor, 16mm2 (7/1.70) Cu, Neutral Screened, PVC Insulated/PVC Sheathed/Nylon Jacket	2406943

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 2857 - 1986	Timber Drums for Insulated Electric Cables and Bare Conductors
AS/NZS 4961:2003	Electric cables—Polymeric insulated— For distribution and service applications
AS/NZS 5000.1:2005	**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 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.

4. Service Conditions

The conditions under which the cables will be required to operate are:

DESCRIPTION	CONDITION
Installation	Installed, directly buried in fine grain bedding material, or, in PVC conduits at a nominal depth of up to 1000 mm, with cable ends rising up concrete or timber poles and exposed to direct sunlight.
Ambient Air Temperatures	Not exceeding 50^{o}C as determined by a shaded thermometer
Ambient Ground Temperatures	Not exceeding 35^{o}C
Altitude	Not exceeding 500 metres above sea level
Humidity	90% high humidity combined with a high temperature (40^{o}C) followed by a sudden drop in temperature of up to 10^{o}C

Exposed sections of the cable will be subject to the following additional service conditions:

DESCRIPTION	CONDITION
Solar Radiation Level	1100 watts per square metre with high ultraviolet content
Precipitation	Tropical summer storms with gust wind speeds above 160km/h and an annual rainfall in excess of 1500mm
Atmospheric classifications	Areas of coastal salt spray and / or industrial pollution with equivalent salt deposit densities in the range of 2.0 – 3.0 g/m^2

5. Design and Construction

5.1 General

The cables shall be designed and manufactured in accordance with AS/NZS 4961:2003

5.2 Core Conductors

The conductors shall be circular plain annealed stranded copper in accordance with Section 2 - “Copper Conductors” of AS 1125.

5.3 Insulation

The insulation material on shall be PVC - V90 complying with AS/NZS 3808. The thickness of the cable insulation shall be in accordance with Table 1 of AS/NZS 5000.1. The cable insulation shall be red in colour.

5.4 Neutral Screen

The neutral screen shall be of a cross sectional area equal to the phase conductor and be stranded annealed copper conductors to AS 1125. The wires shall be applied helically and evenly over the protected core offering a maximum coverage of the core.

5.5 Sheath

Sheath shall be PVC-V90 extruded over, and coaxial with, the neutral screen and shall be capable of removal without screen damage.

The sheath shall be compatible with other materials with which it is in contact. The thickness of the sheath shall be in accordance of Clause 13.4 of AS/NZS 5000.1.

Sheath colour shall be black.

5.6 Insect Protection Jacket

A continuous UV stabilised nylon jacket (nylon 12) not less than 0.4 mm radial thickness producing a smooth glossy surface free from defects or scratches shall be extruded to an even thickness over the entire length of the cable.

The jacket must be capable of removal without damage to the sheath. Jacket colour shall be black.

5.7 Oversheath

The nylon jacket shall be protected by an oversheath of UV stabilised sheathing grade PVC. The oversheath thickness shall be in accordance with Clause 13.4 of AS/NZS 5000.1 to provide adequate protection to the nylon jacket during cable installation in conduit. The colour of the over sheath shall be black.

5.8 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) The words, "Electric Cable, U/G Neutral Screened V-90 followed by 0.6/1kV".

(d) Cross sectional area of the conductor in sq. mm.

(e) 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 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.

The following Routine test shall be carried out, on each completed drum of cable, in addition to those required by Clause 17 of AS/NZS 5000.1

Insulation resistance tests between one core and the other cores joined with readings in MΩ. The test will be carried out at a voltage level of 1.0kV DC and the results recorded after 1 minute or when the reading settles whichever the sooner.

Test configurations shall be from active to neutral / earth – i.e. A – N+E.

Acceptance level for new cable is ≥ 100MΩ.

6.2 Type Tests

Certificates for Type Tests conducted in accordance with clause 17 of AS / ANZ 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 support 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.
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 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 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.

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 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 the flanges:

a) The name Ergon Energy and the relevant stores stock code.

b) Contract number.

c) Order release authority or purchasing order number.

d) Manufacturer's traceability number – derived from Manufacturer's first letter, hyphen, batch number, hyphen, drum number for this batch.

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 210C. 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 PVC 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 40 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.
- Disposal.

14. Environmental Considerations

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 **Attachment 1** of the specification and guarantee all the details provided.

15.2 Checklist of Supporting Documentation

Attachment 2 details a checklist of supporting technical documentation, which shall be submitted with the tender.

16. Attachment 1 – Technical Details

Particulars		0.6/1 kV NEUTRAL SCREENED SERVICE CABLE	
		4mm2 2 Cond. N/S S/C 2400260	16mm2 2 Cond. N/S S/C 2406943
Nominal area of core conductors	(mm²)		
Number of conductor strands			
Cross-sectional area of conductor strand	(mm²)		
Average radial thickness of insulation(mm)			
Minimum radial thickness of insulation	(mm)		
Insulation material and grade			
Neutral screen Material			
Nominal area of screen conductors	(mm²)		
Number of screen strands			
Cross-sectional area of screen strand	(mm²)		
Cover (as a percentage of area of insulation)			
Average radial thickness of sheath	(mm)		
Material type and grade			
Thickness of the nylon jacket	(mm)		
Grade of nylon			
Oversheath material and grade			
Oversheath thickness - Average	(mm)		
Outer sheath colour			
Cable overall diameter	(mm)		
ID of recommended minimum duct size	(mm)		
Cable mass (kg/m)			
Recommended maximum pulling tension	(kN)		
Recommended minimum bending radius (a) during installation (times cable diameter)			
(b) setting (times cable diameter)			

Particulars	0.6/1 kV NEUTRAL SCREENED SERVICE CABLE	
	4mm2 2 Cond. N/S S/C 2400260	16mm2 2 Cond. N/S S/C 2406943
Maximum continuous current rating (Soil Temp. 30°C,Resistivity 1.2K.m/W) (a) Buried direct (A)		
(b) In ducts (A)		
Design maximum conductor operating temperature (a) Normal (°C) (b) Emergency (2 hour) (°C) (c) Short Circuit (°C)		
Maximum D.C. resistance @ 20oC (Ω/km)		
Maximum AC resistance of conductor of completed cable at 50Hz and 90°C (Ω/km)		
Positive and negative sequence impedance at 50Hz of completed cable (resistive and reactive components) (a) At 20°C (Ω/km) (b) At max. operating temperature (Ω/km)		
Zero sequence impedance at 50 Hz of completed cable at 20°C (resistive and reactive components) (Ω/km)		
Capacitance per phase in microfarads per 1000 metres at 20°C (mf/km)		
Power frequency withstand voltage five minutes (kV RMS)		
Insulation Megger readings 100 metre section tested with 2.5 kV Megger - Phase/Neutral screen (a) Expected value (GΩ) (b) Minimum acceptable value (GΩ)		
Type Test copies attached (yes/no)		
Type Test Certificate Number		
Length of cable per drum (m)		
Drum mass complete with cable and lagging (kg)		
Australian Standard drum size (FxBxW) (mm)		
Spindle Hole Diameter (mm)		
Manufacturer's Name and Address		

SIGNATURE OF TENDERER: _____

17. Attachment 2 – Technical Documentation Checklist

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

Clause	Particulars	Units
3.2	Detailed drawings of cable offered	Yes / No
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 1** and **Attachment 2**	Yes / No

NAME OF TENDERER:

ADDRESS OF TENDERER:_____

SIGNATURE: _____ FOR AND ON BEHALF OF TENDERER

DATE: _____