Ergon Energy Corporation Limited

Technical Specification for Overhead Line Porcelain and Glass Insulators

ETS10-01-01

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Contents

Ergon Energy Corporation Limited ABN 50 087 646 062

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1. Purpose and Scope

This specification sets out the requirements for the manufacture, testing and delivery of **overhead line porcelain and glass insulators** for use on overhead electricity distribution and sub-transmission systems in a totally exposed environment.

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

ITEM No.	DESCRIPTION	Stock Code
Low Voltage Insulators:		
1	Type LP.LV	0560003
2	Type SH. LV.2	0555034
11 kV Insulators:		
3	Type SLP/11/180	0560119
4	Type ALP/11/275	0560461
5	Shackle, Type SH.11	2400853
6	11/22kV Bridging Insulator	0560526
22 kV Insulators:		
7	Type SLP/22/420	0560275
8	Type ALP/22/520	0560496
9	22kV Tie Top Line Post	0104197
10	22kV Horizontal Clamp Top Line Post	0104196
33 kV Insulators:		
11	Porcelain Post Insulator Tie Top 200kV	2400845
12	BIL	0560445
13	Two Part, Line Pin Type SLP/33/534	0104199
14	33kV Horizontal Clamp Top Line Post 33kV Vertical Tie Top Line Post	0104200
66kV Insulators:		
15	Line Post Insulator Tie Top 350kV BIL	0553007
16	Line Post Insulator Clamp Top Vertical 350kV BIL	2400855
17	Line Post Insulator Clamp Top Horizontal 350kV BIL	0553058
String Insulator Units:		
18	Type U70 C	2402986
19	Type U70 BL	0551004
20	Type U70 BLP (Fog)	0551008
21	Type U70 BL (Transmission)	2400847
22	Type Normal 125kN (Transmission)	2417970
23	Type Fog 125kN (Transmission)	2417962
Stay Insulators:		
24	Type GY2	0552027
25	Type GY3	0552035
26	Type GY4	0552043

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2. References

2.1 Applicable Standards

The insulators shall be designed, manufactured and tested in accordance 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 1112	ISO metric hexagon nuts, including thin nuts, slotted nuts and castle nuts
AS 1154	Insulator and conductor fittings for overhead power lines
AS 1214	Hot - dip galvanized coatings on threaded fasteners
AS 4680	Hot-dipped galvanized coatings on ferrous articles
AS 1824	Insulation coordination (phase-to-earth and phase-to-phase, above 1 kV
AS 1832	Iron castings - Malleable cast iron
AS 2700	Colour standards for general purposes
AS 2947	Insulators - Porcelain and glass for overhead power lines - Voltages greater than 1000 V ac.
AS 3608	Insulators - Porcelain and glass, pin and shackle type - Voltages not exceeding 1000 V a.c.
AS 3609	Insulators - Porcelain stay type - Voltages greater than 1000 V a.c.
AS/NZS ISO 31000-2009	Risk management
AS4899	Pin insulators- porcelain and glass for overhead power lines- voltages greater than 1000Vac
AS/NZS ISO 9002	Quality systems - Model for quality assurance in production, installation and servicing
BS 1598	Ceramic insulating materials for general electric purposes
IEC 60575	Thermal-mechanical performance test and mechanical performance test on string insulator units
IEC 60305	Insulators for overhead lines with nominal voltage above1000V- Ceramic or glass insulator units for a.c. systems- Characteristics of insulator units of cap and pin type
AS60372	Locking devices for ball and socket couplings of string insulator units-Dimensions and tests
AS 60471	Dimensions of Clevis and Tongue couplings of string insulator units
AS 60120	Dimensions of Ball and Socket couplings of string insulator units
AS IEC 60720	Characteristics of line post insulators
AS/NZS ISO 9001	Quality Management Systems – Requirements

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3. Drawings

3.1 Drawings by the Purchaser

The following drawings form part of this specification.

DRAWING No.	REVISION	TITLE
10-01-01	A	Insulator, Strain (SH.11)
10-01-02	A	11kV Bridging Insulator

4. Service Conditions

The items will be exposed to the following environmental conditions:

Temperatures	50^{o}C summer day time -20^{o}C winter night time
Solar Radiation Level	1 000 Wm^{-2} with high ultraviolet content
Precipitation	Tropical summer storms with high wind speeds, 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 gm^{-2}
Wind Velocity	210km/hr (58m/s)

5. Design and Construction

5.1 Porcelain Insulators

5.1.1 Colour

The glazing of porcelain insulators shall be smoke blue (T33) or light grey (N35) in colour in accordance with AS 2700 and of a uniform shade.

Details of any variation to these colours are to be supplied with the offer.

5.1.2 Surface Finish

The surface of the insulator shall be smooth, uniform and moisture proof. It shall be unaffected by weather, ozone, acidic and/or alkali deposits. Further, the insulator surface shall be free from excessive dust, carbon, cement or other pollutants when supplied.

5.1.3 Porcelain Properties

All porcelain insulators shall be non-porous and pass the porosity test requirements detailed in Clause 25 of AS 2947.1

The raw material shall be milled to achieve maximum homogeneity and the particle size of the quartz and felspar shall not exceed 100 µm.

The type of porcelain is to be stated in **Attachment 1**.

Where soft triaxial porcelain is to be supplied, the following microstructural features are required:

(a) A structure comprising mullite and quartz crystals in a glassy matrix.

(b) Reaction of the quartz crystals with the matrix so that the matrix becomes noticeably rounded and rims of high silica glass are evident around the quartz particles.

(c) Freedom from cracks which are not contained within glassy solution rims of the structure.

The minimum cross breaking strength of the porcelain shall be 70 MPa when determined by the method described in Appendix G of BS 1598.

Photographs of the shape, porosity density and size of porosity of the porcelain to be offered at a minimum magnification of 150 shall be supplied with the offer.

Further, photographs of the microstructure of the porcelain to be offered at a magnification of at least 1500 shall also be supplied with the offer.

5.1.4 Toughened Glass Insulators

The glass used for insulators shall be heat strengthened soda lime glass and shall be smooth and free from defects and blemishes which might adversely affect the life of the insulator. The glass shall be completely non-porous and its impact strength shall be at least 35 Nm. The co-efficient of thermal expansion of the glass shall be between 8 and 9 x 10^{-6} mm / ^{o}C.

The impact strength and the co-efficient of thermal expansion of the glass, is to be stated in Attachment 1.

The insulators offered for transmission type disc insulators and the fog insulators (Items 20 to 23) shall be of high reliability class with a guaranteed service failure rate of less than 2 per 10,000 units per year. The tender documentation shall include documented service history from users as evidence of performance claimed.

5.1.5 Metal Fittings

The grade of malleable cast iron shall be either AS 1832/JMW400-5 or AS 1832/JMB350-10.

The grade of malleable cast iron is to be stated in Attachment 1.

Fittings which are forged or otherwise worked to the final shape shall be normalised after all forging operations.

Tongue and clevis disc insulators shall comply with designation U70C as defined in AS 60305 and be supplied complete with a coupling pin type 16C and one (1) off stainless steel humpback split pin in accordance with Figures 3.1 and 3.2 of AS 2947.3. Ferrous metal fittings shall be hot dip galvanised to AS 4680. The thickness of the zinc coating shall comply with the acceptance criteria set out in clause 26 of AS 2947.1. Preference will be given to the insulators that exceed these criteria. Further all insulators shall be supplied with zinc sleeves.

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Ball and socket disc insulators shall comply with designation U 70 BL (for Items 19 & 21) and U 70BLP (for Item 20) as defined in AS 60305 and shall have standard couplings complying with AS 60372. The locking devices shall be "W" clips type 16B in accordance with AS 60372. Similarly for 125kN type insulators (items 22 and 23) the locking devices shall be "R" clips type 16 – in accordance with AS60372. Ferrous metal fittings shall be hot dip galvanised to AS 4680. The thickness of the zinc coating for item 19 shall comply with the acceptance criteria set out in clause 26 of AS 2947.1. Preference will be given to the insulators that exceed these criteria.

For items 20 and 21, the minimum and the average thickness of the galvanising on the insulator pin shall be 130 and 140 microns respectively. The galvanising on the cap shall comply with AS2947.1. Preference will be given to the insulators that exceed these criteria.

Further, all insulators shall be supplied with zinc sleeves.

Line post insulators are to be supplied complete with a M20/24 galvanized steel stud complete with spring lock washer, round washer and nut as specified in Attachment 1. The base of the insulators shall be in accordance with Table ii and Figure 8 of AS IEC60720 as applicable. The size of the threaded hole for the stud shall be in accordance with the **Attachment 1.**

The clamp top fitting of line post insulators shall be in accordance with Figure 6 and Figure 4 or 5 of AS IEC60720 as applicable. Conductor clamps suitable to accommodate aluminium based conductor with/without armour rods with overall diameter between 5.3 to 18.8mm shall be supplied with the insulators. Conductor clamps are not required for the 66kV insulators.

Ferrous material other than stainless steel shall be galvanized in accordance with AS 4680.

5.1.6 Cement

The cement used to joint the insulator and its associated metalwork shall be non-hydroscopic and shall not affect the corrosion performance of the metal fittings.

Tenderers are to provide details of any testing carried out to verify cement growth inhibiting characteristics.

5.1.7 Insulator Pin Holes

Insulators pin holes on pin insulators shall be in accordance with the following table:

Pin Insulator Type	Pin Hole and Reference Standard	Insulator Pin Size and Reference Standard
LV.LP	Pattern B (Clause 2.1 of AS 3608)	B/100/3.5 (Table 3.1 of AS 4899)
SLP/11/180	Pattern A (Clause 3.3 of AS 4899)	A/130/7 (Table 3.1 of AS 4899)

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ALP/11/275 SLP/22/420 ALP/22/520 SLP/33/534	Pattern C (Clause 3.3 of AS 4899)	C/200/11 (Table 3.1 of AS 4899)

5.1.8 Pin and Post Insulator Head Dimensions

The head dimensions for all pin and post insulators, shall be in accordance with the table below:

Insulator Type	Head Dimensions
SLP/11/180 ALP/11/180 ALP/22/520	Figure 2.12 of AS 4899
11 kV Tie Top Line Post 22 kV Tie Top Line Post 33 kV Tie Top Line Post 66 kV Tie Top Line Post	Table 1 and Figure 2 of AS IEC60720
SLP/22/420	Figure 2.13 of AS4899
SLP/33/534	Figure 2.13 of AS4899

5.1.9 Technical Characteristics

The specified requirements with respect to dimensions, electrical and mechanical characteristics of the insulators, are detailed in **Attachment 1**.

Tender documentation shall include drawings for all items offered.

6. Performance and Testing

The schedule of tests and requirements for testing shall be in accordance with the requirements of Tables 1 to 3 inclusive of AS 2947.1.

6.1 Type Testing

6.1.1 The insulators offered shall be type tested in accordance with the requirements of AS 2947.1, AS 3608 or AS 3609 as applicable.

6.1.2 Type test certificates are to be submitted with the offer.

6.1.3 Testing shall have been undertaken at a NATA registered testing authority and must have been carried within the last ten (10) years. The following insulators are exempt from this requirement:

Low voltage (LP.LV, SH.LV.2) & Strain (GY type)

Note: Should suppliers be unable to provide a type test certificate from a NATA registered testing authority, then evidence must be provided that the testing authority is:

- INDEPENDENT of the manufacturer; and
- NATIONALLY ACCREDITED to carry out the relevant tests.

6.2 Qualification Tests

The materials used for the manufacture of the W-clips for ball and socket insulators shall be subjected to the qualification tests in accordance AS 60372.

6.3 Sample Tests

6.3.1 All insulators shall be sample tested in accordance with the requirements of AS 2947.1, AS 3608 or AS 3609 as applicable.

6.3.2 "W" clips supplied with ball and socket insulators shall be sample tested in accordance with AS 60372.

6.3.3 Sample testing shall be undertaken by a NATA registered testing authority.

6.3.4 All sample test certificates shall state the lower confidence limit of the results (mean minus three [3] standard deviations) and this shall be greater than the specified minimum value.

6.3.5 Sample test certificates shall be supplied with each delivery of insulators (i.e. not by separate mail) and the lot numbers shall be marked on the sample test certificate and the packaging of the lot delivered.

6.4 Routine Tests

Routine tests shall be carried out in accordance with the requirements of AS 2947.1, AS 3608 or AS 3609 as applicable.

7. Risk Assessment

7.1 Compliance Requirements

The Tenderer warrants (without limiting any other warranties or conditions implied by law) that all Goods have been produced, sold and delivered to the Principal in compliance with all applicable laws (including all workplace health and safety and electrical safety legislation, codes of conduct and the Principal's Workplace Health & Safety and Electrical Safety Conditions).

7.2 Formal Risk Assessment

Tendered items shall be subjected to a formal risk assessment prior to acceptance. It is preferred that the tenderers perform the risk assessment themselves and provide the resultant documentation with their tender. Where risk assessment documentation is not provided with the tenders, or does not meet the required standard, such tenders shall have their price loaded with the estimated costs associated with the Purchaser conducting the assessments. Any documented risk assessment which accompanies the tender must meet the requirements of AS/NZS ISO 31000:2009 Risk Management as a minimum standard. It is preferred that the risk assessment methodology uses an energy model to identify hazards.

7.3 Hazards Identification

The risk assessment/s must identify hazards to the corporation personnel, public and property associated with:

- The installation of the equipment
- The operation and maintenance of the equipment during life expectancy
- Dismantling/disposal of equipment at end of life.

The 'Risk Assessment' schedule included with this specification is to be completed by the Tenderer. Note the schedule contains a generic set of questions designed to cover all the purchaser's plant and materials and the tenderer is only required to complete those items applicable to the product offered.

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 insulators is in accordance with AS/NZS ISO 9001 and shall include the Capability Statement associated with the Quality System 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.

9. Samples

9.1 Production Samples

When requested, production samples of each item offered shall be submitted to assist in the evaluation of the offer.

9.2 Sample Delivery

Each sample shall be delivered freight free, suitably crated and packaged and labelled with the following information:

Name of Supplier and this Contract No.
Contract Item Numbers
Any supporting data on features or characteristics

10. Packaging and Marking

10.1 Safe Handling of Products

The successful tenderer(s) shall take all necessary precautions to ensure safe handling of all products supplied. In particular:

a) Individual pack sizes shall not weigh more than 20kg.
b) Palletised goods shall be supplied on standard wooden pallets although specially designed pallets will be acceptable where additional stability is required.
c) Palletised goods are to secured and stabilised with no overhang to facilitate unloading
d) Goods requiring indoor storage shall not exceed 1100mm in height.

10.2 Packaged Lots

Each packaged lot shall be marked with the following information:

Manufacturers Name
Order Number
Ergon Stock Code
Item Description

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Pack Size
Pack Weight

10.3 Quarantine Requirements

11. Should the insulators 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, timber crates must be fumigated with methyl bromide with a concentration of 48 grams per cubic metre for 24 hours at 21 C. The supplier shall ensure that the procedure does not produce any deleterious effects to the insulators or the crates.Service Performance

Suppliers shall state:

(a) the period of service achieved by the items offered within Australian service conditions;

(b) Australian and overseas electricity supply authorities who have a service history of the items offered(including documented user service history, AND

(c) Contact names and phone numbers of relevant employees of those supply authorities who can verify the service performance claimed.

In the absence of relevant Australian Service performance, the information required in (a), (b) and (c) above shall be stated for service history in overseas countries. Priority shall be given to performance in environments similar to those described in Clause 4 above.

12. Reliability

12.1 Service Life

Suppliers 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 and/or audio visuals may be required to be provided for the items accepted under the offer.

Tenderers shall state the availability of training materials which should include but is not limited to the following topics:

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- Handling
- Storage
- Application (particularly in areas of heavy coastal pollution)
- Installation
- Maintenance
- Environmental performance
- Electrical performance
- Mechanical performance
- Disposal

14. Environmental Considerations

Suppliers 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 offered shall be as stated in **Attachment 1** of this specification. The supplier shall provide all details requested by **Attachment 1** and shall guarantee such data.

15.2 Checklist of Supporting Documentation

Attachment 2 details a checklist for the Risk Assessment information which is required to be submitted with the tender.

Attachment 3 details a checklist of supporting technical documentation which is required to be submitted with the offer.

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16. Attachment 1 – Technical Details

Item 1: S/C 0560003 Low Voltage Insulator Type LP.LV	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Figure 4.1 of AS 3608	
Porcelain: (a) Type (b) Colour of Glaze		
Thread Pattern:	Pattern "B" in accordance with AS 4899	
Minimum failing load: (kN)	7	
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

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ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 2: S/C 0555034 Low Voltage Insulator Type SH.LV.2	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Figure 4.3 of AS 3608	
Porcelain: (a) Type (b) Colour of Glaze		
Minimum failing load: (kN)	20	
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

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ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 3: S/C 0560119 HV Pin Insulator Type SLP/11/180	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Figure 2.1 of AS 4899	
Porcelain: (a) Type (b) Colour of Glaze		
Thread Pattern:	Pattern "A" in accordance with AS 4899	
Minimum failing load: (kN)	7	
Minimum creepage distance: (mm)	180	
Power frequency wet withstand voltage: (kV rms)	30	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Power frequency puncture voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	95	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

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ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 4: S/C0560461 HV Pin Insulator Type ALP/11/275	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Fig. 2.3 of AS 4899	
Porcelain: (a) Type (b) Colour of Glaze		
Thread Pattern:	Pattern "C" in accordance with AS 4899	
Minimum failing load: (kN)	7	
Minimum creepage distance: (mm)	275	
Power frequency wet withstand voltage: (kV rms)	30	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Power frequency puncture voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	95	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

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ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 5: S/C2400853 HV Shackle Insulator Type SH.11	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per QESI Drawing No. 10-01-01	
Porcelain: (a) Type (b) Colour of Glaze		
Minimum failing load: (kN)	22	
Minimum creepage distance: (mm)	180	
Power frequency wet withstand voltage: (kV rms)	30	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	95	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

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ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 6: S/C 0560526 11/22 kV Bridging Insulator	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per QESI Drawing No. 10-01-02	
Porcelain: (a) Type (b) Colour of Glaze		
Thread Pattern:	Pattern "C" in accordance with AS 4899	
Minimum failing load: (a) Cantilever (kN) (b) Axial (kN)		
Minimum creepage distance: (mm)	350	
Power frequency wet withstand voltage: (kV rms)	50	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	150	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

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ATTACHMENT 1 -TECHNICAL DETAILS (CONT'D)

Item 7: S/C 0560275 HV Pin Insulator Type SLP/22/420	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	Fig 2.4 of AS4899	
Porcelain: (a) Type (b) Colour of Glaze		
Thread Pattern:	Pattern "C" in accordance with AS 4899	
Minimum failing load: (kN)	11	
Minimum creepage distance: (mm)	420	
Power frequency wet withstand voltage: (kV rms)	50	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Power frequency puncture voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	150	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 – TECHNICAL DETAILS (CONT'D)

Item 8: S/C 0560496 HV Pin Insulator Type ALP/22/520	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Fig 2.7 of AS 4899	
Porcelain: (a) Type (b) Colour of Glaze		
Thread Pattern:	Pattern "C" in accordance with AS 4899	
Minimum failing load: (kN)	11	
Minimum creepage distance: (mm)	520	
Power frequency wet withstand voltage: (kV rms)	50	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Power frequency puncture voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	150	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

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ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 9: S/C 0104197 22kV Tie top Line Post Insulator	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	Head: Figure 2 of AS IEC60720 Overall Height: 365±5 mm	
Porcelain: (a) Type (b) Colour of Glaze		
Bottom Metal Fitting Details:	Figure 8 of AS 60720	
Grade of Malleable Cast Iron		
Stud Material:	Galvanised Steel	
Stud Dimensions:	M20 x 57	
Minimum failing load: (kN)	Cantilever: 11 Axial: 5.5	
Minimum creepage distance: (mm)	660	
Power frequency wet withstand voltage: (kV rms)	50	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	145	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

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ATTACHMENT 1 – TECHNICAL DETAILS (CONT'D)

Item 10: S/C 0104196 22kV Horizontal Clamp-top Line Post Insulator	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	Base to centre-line of conductor attachment: 410±5 mm	
Porcelain: (a) Type (b) Colour of Glaze		
Bottom Metal Fitting Details:	Figure 8 of AS IEC 60720	
Grade of Malleable Cast Iron		
Stud Material:	Galvanised Steel	
Stud Dimensions:	M20 x 57	
Clamp Top	Figure 5 & 6 of AS IEC 60720	
Aluminium conductor diameter range: (mm)	7.5 - 18.8	
Minimum failing load: (kN)	Cantilever: 7 Axial: 11	
Minimum creepage distance: (mm)	660	
Power frequency wet withstand voltage: (kV rms)	50	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	145	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 – TECHNICAL DETAILS (CONT'D)

Item 11: S/C 2400845 Tie-top Line Post Insulator	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	Base to centre-line of conductor attachment: 487±5 mm	
Porcelain: (a) Type (b) Colour of Glaze		
Bottom Metal Fitting Details:	Figure 8 of AS IEC 60720	
Grade of Malleable Cast Iron		
Stud Material:	Galvanised Steel	
Stud Dimensions:	M24 x 35 min	
Minimum failing load: (kN)	Cantilever: 12.5 Axial: 5.5	
Minimum creepage distance: (mm)	895	
Power frequency wet withstand voltage: (kV rms)	95	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	200	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

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ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item12: HV Insulator Type SLP/33/534		Specified Requirement	Guaranteed Value
Manufacturer's Name and Address			
Country of Manufacture			
Manufacturer's Catalogue No.			
Manufacturer's Drawing No.			
Type Test Certificate No.			
Dimensions:		Fig 2.9 of AS4899	
Porcelain: (a) Type (b) Colour of Glaze			
Thread Pattern:		Pattern "C" in accordance with AS 4899	
Minimum failing load:	(kN)	11	
Minimum creepage distance:	(mm)	534	
Power frequency wet withstand voltage:	(kV rms)	70	
Power frequency dry withstand voltage:	(kV rms)		
Power frequency wet flashover voltage:	(kV rms)		
Power frequency dry flashover voltage:	(kV rms)		
Power frequency puncture voltage:	(kV rms)		
Impulse withstand voltage:	(kV pk)	200	
50% dry impulse flashover voltage:	(kV pk)		
Radio interference test voltage	(kV rms)		
Radio interference level	(µV)		
Pack Size			
Pack Weight	(kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 13: S/C 0104199 33 kV Horizontal Clamp-top Line Post Insulator	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	Base to centre-line of conductor attachment: 560±5 mm	
Porcelain: (a) Type (b) Colour of Glaze		
Bottom Metal Fitting Details:	Figure 8 of AS IEC 60720 with threaded hole to suit M20 stud	
Grade of Malleable Cast Iron		
Stud Material:		
Stud Dimensions:		Stud not required with insulator
Clamp Top	Figure 5 & 6 of AS IEC 60720	
Conductor clamp to suit aluminium conductor with armour rods - conductor diameter range: (mm)	7.5 - 18.8	
Minimum failing load: (kN)	Cantilever: 12.5 Axial: 12.5	
Minimum creepage distance: (mm)	620	
Power frequency wet withstand voltage: (kV rms)	70	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	200	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (μV)		
Thickness of galvanising on ferrous parts (μm)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 14: S/C 0104200 33 kV Vertical Tie-top Line Post Insulator	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	Base to centre-line of conductor attachment: 560±5 mm	
Porcelain: (c) Type (d) Colour of Glaze		
Bottom Metal Fitting Details:	Figure 8 of AS IEC 60720 with threaded hole to suit M20 stud	
Grade of Malleable Cast Iron		
Stud Material:		
Stud Dimensions:		Stud not required with insulator
Tie-Top	Figure 2 of AS IEC60720	
Aluminium conductor diameter range: (mm)	7.5 - 18.8	
Minimum failing load: (kN)	Cantilever: 12.5 Axial: 12.5	
Minimum creepage distance: (mm)	590	
Power frequency wet withstand voltage: (kV rms)	70	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	200	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (μV)		
Thickness of galvanising on ferrous parts (μm)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 15: S/C 0553007 66 kV Line Post Insulator -Tie Top 350kV BIL	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions(nominal):	Base to centre-line of conductor attachment: 800 mm	
Porcelain: (e) Type (f) Colour of Glaze		
Bottom Metal Fitting Details:	Figure 8 of AS IEC 60720 with threaded hole to suit M24 stud	
Grade of Malleable Cast Iron		
Stud Material:		
Stud Dimensions:		Stud not required with insulator
Tie Top	Figure 2 of AS IEC60720	
Aluminium conductor diameter range: (mm)		
Minimum failing load: (kN)	Cantilever: 12.5 Axial: 12.5	
Minimum creepage distance: (mm)	1800	
Power frequency wet withstand voltage: (kV rms)	140	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	350	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (μV)		
Thickness of galvanising on ferrous parts (μm)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 16: S/C 2400855 66 kV Line Post Insulator Clamp-top 350kV BIL-Vertical Mounting	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions (minimum):	Base to centre-line of conductor attachment: 800mm	
Porcelain: (g) Type (h) Colour of Glaze		
Bottom Metal Fitting Details:	Figure 8 of AS IEC 60720 with threaded hole to suit M24 stud	
Grade of Malleable Cast Iron		
Stud Material:		
Stud Dimensions:		Stud not required with insulator
Clamp Top	Figure 4 & 6 of AS IEC 60720	
Minimum failing load: (kN)	Cantilever: 12.5 Axial: 12.5	
Minimum creepage distance: (mm)	1800	
Power frequency wet withstand voltage: (kV rms)	140	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	350	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Thickness of galvanising on ferrous parts (um)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

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ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 17: S/C 0553058 66 kV Horizontal Line Post Insulator Clamp Top 350kV BIL	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	Base to centre-line of conductor attachment: 820mm	
Porcelain: (i) Type (j) Colour of Glaze		
Bottom Metal Fitting Details:	Figure 8 of AS IEC 60720 with threaded hole to suit M24 stud	
Grade of Malleable Cast Iron		
Stud Material:		
Stud Dimensions:		Stud not required with insulator
Clamp Top	Figure 4 & 6 of AS IEC 60720	
Minimum failing load: (kN)	Cantilever: 12.5 Axial: 12.5	
Minimum creepage distance: (mm)	1800	
Power frequency wet withstand voltage: (kV rms)	140	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	350	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (μV)		
Thickness of galvanising on ferrous parts (μm)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 18: S/C 2402986 String Insulator Unit Type U 70 C	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Figure 2 of IEC 60305	
Glass: (a) Minimum Impact Strength (Nm) (b) Co-efficient of thermal expansion (per mm/^{o}C)	 35 8-9	
Grade of Malleable Cast Iron		
Clevis Pin	As per section 2 of AS 60372	
Amount of zinc coating on pin shank 10mm remote from the Zn sleeve (micro m) -minimum -average	 70 85	
Amount of zinc coating on cap (micro m) -minimum -average	 70 85	
Minimum failing load: (kN)	70	
Minimum creepage distance: (mm)	295	
Power frequency wet withstand voltage: (kV rms)	40	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Power frequency puncture voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	95	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 19: S/C 0551004 String Insulator Unit Type U 70 BL	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Figure 1 of IEC 60305	
Glass: (a) Minimum Impact Strength (Nm) (b) Co-efficient of thermal expansion (per mm/^{o}C)	 35 8-9	
Grade of Malleable Cast Iron		
"W" clip	As per section 2 of AS 60372	
Amount of zinc coating on pin shank 10mm remote from the Zn sleeve (micro m) -minimum -average	70 85	
Amount of zinc coating on cap (micro m metre) -minimum -average	70 85	
Minimum failing load: (kN)	70	
Minimum creepage distance: (mm)	295	
Maximum nominal diameter of the insulating part (mm)	255	
Nominal spacing ((mm)	146	
Power frequency wet withstand voltage: (kV rms)	40	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Power frequency puncture voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	95	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 -TECHNICAL DETAILS (CONT'D)

Item 20: S/C 0551008 String Insulator Unit Type U 70 BLP (Fog)	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Figure 1 of IEC 60305	
Glass: Minimum Impact Strength (Nm) Co-efficient of thermal expansion (per mm/^{o}C) Shatter rate in service (minimum)	 35 8-9 2 in 10000 p a	
Grade of Malleable Cast Iron		
"W" clip	As per section 2 of AS 60372	
Amount of zinc coating on pin shank 10mm remote from the Zn sleeve (micro m) -minimum -average	130 140	
Amount of zinc coating on cap (micro m) -minimum -average	70 85	
Minimum failing load: (kN)	70	
Minimum creepage distance: (mm)	440	
Maximum nominal diameter of the insulating part(mm)	280	
Nominal spacing	146	
Power frequency wet withstand voltage: (kV rms)	40	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Power frequency puncture voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	95	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (μV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 21: S/C 2400847 String Insulator Unit Type U 70 BL(Transmission)	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Figure 1 of IEC 60305	
Glass: Minimum Impact Strength (Nm) Co-efficient of thermal expansion (per mm/^{o}C) Shatter rate in service (minimum)	35 8-9 2 in 10,000 pa	
Grade of Malleable Cast Iron		
“W” clip	As per section 2 of AS 60372	
Amount of zinc coating on pin shank 10mm remote from the Zn sleeve (micro m) -minimum -average	130 140	
Amount of zinc coating on cap (micro m) -minimum -average	70 85	
Minimum failing load: (kN)	70	
Minimum creepage distance: (mm)	295	
Maximum nominal diameter of the insulating part(mm)	255	
Nominal spacing	146	
Power frequency wet withstand voltage: (kV rms)	40	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Power frequency puncture voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	95	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 22: S/C 2417970 String Insulator Unit Normal 125kN (Transmission)	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Figure 1 of IEC 60305	
Porcelain: Type Colour of Glaze		
Grade of Malleable Cast Iron		
"R" clip	As per section 2 of AS 60372	
Amount of zinc coating on pin shank 10mm remote from the Zn sleeve (micro m) -minimum -average	130 140	
Amount of zinc coating on cap (micro m) -minimum -average	 70 85	
Minimum failing load: (kN)	125	
Minimum creepage distance: (mm)	295	
Maximum nominal diameter of the insulating part(mm)	255	
Nominal spacing	146	
Power frequency wet withstand voltage: (kV rms)	40	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Power frequency puncture voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	110	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

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ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 23: S/C 2417962 String Insulator Unit Fog Type 125kN (Transmission)	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Figure 1 of IEC 60305	
Porcelain: Type Colour of Glaze		
Grade of Malleable Cast Iron		
"R" clip	As per section 2 of AS 60372	
Amount of zinc coating on pin shank 10mm remote from the Zn sleeve (micro m) -minimum -average	130 140	
Amount of zinc coating on cap (micro m) -minimum -average	 70 85	
Minimum failing load: (kN)	125	
Minimum creepage distance: (mm)	295	
Maximum nominal diameter of the insulating part(mm)	255	
Nominal spacing	146	
Power frequency wet withstand voltage: (kV rms)	45	
Power frequency dry withstand voltage: (kV rms)		
Power frequency wet flashover voltage: (kV rms)		
Power frequency dry flashover voltage: (kV rms)		
Power frequency puncture voltage: (kV rms)		
Impulse withstand voltage: (kV pk)	125	
50% dry impulse flashover voltage: (kV pk)		
Radio interference test voltage (kV rms)		
Radio interference level (µV)		
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

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ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 24: S/C 0552027 Stay Insulator Type GY2	Specified Requirement	Guaranteed Value
Manufacturer's Name and Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Figure 4.2 of AS 3609	
Porcelain: (a) Type (b) Colour of Glaze		
Minimum failing load: (kN)	71	
Power frequency wet flashover voltage: (kV rms)	15	
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 25: S/C 0552035 Stay Insulator Type GY3	Specified Requirement	Guaranteed Value
Manufacturer's Name & Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Figure 4.3 of AS 3609	
Porcelain: (a) Type (b) Colour of Glaze		
Minimum failing load: (kN)	222	
Power frequency wet flashover voltage: (kV rms)	20	
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

Item 26: S/C 00552043 Stay Insulator Type GY4	Specified Requirement	Guaranteed Value
Manufacturer's Name & Address		
Country of Manufacture		
Manufacturer's Catalogue No.		
Manufacturer's Drawing No.		
Type Test Certificate No.		
Dimensions:	As per Figure 4.4 of AS 3609	
Porcelain: (a) Type (b) Colour of Glaze		
Minimum failing load: (kN)	222	
Power frequency wet flashover voltage: (kV rms)	30	
Pack Size		
Pack Weight (kg)		

SIGNATURE OF TENDERER: _____

17. Attachment 2 – Risk Assessment

The Tenderer shall complete the relevant items (as applicable):

REF.	PARTICULARS	RESPONSE
1.	Have Risk Assessments been carried out on equipment tendered which meet the requirements of AS/NZS ISO 31000:2009 (Yes/No)	
2.	Have copies of such risk assessments been included with the tender (Yes/No)	
3.	What is the weight of the components to be moved (for example - cable box covers/drawout circuit breaker trucks)?	
4.	How often do the components have to be moved?	
5.	Are space restrictions associated with:	
5.1	Manual/materials handling tasks	
5.2	Installation/maintenance	
5.3	Operating procedures?	
6.	Is there provision for the use of mechanical lifting devices?	
7.	Is the load stable?	
8.	What is the level of coupling? (poor/fair/good) (e.g. are operating handles fitted with grips)	
9.	What are the push/pull/rotational forces required to operate the equipment:	
9.1	When new?	
9.2	During life expectancy?	
10.	Do "above ground" work surfaces have adequate fall protection (e.g. slip resistant surface, hand rails)?	
11.	Do the work positions require undesirable postures such as:	
11.1	Bending	
11.2	Stretching	
11.3	Twisting	
12.	What postures are required to be sustained over what period of time?	
13.	What movements are repetitive and for what duration?	
14.	What are the sound pressure levels (expressed in dB(A))?	
15.	What hazardous substances are used/produced (including after failure) such as:	
15.1	Dust	
15.2	Gas	
15.3	Fume	
15.4	Emissions	
15.5	Mist	
15.6	Liquid	
15.7	Solids	

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ATTACHMENT 2 - RISK ASSESSMENT (CONT'D)

REF.	PARTICULARS	RESPONSE
16.	Are the hazardous substances controls compatible with normal operational requirements?	
17.	Is a Safety Data Sheet for all hazardous substances provided?	
18.	What are the expected hazardous changes/by-products associated with the deterioration of a substance?	
19.	Is there any possible contact with energised components?	
20.	What are the levels of radiation emitted?	
21.	When in service, are any normally accessible areas hot/cold enough to be a hazard?	
22.	Are there any biological hazards?	
23.	Are there any mechanical hazards (e.g. nip in points, exposed moving components)?	
24.	Are mechanical hazards appropriately controlled (e.g. guarding, lock-outs)?	
25.	Are load limits established and clearly identified?	
26.	Are gauges clearly visible and easily interpreted?	
27.	Are control movements consistent with established Australian conventions (e.g. switch "UP" position is "OFF")?	
28.	What is the degree of whole body or hand/arm vibration? (Hz)	
29.	Are projectiles generated?	
30.	Are special tools required/identified/supplied?	
29.	What are the hazards associated with equipment failure?	

SIGNATURE OF TENDERER: _____

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18. Attachment 3 – 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?		
5.1.3	Photographs (minimum magnification of 150) of the shape, porosity density and size of porosity of porcelain offered together with photographs of the microstructure of the porcelain (minimum magnification of 1500)	Yes/No
5.1.6	Verification of cement growth inhibiting characteristics	Yes/No
5.1.9	Drawings for all items offered	Yes/No
6.1	Type test certificates	Yes/No
6.1.3	Certification of testing authority for type tests	Yes/No
6.3.3	Certification of testing authority for sample tests	Yes/No
7	Risk Assessments	Yes/No
8.2	Quality systems of **BOTH** the **SUPPLIER** and the **MANUFACTURER**	Yes/No
11	Service Performance	Yes/No
12	Reliability	Yes/No
13	Training materials	Yes/No
14	Environmental considerations	Yes/No
15	**Attachments 1, 2, and 3**	Yes/No

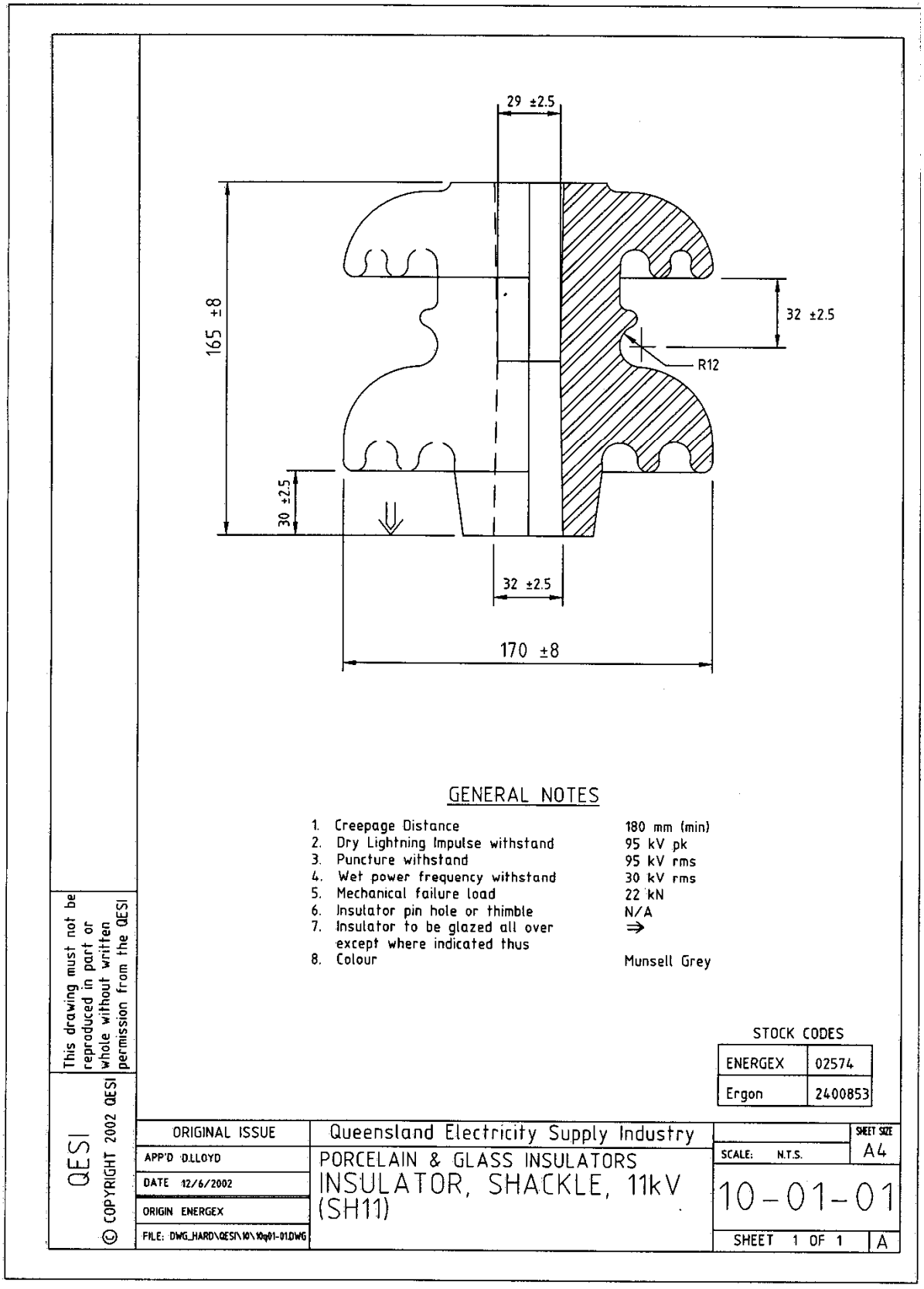
NAME OF TENDERER:

ADDRESS OF TENDERER:_____

SIGNATURE: _____ FOR AND ON BEHALF OF TENDERER

DATE: _____

19. Attachment 4 - Drawings



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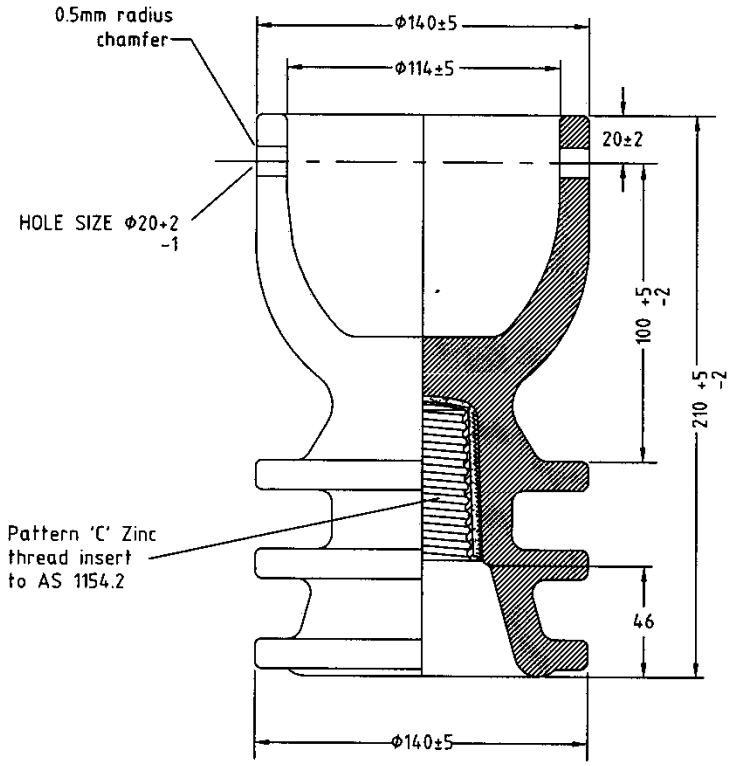

GENERAL NOTES

1.	Creepage Distance	355mm (min)
2.	Dry Lightning Impulse withstand	125 kV pk
3.	Puncture withstand	150 kV rms
4.	Wet power frequency withstand	50 kV rms
5.	Mechanical failure load	5 kN
6.	Insulator pin hole or thimble	Pattern "C" short to AS 1154.2
7.	Insulator to be glazed all over except where indicated thus	⇒
8.	Colour	Munsell Grey

STOCK CODES

ENERGEX	N/A
Ergon	0560526

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ORIGINAL ISSUE	Queensland Electricity Supply Industry	SHEET SIZE A4
APP'D D.LLOYD	PORCELAIN & GLASS INSULATORS	SCALE: N.T.S.
DATE 12-6-2002	INSULATOR, BRIDGING 11kV-22kV	10-01-02
ORIGIN ENERGEX		SHEET 1 OF 1 A
FILE: DWG_HARD\QESI\10\10001-02.DWG		

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