



Ergon Energy Corporation Limited

Technical Specification for Outdoor Porcelain Station Post Insulators

ETS10-01-02

Technical Specification for Outdoor Porcelain Station Post Insulators

Contents

| | |
|--|----------|
| 1. Purpose and Scope | 1 |
| 2. References | 1 |
| 2.1 Applicable Standards | 1 |
| 3. Drawings | 2 |
| 3.1 Drawings by the Purchaser | 2 |
| 3.2 Drawings by the Tenderer | 2 |
| 4. Service Conditions | 2 |
| 4.1 System Conditions | 2 |
| 4.2 Duties..... | 3 |
| 4.3 Performance Requirements | 3 |
| 5. Design and Construction | 4 |
| 5.1 General | 4 |
| 5.2 Colour | 4 |
| 5.3 Surface Finish | 4 |
| 5.4 Porcelain Properties..... | 4 |
| 5.5 Metal Fittings..... | 5 |
| 5.6 Cement | 5 |
| 6. Identification of Insulators | 5 |
| 7. Performance and Testing | 5 |
| 7.1 Tests | 5 |
| 7.2 Test Certificates | 6 |
| 8. Risk Assessment | 6 |
| 9. Quality Assurance | 6 |
| 9.1 Purchasers Policy | 6 |
| 9.2 Documentary Evidence | 7 |
| 9.3 Quality Certification Program | 7 |
| 10. Samples | 7 |
| 10.1 Production Samples | 7 |
| 10.2 Sample Delivery | 7 |



Technical Specification for Outdoor Porcelain Station Post Insulators

| | |
|--|-----------|
| 11. Service Performance | 7 |
| 12. Reliability | 7 |
| 12.1 Service Life | 7 |
| 12.2 Evidence in Support of Reliability..... | 7 |
| 13. Training..... | 8 |
| 14. Environmental Considerations | 8 |
| 15. Information to be Provided | 8 |
| 15.1 Specific Technical Requirements..... | 8 |
| 15.2 Checklist of Supporting Documentation | 8 |
| 16. Attachment 1 – General Particulars..... | 9 |
| 17. Attachment 2 – Guaranteed Performance of Plant..... | 11 |
| 18. Attachment 3 – Technical Document Checklist | 12 |

Technical Specification for Outdoor Porcelain Station Post Insulators

1. Purpose and Scope

This specification sets out the requirements for the manufacture, testing and delivery of outdoor, cylindrical, porcelain station post insulators for use in electricity substations systems in a totally exposed environment.

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

| Item No | Description | Stock Code No |
|---------|--|---------------|
| 1 | 22 kV C6-150-II solid core, porcelain station post insulators. | 0104600 |
| 2 | 33 kV, C6-200-II solid core, porcelain station post insulators. | 0104601 |
| 3 | 66 kV, C6-325-II solid core, porcelain station post insulators. | 0554097 |
| 4 | 132 kV, C6-650-II solid core, porcelain station post insulators. | 0104603 |

2. References

2.1 Applicable Standards

The insulators shall comply in all respects with this Specification and, except where otherwise specified herein, shall conform to the relevant standards in force at the time of tendering of the Standards Australia, or, lacking such publications, of the International Electrotechnical Commission (IEC) and British Standards. In particular, the following standards shall apply:

| STANDARD | TITLE |
|-------------------|---|
| AS 1112 | ISO metric hexagon nuts (All parts) |
| AS 1214 | Hot-dip galvanized coatings on threaded fasteners |
| AS 1824.1 | Insulation Co-Ordination – Definitions, Principles, Rules |
| AS 1832 | Malleable cast iron |
| AS 1931.1 | High Voltage Test Techniques – General definitions and test requirements |
| AS 1931.2 | High Voltage Test Techniques – Part 2: Measuring systems |
| IEC 62271-1 Ed1.1 | Common specification for high voltage switchgear and control gear standards |
| AS 2700 | Colour standards for general purposes |
| AS 4398 | Insulators – Ceramic or glass – Station post for indoor and outdoor use – voltages greater than 1000 Vac (All parts). |
| AS 4436 | Guide for the Selection of Insulators in respect of Polluted Conditions |
| AS/NZS 4680 | Hot-Dip Galvanised (Zinc) Coatings on Fabricated Ferrous Articles |
| AS/NZS ISO | Risk Management |

Technical Specification for Outdoor Porcelain Station Post Insulators



| STANDARD | TITLE |
|-----------------|--|
| 31000-2009 | |
| AS/NZS ISO 9001 | Quality Management Systems – Requirements |
| AS/NZS ISO 9004 | Quality Management Systems – Guidelines for performance improvements |

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, a typical dimensioned drawing of the items tendered.

4. Service Conditions

The items will be exposed to the following environmental conditions:

| | |
|------------------------------|---|
| Temperature | 50 ⁰ C summer day time -20 ⁰ C winter night time |
| Solar Radiation level | 1000Wm ⁻² with high ultra violet content |
| Precipitation | Tropical summer storms with high winds and an annual rainfall in excess of 1500 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) |

4.1 System Conditions

The insulators shall be suitable for use under the following conditions:

| | | | | |
|---|--------|--------|---------|---------|
| System nominal voltage (kV) | 22 | 33 | 66 | 132 |
| System highest voltage (kV) | 24 | 36 | 72.7 | 145 |
| System insulation level LI/AC (kVp/kV) | 150/50 | 200/70 | 325/140 | 650/275 |
| System frequency (Hz) | 50 | 50 | 50 | 50 |
| Number of phases | 3 | 3 | 3 | 3 |

Technical Specification for Outdoor Porcelain Station Post Insulators

4.2 Duties

The insulators will be used in zone substations and switching stations for the following duties, either

- Support of busbars/conductors, or
- Insulation for disconnectors, reactors, etc.

4.3 Performance Requirements

The ratings and performance shall be as defined in the relevant Australian Standards. When the insulators deviate in any respect from these Standards, the Tenderer shall state the applicable Standard or source to justify the deviations.

The ratings and performance requirements of the insulators shall be as those specified in Table 1 - Performance Requirements below.

The Tenderer shall complete Schedule 2 – Guaranteed Performance of Plant, included in this specification, listing the actual ratings, proven by type tests, of the insulators being supplied.

Tenderers shall provide a full information of the plant offered, its electrical and mechanical characteristics, description, construction and drawings of each item tendered. Tenderers shall also provide information to guarantee that all insulators has been developed, manufactured, and proven through satisfactory customer applications, or has been tested as a production model for a period of not less than six months, prior to the submission of their tender.

Table 1. Performance Requirements

| Ref No | Particulars | Unit | Value | | | |
|--------------------------------|--|------|---------------|---------------|---------------|---------------|
| | | | Item 1 | Item 2 | Item 3 | Item 4 |
| STATION POST INSULATORS | | | Item 1 | Item 2 | Item 3 | Item 4 |
| 1. | Designation (AS 4398-1 Table IV) | | C6-150-II | C6-200-II | C6-350-II | C6-650-II |
| 2. | Type of insulation | | Porcelain | Porcelain | Porcelain | Porcelain |
| 3. | Lighting impulse withstand test voltage | kVp | 150 | 200 | 325 | 650 |
| 4. | Power frequency withstand test voltage (wet) | kV | 50 | 70 | 140 | 275 |
| 5. | Minimum nominal creepage distance | mm | 660 | 950 | 1812 | 3625 |
| 6. | Minimum failing loads | | | | | |
| | - Bending | N | 6000 | 6000 | 6000 | 6000 |
| | - Torsion | N.m | 1200 | 1800 | 2500 | 3000 |

Technical Specification for Outdoor Porcelain Station Post Insulators



| Ref No | Particulars | Unit | Value | | | |
|--------|-------------------|------|-------|----|-----|-----|
| 7. | Metal fitting PCD | | | | | |
| | - Top | mm | 76 | 76 | 127 | 127 |
| | - Bottom | mm | 76 | 76 | 127 | 127 |

5. Design and Construction

5.1 General

The insulators shall be of porcelain, solid core, cylindrical station post type with external metal fittings for outdoor use (Designation C of AS.4398.1).

The design and construction of the insulators shall be in accordance with the requirements of AS 4398 except where varied herein.

The Tenderer shall complete **Attachment 1 – General Particulars**, included at the end of this specification, listing the detailed construction of the insulators supplied.

The design, materials used and construction of the insulators shall be suitable for the purpose intended and shall meet all requirements of this specification.

5.2 Colour

The glazing of porcelain insulators shall be silver grey (N24) 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 tender.

5.3 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.

5.4 Porcelain Properties

All porcelain insulators shall be non-porous and pass the porosity test requirements detailed in Clause 5.6 of AS 4398.2-1996.

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.

Technical Specification for Outdoor Porcelain Station Post Insulators

- 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.

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 tender.

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

5.5 Metal Fittings

The fixing arrangement shall be in accordance with Clause 6, and Tables IV and IVA of AS 4398.1.

Bolt pitch circle diameters at the top and bottom metal fittings shall be equal.

Insulators are to be supplied complete with galvanised steel studs complete with spring lock washers, round washers and nuts.

Holes for fasteners in metal fittings shall be tapped and oiled after galvanising. Ferrous material other than stainless steel shall be galvanised in accordance with AS 4680.

5.6 Cement

The cement used to joint the insulator and its associated metalwork shall be non-hygroscopic 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.

6. Identification of Insulators

The insulators shall be marked in accordance with Clause 2.3 of AS 4398.2.

7. Performance and Testing

7.1 Tests

Type, sample and routine tests shall be in accordance with the relevant sections of AS 4398.2.

The type and sample tests shall have been undertaken by a NATA registered testing authority. Type tests must have been carried out within the last ten (10) years.

Should the Tenderer be unable to provide Type and Sample Test Certificates 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.

Technical Specification for Outdoor Porcelain Station Post Insulators

7.1.1 Type Tests

Type test certificates shall be supplied with the tender showing that insulators identical in all respects with the insulators being offered has successfully passed all the type tests set out in relevant part of AS 4398.2.

Insulators under this contract which undergoes any design or constructional modifications shall be type tested anew or tested to the satisfaction of the Engineer.

Tenders for insulators, which have not been type tested in accordance with AS 4398.2 will not be considered.

7.1.2 Sample Tests

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.

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.

7.1.3 Routine Tests

All materials, components and items of insulators shall be subjected during the course of manufacture to all the tests prescribed in the relevant Australian, IEC or British Standards in that order, and to all tests considered necessary by either the Manufacturer or the Purchaser to prove their compliance with the performance figures stated in the tender.

Insulators shall be routine tested in accordance with AS 4398.2.

7.2 Test Certificates

Upon completion of any test, the Contractor shall forward to the Purchaser certified test sheets showing the results of each such test.

If the results of any test sheets furnished by the Contractor as aforesaid are found incorrect, the Purchaser may reject any insulators which has been taken over, in the belief that the said results were correct.

No item of insulators shall be dispatched from the Contractor's works until the Purchaser has approved the Test Certificates.

The insulators shall be considered as substantially incomplete and payment shall not be made until all test certificates have been received.

8. Risk Assessment

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

9. Quality Assurance

9.1 Purchasers Policy

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

Technical Specification for Outdoor Porcelain Station Post Insulators

9.2 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.

9.3 Quality Certification Program

Tenderers shall provide details of their program to upgrade their Quality Certification to meet the requirements of ISO 9001:2008.

10. Samples

10.1 Production Samples

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

10.2 Sample Delivery

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

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

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.

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

Tenderers are required to comment on the reliability of the equipment and the performance of the materials offered for a service life of 40 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.

Technical Specification for Outdoor Porcelain Station Post Insulators

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 tender.

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

- Handling
- Storage
- Application (particularly in areas of heavy coastal pollution)
- Installation
- Maintenance
- Environmental performance
- Electrical performance
- Mechanical 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 recyclability and disposability at the end of service life.

15. Information to be Provided

15.1 Specific Technical Requirements

The specific technical requirements for the items shall be as stated in **Attachment 1 and 2** of this specification. The Tenderer shall fill in all data requested in these Attachments and shall guarantee such data.

15.2 Checklist of Supporting Documentation

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

Technical Specification for Outdoor Porcelain Station Post Insulators

16. Attachment 1 – General Particulars

| Ref No | Particulars | | Value/Details | | | |
|--------|-----------------------------------|--------|---------------|--------|--------|--------|
| | | | Item 1 | Item 2 | Item 3 | Item 4 |
| | Station Post Insulators | | | | | |
| 1. | Manufacturer | | | | | |
| 2. | Country of manufacture | | | | | |
| 3. | Place of manufacture | | | | | |
| 4. | Insulator designation | | | | | |
| 5. | Manufacturer's catalogue No | | | | | |
| 6. | Manufacturer's drawing No | | | | | |
| 7. | Type test certificate No | | | | | |
| 8. | Type test copies attached | yes/no | | | | |
| 9. | Dimensions | | | | | |
| | - Overall height | mm | | | | |
| | - Porcelain diameter | mm | | | | |
| | - Creepage distance | mm | | | | |
| | - Dry arcing distance | mm | | | | |
| 10. | Porcelain | | | | | |
| | - Type | | | | | |
| | - Colour of glaze | | | | | |
| | - Minimum cross breaking strength | MPa | | | | |
| 11. | Top metal end fitting | | | | | |
| | - Material and grade | | | | | |
| | - Mounting surface diameter | mm | | | | |
| | - Bolt PCD | mm | | | | |
| | - Bolt/stud dimensions | mm | | | | |
| | - Thread pattern | | | | | |
| 12. | Bottom metal end fitting | | | | | |
| | - Material and grade | | | | | |
| | - Mounting surface diameter | mm | | | | |
| | - Bolt PCD | mm | | | | |
| | - Bolt/stud dimensions | mm | | | | |
| | - Thread pattern | | | | | |

Technical Specification for Outdoor Porcelain Station Post Insulators

| Ref No | Particulars | Value/Details | | | | |
|--------|---|---------------|--|--|--|--|
| 13. | Fasteners - Bolts or studs? - Material - Quantity of spring washers - Quantity of flat washers - Quantity of nuts - Galvanised? | yes/no | | | | |
| 14. | Cement type | | | | | |
| 15. | Evidence of test on cement growth inhibiting characteristics provided? | Yes/no | | | | |
| 16. | Packing - Number of units/pack - Pack size - Pack weight | mm kg | | | | |
| 17. | Photographs of shape, density and size of porosity in porcelain provided? | Yes/no | | | | |
| 18. | Photographs of porcelain microstructure provided? | Yes/no | | | | |
| 19. | What manual will be provided | | | | | |
| 20. | What training material will be provided | | | | | |

SIGNATURE OF TENDERER: _____

Technical Specification for Outdoor Porcelain Station Post Insulators



17. Attachment 2 – Guaranteed Performance of Plant

The Tenderer shall guarantee the performance of various items in the following schedule:

| Ref No | Particulars | | Value/Details | | | |
|--------------------------------|----------------------------------|-----|---------------|--------|--------|--------|
| | | | Item 1 | Item 2 | Item 3 | Item 4 |
| Station Post Insulators | | | | | | |
| 1 | Electrical ratings | | | | | |
| | - LIWV | kVp | | | | |
| | - 50% Impulse flashover positive | kVp | | | | |
| | - 50% Impulse flashover negative | kVp | | | | |
| | - PFWV 1 min wet | kV | | | | |
| | - PFWV 1 min dry | kV | | | | |
| | - PF flashover wet | kV | | | | |
| | - PF flashover dry | kV | | | | |
| 2 | Mechanical ratings | | | | | |
| | - Bending strength upright | N | | | | |
| | - Bending strength underhung | N | | | | |
| | - Tension strength | N | | | | |
| | - Torsion strength | N.m | | | | |
| | - Compression strength | N | | | | |
| 3 | Radio Interference | | | | | |
| | - Test voltage phase-earth | kV | | | | |
| | - Max RIV | μV | | | | |
| | - At frequency | kHz | | | | |

SIGNATURE OF TENDERER: _____

Technical Specification for Outdoor Porcelain Station Post Insulators



18. Attachment 3 – Technical Document Checklist

| CLAUSE Ref. | PARTICULARS | RESPONSE |
|--|--|----------|
| Have full and comprehensive details been submitted WITH the tender documents associated with each of the following items? | | |
| 3.2 | Drawings for all items offered | Yes/No |
| 4 | Full information of items offered | Yes/No |
| 5.2 | Details of variation from required colours | Yes/No |
| 5.4 | 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 |
| 5.6 | Verification of cement growth inhibiting characteristics | Yes/No |
| 7 / 7.2 | Type and Sample test certificates | Yes/No |
| 7.1.1 | Certification of testing authority for type tests | Yes/No |
| 7.1.2 | Certification of testing authority for sample tests | Yes/No |
| 9.2 | Evidence of Quality System Certification and Capability Statement | Yes/No |
| 9.3 | Quality Program | Yes/No |
| 10 | Service Performance | Yes/No |
| 12 | Comments on Reliability | Yes/No |
| 13 | Training | Yes/No |
| 14 | Environmental considerations | Yes/No |
| 15 | Attachment 1, 2 and 3 | Yes/No |

NAME OF TENDERER:

ADDRESS OF TENDERER: _____

SIGNATURE: _____ FOR AND ON BEHALF OF TENDERER

DATE: _____