

QUARRY PRODUCTS AND RAW MATERIALS - TECHNICAL SPECIFICATION

THE PURPOSE OF THIS SPECIFICATION IS TO SET OUT IN DETAIL THE MINIMUM TECHNICAL REQUIREMENTS FOR THE SUPPLY OF QUARRY PRODUCTS USED IN THE EVOENERGY ELECTRICITY DISTRIBUTION NETWORK

It is not the intention of this specification to specify all the details of each of the material. However the material supplied must meet all the requirements specified in the standards and in this document.

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1. SCOPE

This specification defines Evoenergy's requirement for the supply and delivery of quarry products for use on Evoenergy electrical infrastructure. The range of products are listed in Schedule 1 of the contract.

It is not the intention of this specification to specify all the details of each of the material. However the material supplied must meet all the requirements specified in the standards and in this document.

2. PURPOSE

The purpose of this specification is to set out in detail the minimum technical requirements for the supply of quarry products used in the Evoenergy Electricity Distribution Network.

3. STANDARDS

All materials must be supplied and tested to the standards listed below. All non-compliance with the appropriate Standards must be stated by the supplier.

REGULATIONS	
WHS Act 2011	Work Health and Safety Act 2011
ENA DOC01 – 2008	ENA National Electricity Network Safety Code
Standards	
ASTM D5334-14	Standard Test Method for Determining the Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe Procedure.
AS 1141 (series)	Methods of sampling aggregate (various)
AS 1141.31 – 2015	Methods of sampling aggregates – Method 31: Light Particles
AS 1141.14 – 2007	Methods of sampling aggregates – Method 14: Particle shape, by proportional calliper
AS 1141.22 – 2019	Methods of sampling aggregates – Method 22: Wet/dry strength variation
AS 1141.36 – 2017	Methods of sampling aggregates – Method 36: Sulphur in metallurgical slag, crushed rock or other pavement materials
AS 1289 (series)	Methods of Testing Soils for Engineering Purposes
IEEE 442 – 2017	Guide for Soil Thermal Resistivity Measurements for general information on test equipment for use on TR testing.
AS 2758.1 – 2014	Aggregates and rock for engineering purposes – Concrete Aggregates
AS 4676 – 2000	Structural Design Requirements for Utility Services Poles
AS 4436 – 1996	Guide for the Selection of Insulators in Respect of Polluted Conditions
AS ISO 9001-2016	Quality Management Systems
RMS T114 – 2012	Test Method – Maximum Dry Compressive Strength of Road Construction Materials

4. REQUIREMENTS

4.1 General requirements

The material supplied must meet the intent of the nominated standards and codes.

All product and product part dimensions must be ISO Metric.

All values submitted must be guaranteed values and must be treated as such in the evaluation when assessing whether the delivered equipment meets the specification.

Approval of the material is subject to satisfactory completion of detailed assessment of a provided sample.

Where material is specified in general terms, and specific types are stated to be approved items, equivalents may be offered for approval. However, this must be made clear in the tender documents and sufficient information on the design and engineering performance of the equivalent components must be provided.

4.2 Service conditions

The service conditions in the Australian Capital Territory are generally in accordance with the standard requirements for outdoor use as described in the applicable tables in AS4676-2000 and AS4436-1996 as outlined in the table below.

DESCRIPTION	PARAMETERS
Altitude	<1000m
Maximum ambient temperature	45 deg. C
Minimum ambient temperature	-10 deg. C
Average ambient temperature maximum	40 deg. C
Environment (as per AS 4676-2000, Table D1)	Climatic Zone – Temperate Industrial proximity – exposure zone B1
Pollution level (as per AS 4436-1996, Table I)	Level 2 – Medium
Annual average daily 9am relative humidity	60-85%
Vibration	N/A

4.3 Technical performance requirements - Common

The Supplier must, in relation to the extraction of sand and other materials which are used in the performance of the Agreement, supply copies of relevant approvals required under State or Territory Law in the place where the product is extracted.

4.3.1 Aggregate 10mm, 14mm, 20mm

Aggregate shall be a hard crushed angular product that provides a degree of interlock between adjacent stones. Rounded uncrushed river gravel is unsuitable.

4.3.2 Unwashed bedding sand for electrical infrastructure

Bedding sand shall consist of granular material unwashed and of well-graded material such as quarry fines and must be sand free from organic matter. Bedding sand submitted for use with electrical infrastructure must be tested to ASTM D5334-14.

Note that results from this method are for thermal conductivity, and it will be necessary to take the reciprocal of this value to calculate the thermal resistivity (TR), which is the value generally used in Australia for cable installations. The following references must be used in place of the comparable US standards where referenced in ASTM D5334-08:

- ☞ AS 1289.5.1.1-2017: Method of Testing Soils for Engineering Purposes – Soil compaction and dry density Tests.
- ☞ AS 1289.2.1.1-2005: Method of Testing Soils for Engineering Purposes – Soil moisture content tests
- ☞ AS 1289.1.1-2001: Method of Testing Soils for Engineering Purposes – Sampling and preparation of soils.

Refer to Part 5 of IEEE 442-2017 for general information on test equipment for use on TR testing.

For compacted granular thermal bedding materials (including graded sands) submitted for approval or routine testing the following information must be provided.

- ☞ Thermal resistivity at a specified compaction density*
- ☞ Moisture content – when compacted

- 📄 Proctor density of the compacted sample*
- 📄 Thermal resistivity in the fully dried out state
- 📄 Dry Density

* For material submitted for approval (type testing) the fully dried out TR shall also be determined at 95% and 90% standard Proctor density.

The maximum acceptable thermal resistivity for bedding material used with electrical infrastructure is

0.9°Cm/W for Transmission cables and;

1.2°C.m/W for distribution MV and LV cables

The formula used to calculate TR for a line heat source of infinite length within an infinite medium is:

$$\rho = (4 \times \pi \times (T_2 - T_1)) / (2.303 \times q \times \log(t_2/t_1))$$

Where:

ρ = TR in Km/W (or °Cm/W)

T1 and T2= Temperatures at the beginning and end of the test period respectively

q = Heat dissipated by the line heat source in watts/m

t1 and t2 = Times at the beginning

The supplier must submit two (2) copies of resistivity test reports and certificates to the Evoenergy for approval

4.3.3 Washed sand

Fine aggregate for concrete shall be washed and uncrushed conforming to AS 2758.1-2014. Testing of sand shall be in accordance with AS.1141.31-2015.

4.3.4 Bricklayers sand

The sand shall be free of deleterious quantities of soluble salts and other contaminants which would cause surface staining. Grading of the sand shall comply with the limits prescribed in the following table.

AS Sieve Size (mm)	% Passing by Mass
2.36	100
1.18	95-100
0.75	8-12

4.3.5 Crushed Granite

Decomposed granite gravel paving shall consist of naturally occurring granitic gravel material, free from vegetable matter and other adverse constituents, from all approved source of supply. The colour and quality of the gravel is to be approved by Evoenergy prior to supply. The particle size distribution shall conform to grading below. The plasticity index shall be between 9 & 15 with a maximum liquid limit of 35.

AS Sieve Size (mm)	% Passing by Mass
19.0	100

AS Sieve Size (mm)	% Passing by Mass
13.2	85-100
9.5	70-90
4.75	48-72
2.36	34-60
0.425	14-34
0.075	6-20

4.3.6 Scalping (crushed rock)

scalping's shall be crushed rock sub-base or suitable natural gravels. Stone shall be hard and durable, and the materials shall be free of clay lumps and organic matter. Particle size distribution shall comply with the Table for Grading 'C' materials as specified in AS 1289.3.6.1-2009.

The material shall conform to relevant clauses of AS 1141.31-2015 and AS 1289.3.6.1-2009. If non-plastic, the material shall have a maximum dry compressive strength of not less than 1.0MPa (RMS T114).

4.3.7 Fine Crushed rock (DGB20 road base)

Fine crushed rock shall be manufactured from hard, durable stone free of clay lumps, organic matter, and objectionable quantities of deleterious substances. The material may be crusher run or screened and recombined.

All the following material requirements apply both prior to and after placement in the pavement. Particle size distribution after compaction in the pavement shall comply with the limits prescribed in AS 1289.3.6.1-2009, as below.

AS Sieve Size (mm)	% Passing by Mass
26.5	100
19.0	95-100
13.2	78-92
9.5	63-83
4.75	44-64
2.36	30-48
0.425	14-22
0.075	6-10

- ☞ Liquid limit shall not exceed 23% AS1289.3.1.1-2009.
- ☞ Plasticity index shall not exceed 6% AS 1289.3.3.1-2009.
- ☞ Linear shrinkage shall not exceed 3% AS 1289.3.4.1-2008.

If non-plastic, the material shall have a maximum dry compressive strength on fraction passing 19 mm sieve of not less than 1.7MPa (RMS T114).

The wet strength shall be not less than 100kN AS 1141.22-2019. The proportion of misshapen particles using a 2:1 ratio shall not exceed 35% AS 1141.14-2007. The water-soluble sulphate content, expressed as

percentage S04 by mass of fine crushed rock, shall not exceed 0.1% AS 1289.4.2.1-2020. The total sulphur content, expressed as percentage S by mass of fine crushed rock, shall not exceed 0.05% as per AS 1141.36-2017.

4.3.8 Crusher Dust

Crusher dust shall consist of quarry fines granular material of low plasticity which is free from organic matter with a minimum of 85% passing the 2.36mm sieve and not more than 15% passing the 0.075mm sieve.

4.3.9 Topsoil

Soils shall be free from any seed; especially weed seeds such as couch grass, phalaris, paspalum nut grass and broad-leaved weeds or foreign materials including gravel, rocks, and stones. The total dissolved salt content of the topsoil shall not exceed 100ppm in a 1:5 water extract. The pH level shall be between 6.00 and 7.5 in a 1:5 soil water extract.

The hydraulic conductivity must exceed 5mm/hour when moderately compacted. A moderately compacted soil for turf is 16 drops x 150mm of soil at field capacity. Water holding capacity to be at least 12% at field capacity at 1 metre suction. The particle size distribution of the soil shall be in accordance with the following table:

AS Sieve Size (mm)	% Passing by Mass
2.36 mm	100
1.18 mm	90 - 100
0.600 mm	70 - 100
0.300 mm	30 - 95
0.150 mm	16 - 60
0.075 mm	6 - 45

4.4 Testing

4.4.1 General

The following clauses detail the testing requirements for the quarry products. The tests must confirm the ability of the quarry products to meet the technical requirements of this specification. The supplier shall provide two (2) copies of certified test reports for type, routine, and special tests.

At any time during the supply of materials, Evoenergy may consider it necessary to confirm performance of the product by conducting more tests.

4.4.2 Type tests

The Evoenergy may accept test results of previously conducted type tests, provided the offered product is of substantially the same material type and is in compliance with this specification.

If an offered product does not successfully pass a type test to Evoenergy's satisfaction, or the test results do not meet the technical requirements of this specification, the supplier must ensure that fresh type tests are conducted pursuant to Clause 4.5.1 at the supplier's expense. Evoenergy reserves the right to witness type tests, for which a minimum of two weeks' notice must be given. The supplier must submit two (2) copies of type test reports and certificates to the Network Standards Manager for approval.

4.4.3 Sampling and Test Frequency

The supplier shall provide copies of production testing records to verify compliance of the materials. Production records shall be no older than 1 month.

Materials delivered to Evoenergy shall be sampled for testing at the following rates:

- 📌 1 set of samples taken at random from the first load of quarry product delivered, then
- 📌 1 set of samples taken at random from the subsequent 1000 tonne or part thereof of quarry product delivered; and there after
- 📌 1 set of samples taken at random from every subsequent 2500 tonne or part thereof of quarry product delivered to site.

4.4.4 Testing Authority

Type testing must be undertaken by any of the following:

- 📌 an authority accredited by NATA for the tests involved; or
- 📌 an authority outside Australia accredited, for the tests involved, by an organisation recognised by NATA through a mutual recognition agreement.
- 📌 a test house whose operations are controlled by a Quality Management System which retains current accreditation by an acceptable third party to a standard not less than that of ISO 9001-2016. (Acceptance of this form of testing authority shall be at the complete discretion of the Technical Standards Manager)

4.4.5 Routine tests

The supplier must provide to Evoenergy a copy of the routine test reports with each batch of product delivered.

4.4.6 Technical support

The Supplier must provide to Evoenergy details of technical support available to service the contract. The information and evidence to be provided must include:

- 📌 Number of technical support staff available to provide technical support to Evoenergy;
- 📌 Proposed plans for providing onsite technical support to Evoenergy; and
- 📌 Supplier's KPI's for dealing with requests for technical support, i.e. time limit for confirmation of request for support and resolution of issues.

The supplier must also provide a quality control checklist for the receipt of the product into Evoenergy stores.

4.5 Documents and Drawings

The documents and drawings form part of this specification may be found in Clause 3 (Standards).

5. DEFINITIONS AND ABBREVIATIONS

TERM	DEFINITION
AC	Alternating Current
AS	Australian Standard
AS/NZS	Australian Standard / New Zealand Standard
ASTM	ASTM International Standard (formerly American Society for Testing and Materials)
RMS	NSW Roads and Maritime Services
IEEE	Institute of Electrical and Electronic Engineers
IEC	International Electrotechnical Commission

6. VERSION CONTROL

VERSION	DETAILS	APPROVED
1.0	Initial Document	W. Cleland; 01/10/2014
2.0	Safety in Design Assessment by Northrop Engineers Updated to latest technical standards Reviewed by WC requested updates	Northrop; 30/10/2014
2.1	Safety in Design Assessment by Northrop Engineers Complete requested updates	Northrop; 4/11/2014
3.0	Formatting of the document	J Atanasievska; 14/08/2015
4.0	Document updated for Rebranding to 'Evoenergy'	C. Desai, W. Ibrahim; 15/01/2018
4.1	Minor Update, Reference and template updated	N. Azizi 16/06/2023

7. DOCUMENT CONTROL

DOCUMENT OWNER	DOCUMENT CUSTODIAN	PUBLISH DATE	REVIEW DATE
Group Manager Strategy and Operations	Principal Engineer Standards and Specifications	20/06/2023	20/06/2028