



Engineering

Technical Standard

TS0630 - Coarse Aggregates for Civil Works

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Only the current revision of this Standard should be used which is available for download from the SA Water website.

Significant/Major Changes Incorporated in This Edition

This is the first issue of this Technical Standard with the new numbering system; however, the older version of this Standard was published as TS 40 to identify the requirements for crushed rock aggregates for wellpoints. Compared with TS 40, TS 0630 has the following changes:




- Section 2: In addition to crushed rock aggregates for wellpoints, the following materials are also covered in this Standard: 10 mm and 14 mm single size aggregate, PM1/20, and PM2/20 materials.
- Section 3: Limitations are added, where the wellpoint definition is clarified to distinguish it from other dewatering techniques using deep wells.
- Section 5: The grading and other requirements for the coarse aggregates are added.
- Section 6, 7, and 8 are added to clarify the requirements for product certifications, supplier's quality management systems, and sampling and testing.
- Sections 9 and 10: Acceptance of materials and rejection are clarified further.
- Appendix A is added to summarize the requirements of Hold Points, Witness Points and Records.

Document Controls

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1 Introduction

SA Water is responsible for operation and maintenance of a large portfolio of engineering infrastructure.

This standard has been developed to assist in the design, maintenance, construction, and management of this infrastructure.

1.1 Purpose

The purpose of this standard is to detail minimum requirements for coarse aggregates supplied for use in SA Water projects, to ensure they are fit for purpose and of suitable and consistent quality.

1.2 Glossary

The following glossary items are used in this document:

Term	Description
DIT	Department for Infrastructure and Transport
SA Water	South Australian Water Corporation
TS	SA Water Technical Standard

1.3 References

1.3.1 Australian and International

The following table identifies Australian and International standards and other similar documents referenced in this document:

Number	Title
AS 1141	Methods for sampling and testing aggregates
AS 1141.11.1	Methods for sampling and testing aggregates - Particle size distribution - Sieving method
AS 1141.12	Methods for sampling and testing aggregates - Materials finer than 75 microns in aggregates (by washing)
AS 1141.23	Methods for sampling and testing aggregates - Los Angeles value
AS 1141.3.1	Methods for sampling and testing aggregates - Sampling - Aggregates
AS 1289.3.1.2	Methods of testing soils for engineering purposes - Soil classification tests - Determination of the liquid limit of a soil - One-point Casagrande method
AS 1289.3.3.1	Methods of testing soils for engineering purposes - Soil classification tests - Calculation of the plasticity index of a soil
AS 1289.3.4.1	Methods of testing soils for engineering purposes - Soil classification tests - Determination of the linear shrinkage of a soil
AS 2566.2: 2002 (R2016)	Buried flexible pipelines, Part 2: Installation
RD-PV-S1	DIT's Master Specification for Supply of Pavement Materials
ISO 3310-1	Test Sieves - Technical Requirements and Testing - Part 1: Test Sieves of Metal Wire Cloth
ISO 3310-2	Test sieves - Technical requirements and testing - Part 2: Test sieves of perforated metal plate
AS/NZS ISO 9001: 2016	Quality management systems - Requirements

1.3.2 SA Water Documents

The following table identifies the SA Water standards and other similar documents referenced in this document:

Number	Title
TS 0710	Concrete

1.4 Definitions

The following definitions are applicable to this document:

Term	Description
SA Water's Representative	The SA Water representative with delegated authority under a Contract or engagement, including (as applicable): <ul style="list-style-type: none">• Superintendent's Representative (e.g. AS 4300 & AS 2124 etc.)• SA Water Project Manager• SA Water nominated contact person
Responsible Discipline Lead	The engineering discipline expert responsible for TS0630 defined on page 3 (via SA Water's Representative)

2 Scope

This Technical Standard covers the requirements for the supply and delivery of the following coarse aggregates to be used in SA Water projects:

- 3 mm Crushed Rock Aggregate, to be used in installation of wellpoints.
- 10 mm Single Size Aggregate, to be used in installation of water or sewer pipelines, or other civil works such as porous bedding layers for stormwater pipes or subsoil drainage installations.
- 14 mm Single Size Aggregate, to be used in installation of water or sewer pipelines, or other civil works such as porous bedding layers for stormwater pipes or subsoil drainage installations.
- PM1/20 and PM2/20 pavement materials, also referred to as coarse aggregates within this Standard, to be used in installation of pipelines, restoration of trench fill, pavement construction, or any other civil works.

3 Limitations

The nominated 3 mm crushed rock aggregates as introduced in this Standard are to be used as backfill around the wellpoints only, and not to be used in the dewatering techniques associated with deep wells.

A wellpoint system consists of a series of closely spaced small diameter water abstraction points connected, via a manifold, to the suction side of a suitable pump.

In contrast, a deep well system consists of an array of bored wells pumped by submersible pumps. Design and installation of deep wells will require proper design of filter packs. The filter should be designed by a suitably qualified designer, to satisfy the filtration and the permeability criteria, which are outside the scope of this Standard.

The nominated 3 mm crushed rocks in this Standard shall not be used for any other dewatering purposes other than the backfill around wellpoints.

The use of the coarse aggregates in this Standard is limited to the installation of pipelines, restoration of the trench fill, pavement construction and restoration, and other civil works.

The requirements for coarse aggregates in concrete works are described in TS 0710 and are not covered in the present Standard.

4 Quality of Material

To the satisfaction of SA Water's Representative, the particles shall be clean, sound, hard, durable, and free from adherent coatings, foreign matter, organic impurities, and reactive salts.

The 3 mm crushed rock material shall consist of quartzite, dolomite, or other approved stone.

5 Grading

Sieve sizes referenced throughout Section 5 shall be in accordance with ISO 3310 part 1 and 2, or equivalent.

The adopted Standard of the sieve sizes shall be stated on the test reports.

5.1 3 mm Crushed Rock Aggregate

The grading of the material shall be in accordance with Table 1.

Table 1: Grading of 3 mm Crushed Rock Aggregate

Sieve Size	6.7 mm	4.75 mm	2.36 mm	1.18 mm	600 microns	300 microns	150 microns	75 microns
% Passing	100	80 – 100	13 – 24	2 – 10	0 – 7	0 – 5	0 – 3	0 – 3

5.2 10 mm Single Size Aggregate

The grading of the material shall be in accordance with AS 2566.2, Table G2, also reproduced here in Table 2.

Table 2: Grading of 10 mm Single Size Aggregate

Sieve Size	13.2 mm	9.5 mm	4.75 mm	2.36 mm	75 microns
% Passing	100	85 – 100	0 – 20	0 – 5	0 – 2

Where coarse aggregates contain more than 2% of material passing the 75-micron sieve, particular care should be taken to remix or wash this material to minimize the effect of segregation.

5.3 14 mm Single Size Aggregate

The grading of the material shall be in accordance with AS 2566.2, Table G2, also reproduced here in Table 3.

Table 3: Grading of 14 mm Single Size Aggregate

Sieve Size	19.0 mm	13.2 mm	6.7 mm	2.36 mm	75 microns
% Passing	100	85 – 100	0 – 20	0 – 5	0 – 2

Where coarse aggregates contain more than 2% of material passing the 75-micron sieve, particular care should be taken to remix or wash this material to minimize the effect of segregation.

5.4 PM1/20

The grading of the material shall be in accordance with DIT's Master Specification for Supply of Pavement Materials (RD-PV-S1), also shown in Table 4 below.

Table 4: Grading of PM1/20

Sieve Size	26.5 mm	19 mm	13.2 mm	9.5 mm	4.75 mm	2.36 mm	0.425 mm	75 microns
% Passing	100	95–100	77–93	63–83	44–64	29–49	13–23	5–11

The quarried material shall have a uniform grading and shall not be graded from the coarse limit of the grading envelope to the fine limit of the grading envelope, or vice versa.

The use of recycled aggregates is not permitted unless a dispensation is sought from SA Water Engineering.

The Atterberg limits of the fine fraction (passing 75 micron) of material shall be in accordance with Table 5.

Table 5: Atterberg Limits of PM1/20

Parameter	Standard	Limit
Liquid Limit	AS 1289.3.1.2	Maximum 25%
Plasticity Index	AS 1289.3.3.1	Minimum 1%, Maximum 6%
Linear Shrinkage	AS 1289.3.4.1	Maximum 3%

The LA Abrasion of the materials shall be less than or equal to 30%, when tested according to AS 1141.23 (Grading 'B').

5.5 PM2/20

The grading of the material shall be in accordance with DIT's Master Specification for Supply of Pavement Materials (RD-PV-S1), also shown in Table 6 below.

Table 6: Grading of PM2/20

Sieve Size	26.5 mm	19.0 mm	13.2 mm	9.5 mm	4.75 mm	2.36 mm	0.425 mm	75 microns
% Passing	100	90–100	74–96	61–85	42–66	28–50	11–27	4–14

The quarried material shall have a uniform grading and shall not be graded from the coarse limit of the grading envelope to the fine limit of the grading envelope, or vice versa.

The use of recycled aggregates is not permitted unless a dispensation is sought from SA Water Engineering.

The Atterberg limits of the fine fraction (passing 75 micron) of material shall be in accordance with Table 7.

Table 7: Atterberg Limits of PM2/20

Parameter	Standard	Limit
Liquid Limit	AS 1289.3.1.2	Maximum 28%
Plasticity Index	AS 1289.3.3.1	Minimum 1%, Maximum 8%
Linear Shrinkage	AS 1289.3.4.1	Maximum 4%

The LA Abrasion of the materials shall be less than or equal to 45%, when tested according to AS 1141.23 (Grading 'B').

6 Product Certification

In order for a Supplier to be nominated on an SA Water approved suppliers list, the supplier of any type of coarse aggregate listed herein shall provide a certificate of compliance verifying that the aggregate complies with all the requirements of this Standard with test results reported on NATA accredited test documents.

The certificate for tests shall not be more than six (6) months old.

The Supplier shall forward the Product Certification with the delivery of each order of material stating that the material is in accordance with this Standard.

7 Supplier's Quality Management System

The Supplier must establish and maintain a Quality Management System complying with AS/NZS ISO 9001 or equivalent QMS in place as a means of ensuring that the product conforms to this Standard.

The supplier shall provide evidence verifying compliance with this Clause.

8 Samples and Testing

During the supply of coarse aggregates to any SA Water projects, which shall satisfy the requirements of Section 5, the contractor shall provide the result of material testings in accordance with Table 8 to SA Water's Representative.

All aggregates shall be tested at a frequency which is sufficient to ensure that they comply with the specified requirements. The minimum frequency of testing is shown in Table 8.

Any change in production parameters or change in quarry face shall initiate the commencement of a new test cycle.

All tests shall be performed by a NATA accredited laboratory. All test certificates shall clearly show the following information:

1. Technical Standard TS 0630
2. Type of Material
3. Name of Contractor and/or Supplier
4. Origin of Supply and Supplier Name (if not provided above)
5. Date of sample testing

Table 8: Minimum Frequency of Testing for Aggregate

Type of Test	Test Method	Minimum Frequency of Testing
Particle Size distribution	AS 1141.11.1 (for coarse fraction) AS 1141.12 (for fine fraction with washing)	1. At the start of the project or as part of regular supplier compliance if the Product Certification is current; and 2. 1 per 500 tonnes of aggregate production or part thereof.
Liquid Limit	AS 1289.3.1.2	1. At the start of the project or as part of regular supplier compliance if the Product Certification is current; and 2. 1 per 1000 tonnes of aggregate production or part thereof.
Plasticity Index	AS 1289.3.3.1	
Linear Shrinkage	AS 1289.3.4.1	
Los Angeles Abrasion	AS 1141.23	Minimum of half yearly interval

Sampling must be carried out as described in AS 1141.3.1 with all samples taken from at least 300 mm away from the face of the stockpile. Use the sampling technique detailed in Annexure A5 in AS 1141.3.1.

Sampling may be carried out using AS 1141.3.1 Section 9.3 "Backblading method" but the samples must not be mixed to form an average from the stockpile.

The contractor or their supplier may propose to SA Water's Representative a reduced minimum frequency of testing in accordance with SA Water Engineering dispensation procedures. In such cases, the supplier shall support their dispensation request by a statistical analysis verifying consistent process capability and product characteristics. The request for dispensation shall be submitted to SA Water Engineering.

In the event of a nonconformity, a reduced frequency of testing must revert immediately to the specified minimum frequency of testing.

9 Acceptance of Material

All materials shall be subject to testing and will be accepted only if the requirements of this Standard are met.

10 Rejection

Materials that do not comply with the requirements of this Standard shall be liable to rejection by SA Water's Representative.

All rejected materials shall be removed from the Site by the Supplier or the responsible Contractor and at their expenses.

Appendix A : Schedules of Hold Points, Witness Points & Identified Records

A1 Schedule of Hold Points and Witness Points

Clause	Type	Description
6.0	Hold	Product Certification is required for all coarse aggregates supplied to SA Water projects.
8.0	Hold	During the supply process of the coarse aggregates to any SA Water projects, the contractor shall provide the results of testing of the materials in accordance with Table 8.
8.0	Witness	All tests shall be performed by a NATA accredited laboratory.

A2 Schedule of Identified Records

Clause	Description of Identified Record
6.0	Certificate of conformity
8.0	All test certificates during the supply of the coarse aggregates to the projects. All tests shall be performed by a NATA accredited laboratory.