

TECHNICAL STANDARD**SUPPLY AND DELIVERY OF GRADE 32, 40 OR
50 CONCRETE**

Issued by: Manager Engineering

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APPROVAL TO DEVIATE FROM THIS STANDARD

Approval may be granted by the Asset Owner to deviate from the requirements as stipulated in this Standard if the functional requirements (e.g. Asset Life) for the asset differs from those stated in the Standard, but is assessed as still being acceptable by the Asset Owner's nominated representative.

Any approval to deviate from the stated requirements of this Standard will not be seen as creating a precedent for future like project. Any request to deviate from this Standard must be carried out on a project by project basis where each alternate proposal will be individually assessed on its own merit.

NO CHANGES REQUIRED IN THE JANUARY 2012 EDITION

The following lists the major changes to the July 1995 edition and published in the October 2004 edition of TS 1b:

1. Reformatted from DS to TS (Departmental Standard to Technical Standard), and updated referenced Australian Standards.
2. Conversion to a technical standard by removal of contractual conditions (to be included in the contract that references this standard).

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REFERENCED DOCUMENTS

AS 1012:	Methods of testing concrete
AS 1379:	Specification and supply of concrete
AS 1478:	Chemical admixtures for concrete, mortar and grout
AS 3600:	Concrete structures
AS/NZS 3905:	Quality system guidelines
AS 3972:	Portland and blended cements
AS/NZS ISO 9001:	Quality management systems – Requirements
TS 3b	Fine and course aggregates for concrete for water retaining structures and in aggressive environments (Excluding Lightweight Aggregates)
TS 3c	Fine and coarse calcareous aggregates (Marble) for concrete sewage structures (Excluding Lightweight Aggregates)

SECTION 1: SCOPE

This Technical Standard (TS) is for the supply and delivery of concrete. The grade or grades of concrete shall be as specified in Table 4.1.

The “Supplier” shall be a concrete Supplier that has a certificated Quality Assurance System for the supply of concrete.

The “Concrete Placer” shall be responsible for the placement of concrete and has a certificated Quality Assurance System for the placement of concrete.

The concrete shall be made in accordance with an 'Approved Mix' as specified in Clause 6.2 from materials which are identical, within specified limits, to samples supplied by the Supplier and approved by SA Water’s Representative before the delivery of the concrete.

The mix design, materials and expected variations in grading, quality etc. for all concrete supplied to this standard shall all be specified by the Supplier and approved by SA Water’s Representative prior to the production of any such concrete. No variations outside the accepted limits will be permitted without SA Water’s Representative’s written approval.

The concrete, unless specified otherwise, shall be in accordance with AS 1379 and all other applicable Australian Standards.

SECTION 2: SA WATER’S REPRESENTATIVE

SA Water’s Representative in this Technical Standard will be nominated by SA Water.

SECTION 3: QUALITY CONTROL & QUALITY ASSURANCE

The Supplier shall implement and maintain an approved quality control/quality assurance system covering all testing and manufacturing equipment, materials and workmanship used in the manufacture of the concrete.

Approved quality assurance and control systems shall, as a minimum, comply with the requirements of AS/NZS ISO 9001. Proof of a certified quality assurance system shall be provided to SA Water’s Representative before production of concrete to this standard commences.

Preference will be given to using Suppliers that have an acceptable third party certified quality assurance system. SA Water’s Representative may carry out a quality audit of the Supplier’s quality system if there is no third party certification.

The Supplier shall supply to SA Water’s Representative NATA certified test certificates for the concrete which has been tested in accordance with Production Assessment Clauses of AS 1379.

The Concrete Placer shall be responsible for scheduling quality assurance audits of the concrete supplied during the period of construction as directed and in the presence of SA Water's Representative.

The Concrete Placer shall provide SA Water's Representative at all times with access to the Supplier's quality procedures and records to enable monitoring and quality auditing. Random sampling and/or testing will also be carried out on the job site as specified in Clause 4.5.

Auditing and proof testing by SA Water's Representative shall in no way relieve the Supplier of any of the obligations under this standard.

SECTION 4: GRADES OF CONCRETE

Concrete shall be Special Class and in accordance with AS 1379 except where specified otherwise in this Technical Standard.

The required standard grade or grades of concrete to be supplied are shown in Table 4.1 below.

Table 4.1 Grades of Concrete

Standard Grades	Min Cement Content (kg/m ³)	Max w/c Ratio	Max. size of Aggregate (mm)	Slump and Tolerance (mm)	Characteristic Compressive Strength at 28 days F'c (MPa)
50	380	0.40	20	70 ± 10	50
40	360	0.47	20	70 ± 10	40
32	335	0.53	20	80 ± 15	32

The cement shall be Type GP, GB, HE or SR as shown in the Drawing or as nominated by SA Water's Representative and shall be in accordance with AS 3972.

4.1 Testing

4.1.1 General

Testing of concrete supplied to this standard shall be subject to Project Assessment requirements in accordance with AS 1379 unless specified otherwise.

4.1.2 Slump

Slump testing of concrete shall be in accordance with AS 1012.3. Variations in slump over those values specified will be considered as an immediate indication of departure from the approved mix.

Slump testing is mandatory for concrete in which test cylinders are taken. SA Water's Representative may slump test any other concrete that he/she deems to be outside the specified limits.

Any batch of concrete at delivery that falls outside the specified limits for slump, as shown in Table 4.1, will be liable for rejection. To avoid possible rejection the Supplier is advised to target the lower end of the slump range. Any concrete in which the slump is in less than the lower limit shown in Table 4.1 may be 'rescued' by use of a superplasticiser. Concrete in which the slump is 25 mm and lower shall be rejected.

Concrete in which the slump is greater than the limiting tolerances shown in Table 4.1 shall be rejected.

If SA Water's Representative allows the addition of a superplasticiser at the project site then the Supplier shall add that superplasticiser at a predetermined dosage to achieve the required consistency. The upper slump limit for superplasticised concrete shall be 130 mm.

Water shall not be added to the transit mixer once it has left the plant.

4.1.3 Acceptance Criteria

The strength of concrete shall be deemed to comply with this standard if it is in accordance with AS 1379.

In addition each sample tested shall have a minimum compressive strength as shown on Table 4.1.

SECTION 5: ACCEPTABILITY OF PLANTS

Note: Unless specified otherwise by SA Water's Representative, Section 5 will apply to all cases and is essential for compliance with standard.

5.1 Basis of Acceptance

5.1.1 Prior to Production of Concrete

A plant producing at least one controlled grade shall not be accepted for production of concrete to this standard until the Supplier has provided:

- (1) All the necessary evidence to show the plant can consistently supply concrete that is in accordance with:
 - (a) All the requirements specified in Table 4.1 of this standard
 - (b) The general requirements of AS 1379.
- (2) Certified evidence to indicate that all batching and transporting equipment is in accordance with AS 1379.
- (3) The maximum rate in cubic metres per hour at which the concrete can be delivered.

A plant producing no controlled strength grades in accordance with AS 1379 may be required to undergo a visual inspection by SA Water's Representative to assess its suitability for acceptance. This will be in addition to the requirements of (1), (2) & (3) above.

The Supplier may submit several plants for acceptance.

5.1.2 Continuity of Acceptance

The Supplier may be required to provide SA Water's Representative with production assessment data at the end of each month to show that the plant(s) supplying concrete to this standard continue to meet the requirements specified in Clause 5.1.1.

5.2 Review of Plant Acceptance

If results from the Supplier's testing program indicate that the plant is not in accordance with this standard, the Supplier shall immediately notify SA Water's Representative. The Supplier shall state the problems, the cause of the problems and proposed rectifications to SA Water's Representative (see also AS 3600).

If, at anytime, the concrete delivered from a plant is not in accordance with Clauses 5.1.1 or 4.1 SA Water's Representative may withdraw acceptance of that plant. The Supplier shall then supply concrete from another accepted plant.

A plant withdrawn from certification may be submitted by the Supplier for reacceptance if meets Clauses 5.1.1 or 4.1 to the satisfaction of SA Water's Representative.

SECTION 6: ACCEPTABILITY OF CONCRETE

6.1 Materials

Unless specified otherwise, all materials shall be in accordance with the relevant Australian Standards. The fine and coarse aggregate shall be in accordance with TS 3b or TS 3c as applicable.

SA Water's Representative shall have the right to take any samples of the materials and test them in accordance with the relevant Australian Standard at any time during supply of concrete to this standard.

The Supplier shall state the proposed sources of supply of the materials for each plant, and shall not vary these without the written approval of SA Water's Representative.

Samples of the proposed aggregate shall be supplied as directed by SA Water's Representative in accordance with TS 3b or TS 3c as applicable. The Supplier will not be required to submit 'contract samples' as specified in TS 3b or TS 3c.

6.2 Mix Acceptance

6.2.1 Approved Mix

A concrete mix approved by both SA Water's Representative and the Concrete Placer shall become the **Approved Mix** for the period of construction. It shall not be altered without the written approval of SA Water's Representative. The Supplier shall supply from each mixing plant, for the approval of SA Water's Representative, details of the mix to which the plant production assessment data applies. The Supplier shall show the basis for the design of that mix along with the anticipated total aggregate grading envelope.

6.2.2 Variation of Approved Mix

If the Supplier requires to vary the approved mix they are required to notify SA Water's Representative in writing of the reason for the proposed variation, the proposed mix details together with compressive strength and slump test results conducted on trial mixes showing that the concrete mix proposed shall be in accordance with this standard. The Supplier shall not vary the concrete mix until he/she receives the approval of SA Water's Representative in writing. Any approval variation of the approved mix shall be referenced in numerical order with the date when the approval was given to vary the mix.

Example: Approved Mix – Variation No. 2
Approval 10.6.92

6.3 Admixtures

6.3.1 Water-reducing

The Supplier may use a water-reducing admixture in the concrete. The water-reducing admixture shall be in accordance with AS 1478 and shall be approved by SA Water's Representative. Suitable water-reducing admixtures shall be an essential ingredient of the approved mix design. Suppliers shall submit details of the manufacture and type they intend to use for approval.

6.3.2 Superplasticisers

SA Water's Representative may permit the use of approved high range water-reducing admixtures (superplasticisers) in special circumstances (see Clause 4.1.2) but they shall not constitute an essential ingredient of the approved mix design. Additions shall only be made at the site. Dosage rates shall be predetermined and controlled to avoid overshooting the slump and to eliminate possible segregation.

6.3.3 Other Admixtures

No other admixtures shall be used unless approved or requested in writing by SA Water's Representative.

Addition sequences and dosage rates of all admixtures shall be as per Manufacturer's instructions.

6.4 Slump

The slump and tolerances shall be as specified in Table 4.1.

Day to day consistency of the concrete will be determined on the slump tests carried out at the worksite in accordance with AS 1012.3 (see also Clause 4.1).

6.5 Mixing and Delivery

All mixing water shall be added to the concrete mix only at the plant.

Plant mixed concrete will not be accepted if it is transported to the worksite in non-agitating equipment. The transporting units shall be in accordance with AS 1379. The transporting units and any associated equipment shall be kept clean and in good mechanical repair.

The re-tempering of concrete which has partially hardened, that is the re-mixing of concrete with or without additional cement, aggregate, or water will not be allowed, and any concrete subjected to this treatment will be rejected.

The Supplier shall keep a record of each batch of concrete supplied, providing relevant information of the wet concrete such as total water addition, slump, water/cement ratio etc, and also indicating the adjustments in the batch weights as a consequence of corrections made due to variations in moisture conditions and absorptive characteristics of the aggregates. Appendix A is an attached blank pro-forma sheet exemplifying what is required to be kept as a record.

6.6 Testing by SA Water's Representative

All aggregate and concrete testing by SA Water's Representative (see also Clauses 4.1 and 6.1) will be carried out at a NATA registered laboratory.

SECTION 7: REJECTION

Concrete that is not in accordance with this standard will be rejected by SA Water's Representative. In particular, SA Water's Representative will reject a load of concrete if:

- (1) Not mixed at an 'Accepted Plant' as defined in Section 5,
- (2) Significant variations to the current nominated mix are found by SA Water's Representative, or the slump measured at delivery as specified in Clause 4.1 are outside the specified limits in Table 4.1.
- (3) One and a half hours have elapsed since water was first added to the dry ingredients,
- (4) Delivered to worksite in non-agitating transport equipment or by a method not in accordance with AS 1379,
- (5) The temperature of the concrete exceeds 32°C,

(6) Statement of Compliance and Cartnote is not provided at time of delivery.

If 28 day characteristic compressive strength tests done by SA Water's Representative indicate that hardened concrete (ie: that has been laid) is not in accordance with the standard, SA Water's Representative will examine all concrete structures affected in accordance with methods specified in AS 1379. If SA Water's Representative deems that the structure is inadequate the cost of any demolition and replacement, or any remedial work shall be borne by the Supplier.

The certification of plant and/or transporting units may be withdrawn by SA Water's Representative for non-compliance with this standard.

SECTION 8: STATEMENT OF COMPLIANCE

The Supplier shall provide to SA Water's Representative at time of delivery a statement of compliance with each load of concrete delivered which shall state that the batch delivered is in compliance with the approved design mix,

SECTION 9: CARTNOTES

The Supplier shall provide a Cartnote with each load of concrete delivered, on which the following information shall be recorded:

- (1) Cartnote identification number
- (2) Date of delivery
- (3) Grade of concrete and nominal slump
- (4) Cement type and cement content (kg/m³)
- (5) Water cement ratio
(free water after allowing absorption of aggregates)
- (6) Plant at which concrete mix was batched
- (7) Quantity of concrete in delivery vehicle
- (8) Time water was added to the aggregate and cement
- (9) Time vehicle left batching plant
- (10) Time vehicle started unloading concrete at worksite
(by SA Water's Representative or his nominated Inspecting Officer)
- (11) Time discharge of load was completed
(by SA Water's Representative or his nominated Inspecting Officer)
- (12) Place concrete was delivered.

Note (8) and (9) are required separately if the time difference is appreciable.

SA Water's Representative or his nominated Inspecting Officer will sign for the concrete delivered and keep one copy of the Cartnote.

APPENDIX A: PROFORMA SHEET CONCRETE PRODUCTION

PROFORMA SHEET CONCRETE PRODUCTION

PROJECT..... DATE: / /20

AGGREGATE CONDITION

AGGREGATE	MOISTURE CONTENT %	ABSORPTION %	CORRECTED DIFFERENCE
20 mm			
10 mm			
Sand			

BATCH WEIGHTS

SSD WEIGHTS	1 m ³	5 m ³	ACTUAL WEIGHTS	CUMULATIVE WEIGHTS	CORRECTED MIX WATER
Cement					
20 mm					
10 mm					
Sand					
Water					
Admixture					

CONCRETE POUR

Truck No.									
Sample No.	1	2	3	4	5	6	7	8	9
Time Batched									
Left Plant									
Time Arrived									
Progressive Total									
Slump (mm)									
Slump After S/P									
Total Water Added									
Effective Water									
W/C Ratio									
Superplasticiser Dosage									

.....
Supplier's Signature Date