



Hunter Water Corporation A.B.N. 46 228 513 446

Standard Technical Specification for:

**STS 104**  
**CONCRETE SUPPLY AND CONSTRUCTION**  
**(GENERAL)**

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# Standard – STS 104 – Concrete Supply and Construction (General)

## 1 Purpose

This standard technical specification (STS 104) details the requirements for the supply and construction of Hunter Water concrete operations and minor works.

This specification applies to all normal pre-mixed concretes for the construction of minor civil engineering works.

The specification includes normal class concrete types.

The contractor shall consider the environment in which the new concrete asset is to be located when selecting the type of concrete and constructability (For example; extreme H<sub>2</sub>S or acidic or other).

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## 2 Interpretation

For the purposes of interpretation of STS 104, except where the context is provided otherwise:

- 'drawings' means the drawings detailing the work involved in a particular project in hand
- 'include' means including but not limited to, and is used to provide clarification or examples of the type and nature of items intended
- 'specification' means a specification detailing the work involved in a particular project
- 'standards' means applicable industry standards including the Australian Standards (AS), Australian/New Zealand Standards (AS/NZS), American National Standards Institute (ANSI) and ISO Standards (ISO) referenced in Appendix A
- 'standard drawings' means Hunter Water Corporation Limited drawings
- 'standard technical specification' (STS) references any of Hunter Water's Standard Technical Specifications, as implied by the text.

Headings are for the convenience of the reader and shall not be used in the interpretation of this STS.

Unless the context is provided, any expression such as 'give notice', 'submit', 'approval', or 'directed' means give notice to, submit to, approval by, or directed by the person nominated by Hunter Water to act on its behalf.

Approval does not imply acceptance of responsibility by Hunter Water for compliance with this technical specification. Unless approval has been issued in writing, approval has not been granted.

Failure to comply with the requirements of this STS or any referred documentation may result in rejection. Where equipment and/or manufacture is rejected, notice will be given by Hunter Water in writing. All associated rectification work shall be completed by the contractor at their cost.

### 2.1 Order of precedence

Specific requirements, including those in project specifications or standard drawings, take precedence over requirements in this STS. Any deviation from this STS shall be approved in writing on a case by case basis by Hunter Water.

### **3 Roles and responsibilities**

#### **3.1 Document Owner**

The Document Owner of this Hunter Water Standard Technical Specification is the Hunter Water Manager Asset Management.

#### **3.2 Responsibilities**

Any request for a variation to STS 104 shall be in accordance with the change management process in the Hunter Water Asset Standards Management Plan.

The Document Owner shall approve any updated revisions of STS 104.

## 4 Definitions

Where the following term, abbreviation or expression occurs in this STS, it is defined as follows, unless the context implies otherwise.

Term/Abbreviation/Expression	Definition
AS	Australian Standard
AS/ANZ	Australian and New Zealand Standards
STS	Standard Technical Specification
Hunter Water Corporation	Hunter Water

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## 5 General requirements

### 5.1 Compliance and regulatory requirements

In addition to STS 104, all work shall comply with the details defined in other Hunter Water standard technical specifications.

#### 5.1.1 Legislative requirements

The relevant Commonwealth and New South Wales (NSW) legislation shall apply to all materials and equipment supplied to and constructed for Hunter Water.

The Designer, Manufacturer, Supplier, and Installer shall comply with the requirements of:

- the Work Health and Safety (WHS) Act, NSW, 2011 (WHS Act)
- the Work Health and Safety Regulation, NSW, 2011 (WHS Regulation) and
- NSW WorkCover Codes of Practice.

### 5.2 Standards

Any standards relevant to concrete supplied, constructed or installed for Hunter Water shall apply, including specific standards referenced in STS 104.

A list of relevant standards is provided in Appendix A.

### 5.3 Material and equipment

Use only equipment and materials:

- as specified within STS 104.

All materials and equipment used shall be from items stocked within Australia and shall be from local suppliers within the Newcastle region who provide support services for their products.

Where items are described by reference to a trade brand name or catalogue number, such a description is intended to indicate the type, quality, appearance and method of construction required. An item of a similar or equal standard may be incorporated in the works, subject to written approval from Hunter Water.



## **6 Quality assurance**

Concrete shall be manufactured and supplied under coverage of a certified ISO 9001:2008 management system. The scope of the certification shall include 'Manufacture and supply of pre-mixed concrete to AS 1379' or similar.

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## **7 Materials**

### **7.1 Concrete**

#### **7.1.1 Requirements**

This product specification covers normal class pre-mixed concrete which is used in applications such as anchor blocks, concrete encasement and operational concrete remediation works.

Normal class concrete shall comply with AS 1379 and Hunter Water's Version WSA PS 357.

#### **7.1.2 Strength**

The strength class shall be as specified in the project specification or on the design drawings.

If strength class is not nominated in the project specification or on the design drawings, normal class N20 concrete is to be used, see Table 1.

#### **7.1.3 Slump**

Slump shall be as specified in the project specification or on the design drawings. Slump shall be appropriate to the project and method of concrete placement.

If slump is not nominated in the project specification or on the design drawings, the supplier's and/or other specialist advice shall be obtained.

Nominated slump shall be not less than 80 mm.

### **7.2 Cement**

This product specification covers use of one of the following cements:

- fly ash blended cement conforming to the requirements of Type SR to AS 3972 and contain 20% fly ash to AS 3582.1, 'fine grade' only, or
- blended cement, other than fly ash, conforming to the requirement of Type SR to AS 3972.

### **7.3 Aggregates**

Aggregates used in the manufacture of concrete shall be of clean, hard, chemically inert and durable particles that comply with AS 2758.1 for an exposure classification 'C' and comprise either normal weight or heavy weight aggregates.

### **7.4 Water**

Water used in the manufacture of concrete shall be of good quality complying with AS 1379.

### **7.5 Chemical admixtures**

Admixtures shall comply with AS 1478.1 and AS 1478.2.

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## 7.6 Concrete delivery identification

Provide a completed identification certificate with each load of concrete delivered to site.

For normal class concrete, as a minimum, include the following details on each concrete identification certificate:

- date
- unique batch identification number
- size of the load in cubic metres
- source of concrete
- type of concrete
- total cement content of the load (kg)
- amount of free water batched (L) at the plant
- slump at time of batching (mm)
- type of cement used
- time of batching
- expiry time of batch
- the maximum amount of water that may be added at the site to meet performance requirements along with the actual measured amount added at the site.

A completed concrete delivery identification certificate must be submitted before concrete placement may commence.

## 7.7 Placement of log book

Keep on site and make available for inspection a log book recording each placement of concrete including:

- the structure and the particular portion of work
- details of samples taken for testing
- volume placed
- unique batch identification number to allow cross-reference with the concrete delivery identification certificate
- start and end time of the pouring of concrete
- start and end time of concrete finishing work.

## 7.8 Performance schedule

**Table 1 Performance schedule – concrete (General)**

Limitation/requirement		Grade
		N20
Materials and mix	Cement type	SR
	Minimum cementitious material (kg/m <sup>3</sup> )	-
	Maximum cementitious material (kg/m <sup>3</sup> )	-
	W/C ratio maximum	-
	Admixture types	-
	Lab trial mix required?	No
Strength grade	Compressive f'c 28 days (MPa)	20
Other requirements	Nominal slump (mm)	80
	Drying shrinkage at 3 weeks (strain x 10 <sup>-6</sup> )	-
	Air content (%)	-
	Curing compound permitted?	Yes
	Pumped concrete accepted?	Yes

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## **8 Construction**

### **8.1 Formwork**

Refer to AS 3610.

### **8.2 Reinforcement**

Deliver reinforcing mesh to site as flat sheets. Rolls will not be accepted.

Reinforcement shall comply with Hunter Water's Version WSA PS 367.

#### **8.2.1 Cover**

Unless otherwise shown on the design drawings, reinforcement shall have at least 50 mm clear cover everywhere except to internal faces of all water retaining structures or any other structures in contact with sewage where minimum clear cover shall be 65 mm

Do not place cast pipes or conduits within the concrete cover to reinforcement.

#### **8.2.2 Storage on site**

Reinforcement when delivered on to the work site shall be suitably stored to avoid damage and contamination. Do not allow the reinforcement to come into contact with the ground.

#### **8.2.3 Cleaning**

At the time concrete is placed, reinforcement shall be free from mud, oil, grease, other non-metallic coatings and loose rust which would reduce the bond between the concrete and the reinforcement.

Rust shall not be deemed to be loose if, on rubbing with the thumb, it leaves only a stain.

### **8.3 Workmanship**

#### **8.3.1 Placing and compaction**

Place and compact concrete in accordance with AS 3600, Section 17.1.3.

In vertical elements, limit the free fall of concrete to 1500 mm per 100 mm element thickness, up to a maximum free fall of 2000 mm.

Place concrete in maximum 500 mm layers such that each succeeding layer is blended into the preceding one by the compaction process.

Minimise shrinkage effect by pouring the sections of the work between construction joints in a sequence such that there will be suitable time delays between adjacent pours. Provide location of construction joints, pour sequence and time delays if not shown on the drawings or specified.

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Place concrete within:

- 90 minutes of batching for ambient temperatures of < 27 °C
- 60 minutes of batching for ambient temperatures of 27 - 30 °C
- 45 minutes of batching for ambient temperatures of 31 - 35 °C
- Do not place concrete if the ambient temperature is > 35 °C

### **8.3.2 Preparation for placing**

Ensure adjoining surfaces and/or embedded items against which concrete is to be placed are clean, moist (if absorbent), free from laitance and other coatings and free of weak or loose material. In hot weather, cool non-absorptive surfaces by watering (remove the excess).

At the time of placing, temperature of fresh concrete shall be within the 5 °C and 35 °C range.

Do not place concrete when ambient temperature is at or above 35 °C, or is forecast to be at or above 35 °C at the work site within the next 5 days.

Note: Placement of concrete in up to 40 °C ambient temperatures is only permitted on a case by case basis.

Do not place concrete if relative humidity is below 20%.

Do not place concrete if wind speeds over the previous hour have averaged higher than 30 km/h.

Do not place concrete when ambient temperature is lower than 3 °C.

## **8.4 Surface considerations**

### **8.4.1 Level surfaces**

Provide the following cross-fall to weather exposed surfaces:

- narrow surfaces: (up to 1 m) 3 mm per 100 mm width
- broad surfaces: (over 1 m) 2 mm per 100 mm width.

When providing cross-fall consider the most appropriate side to direct runoff.

### **8.4.2 Surface finishes**

#### **8.4.2.1 Schedule of surface finishes**

The surface finishes required at particular locations are detailed in the below table.

**Table 2: Schedule of surface finishes**

Location	Surface Finish (all classes and grades)	
	Formed	Unformed
Surfaces exposed to sewage, effluent or sewage gases	F3	U3
Surfaces of water retaining structures exposed to water	F3	U3
Internal surfaces and all exposed surfaces, except trafficable surfaces	F2	U2
Trafficable surfaces – internal	F2	U5
Trafficable surfaces – external	F2	U4
Concealed surfaces	F1	U1

### 8.4.2.2 Surface finish requirements

**Table 3: Surface finishes (requirements)**

Class	Acceptance Criteria
F1	Abrupt and gradual irregularities less than 25 mm AS 3610 – Class 3 finish. Blowholes to Appendix B, Figures B3 (a) and (b) Blowhole depth less than 10 mm
F2	Abrupt irregularities less than 6 mm Gradual irregularities less than 12 mm AS 3610 – Class 2 finish. Blowholes to Appendix B, Figures B2 (a) and (b) Blowhole depth less than 10 mm
F3	Abrupt irregularities not accepted Gradual irregularities less than 6 mm AS 3610 – Class 1 finish. Blowholes to Appendix B, Figures B1 (a) and (b) Blowhole depth less than 6 mm

Offsets resulting from displaced or misplaced form sections, from loose knots or otherwise defective forms, are to be classed as abrupt irregularities and assessed by direct measurement.

Gradual irregularities are to be measured from a straight template 1500 mm long.

Bagged surface finishes are prohibited.

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### 8.4.2.3 Unformed surfaces finish

**Table 4: Unformed surfaces finish**

Class	Finish	Acceptance Criteria
U1	Screeded finish	Abrupt and gradual irregularities less than 10 mm
U2	Wood float finish	Abrupt and gradual irregularities less than 5 mm
U3	Steel trowelled finish	Abrupt irregularities not accepted Gradual irregularities less than 5 mm
U4	Broom finish Wood float finish Class U2 to be lightly broomed at right angles to the alignment of the pavement	Abrupt and gradual irregularities less than 5 mm
U5	Sponge float – trafficable Steel trowelled finish Class U3 to be sponge floated	Abrupt irregularities less than 2 mm Gradual irregularities less than 5 mm

Vertical offsets are to be classed as abrupt irregularities and assessed by direct measurement.

Gradual irregularities are to be measured from a 3 m long straight template.

## 8.5 Curing

All concrete shall be cured continuously during the specified curing period either by water curing or by membrane curing.

Concrete components shall be cured continuously for a period of time that ensures that the design requirements for strength, serviceability and stripping are satisfied. To satisfy durability requirements, the initial curing periods shall be those provided in AS 3600 Sections 4.4 to 4.6 based on the specified concrete strength.

Protect the concrete surface from damage during the specified curing period.

## 8.6 Mass concrete stairs

Requirements for stairs are:

- material – Class N20 MPa mass concrete
- finish – Class U4 (broom finish): wood float finish Class U2 to be lightly broomed at right angles to the direction of movement of pedestrians.

## 8.7 Rectification and repairs

### 8.7.1 Concrete repairs

Do not undertake concrete repairs until all formwork has been removed and curing is complete.

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### **8.7.2 Patching concrete surfaces**

In areas where the existing concrete surface has been broken back or attacked, resulting in an uneven and irregular surface profile or exposure of reinforcement, the surface shall be cut back and filled with a polymer modified repair mortar to provide a smooth concrete surface.

The extremities of the repair locations shall be saw cut or cut back to a depth of at least 10 mm to prevent feather edging. The concrete repair area shall be broken back to a minimum depth of 10 mm. Where breaking out is not required the surface shall be roughened and any laitance removed by scabbling or abrasive blasting. The surface shall then be cleaned to ensure it is free from contamination such as oil, dust, loose particles and organic growth prior to placement of the repair mortar.

The concrete surface to be filled/repared shall have Renderoc HB25/HB40 as appropriate or equivalent proprietary mortar applied to it. The mortar shall be applied strictly in accordance with the manufacturer's recommendations and trowelled to a smooth finish with the existing undamaged concrete surface.

### **8.7.3 Defective concrete**

Concrete which is not placed and completed in accordance with this specification or which, in the opinion of Hunter Water, is defective shall be removed and replaced by concrete placed and completed in accordance with this specification.

## 9 Related documents

In addition to STS 104, all work shall comply with relevant current standards and regulations inclusive of all amendments.

Appendix A lists referenced standards in this specification and other standards relevant to the scope.

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**10 Document control**

**Document Controller:** Manager Asset Management

Version	Date	Author's name	Details of change	Approval date	Approved by	Next scheduled review
3.0	05 Jan 17	S Groves	Complete update	31 July 2017	S Horvath	July 2019

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## Appendix A: Standards

Works shall comply with the requirements of the following current standards to the extent that they are relevant and not overridden by this specification.

**Table 5: Standards applicable to STS 104**

Reference Number	Title
AS 1379	Specification and supply of concrete
AS 1478.1	Chemical admixtures for concrete, mortar and grout – Admixtures for concrete
AS 1478.2	Chemical admixtures for concrete, mortar and grout – Methods of sampling and testing admixtures for concrete, mortar and grout
AS 2758.1	Aggregates and rock for engineering purposes – Concrete aggregates
AS 3582.1	Supplementary cementitious materials – Fly ash
AS 3600	Concrete structures
AS 3610	Formwork for concrete
AS 3972	Portland and blended cements
WSA PS – 357	Concrete, Pre-mixed, Normal class
WSA PS – 367	Steel Reinforcing Materials for Concrete

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