Master Specification
Part ST-SC-S3

Precast Concrete Units

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Government of South Australia
Department for Infrastructure and Transport

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Contents

ST-SC-S3 Precast Concrete Units

1 General

a) This Master Specification Part specifies the requirements for the manufacture of precast concrete units, including:

i) the documentation requirements, as set out in section 2;

ii) the manufacturing requirements, as set out in section 3;

iii) the curing requirements, as set out in section 4;

iv) the marking requirements, as set out in section 5;

v) the lifting, handling, and storage requirements, as set out in section 6;

vi) the transportation requirements, as set out in section 7;

vii) the precast prestressed concrete unit requirements, as set out in section 8; and

viii) the Hold Points and Witness Point requirements, as set out in section 9.

b) Precast concrete units must be manufactured in accordance with the requirements of:

i) ST-SC-C6 “Formwork”;

i) ST-SC-C7 “Placement of Concrete”

ii) ST-SC-S4 “Low Pressure Steam Curing of Precast Units”;

iii) ST-SC-S5 “Heat Accelerated Curing”;

iv) ST-SC-S6 “Steel Reinforcement”; and

v) ST-SC-S7 “Supply of Concrete”,

except where amended or added to in this Master Specification Part.

c) In addition to the requirements of this Master Specification Part, prestressed precast concrete units must comply with ST-SC-C1 “Pre-Tensioned Concrete” and ST-SC-C2 “Post Tensioned Concrete” as applicable.

d) The manufacture of precast concrete units must comply with the Reference Documents, including:

i) AS 3600 Concrete structures; and

ii) AS 5100 Bridge design.

2 Documentation

2.1 Construction Documentation

In addition to the requirements of PC-CN3 “Construction Management”, the Construction Documentation must include the following documents, procedures, and instructions relating to the manufacture of precast concrete units:

a) lifting methods;

b) minimum concrete strength requirements prior to lifting (where not shown on the Design Drawings);

c) where it is proposed to stack units, evidence to demonstrate the strength and stability of the stack and the units within the stack; and

d) details of the measures to be taken to minimise handling stresses in accordance with section 6b).

2.2 Quality Management Records

In addition to the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable), the Quality Management Records must include a closed production Work Lot demonstrating the precast concrete unit is compliant with the Contract Documents, in accordance with the requirements of section 7c).

3 Manufacture

a) Formwork must be of rigid construction and concrete vibration must be such that intense concrete compaction will be achieved. This may require the use of form vibrators or vibrating tables on some large or complex shaped units.

b) Formwork and embedded items must not restrain movements nor damage precast units within the formwork due to the effects of shrinkage or steam curing. Water based mould release agents must be used.

c) The casting of the precast units must be carried out on specially prepared casting beds which will prevent any distortion or misalignment of the forms during and after concreting. Each precast unit must be cast in one continuous operation with no construction joints other than where specified on the Design Drawings.

d) In addition to the sampling requirements for production assessments, the minimum sampling rate for 28-day compressive strength (or 56-day compressive strength where appropriate) must be one concrete cylinder per precast unit manufactured. If the volume of concrete exceeds 2 m^3 per precast unit, then one additional cylinder is required for each additional 2 m^3 (or part thereof). These cylinders must be tested at 28 days (or at 56 days if appropriate) for verification of concrete strength. If lifting or handling will occur earlier than at 28 days (or at 56 days if appropriate), then additional cylinders must be cast.

e) Test specimens, for the purpose of determination of adequate unit strength for lifting and handling, must be subjected to the same curing regime as the unit they represent. The Contractor must ensure that sufficient additional cylinders are provided to enable the required testing to be undertaken.

4 Curing

Precast concrete units must be either:

a) water cured in accordance with ST-SC-C7 “Placement of Concrete”;

b) steam cured in accordance with ST-SC-S4 “Low Pressure Steam Curing of Precast Units”; or

c) hot water cured in accordance with ST-SC-S5 “Heat Accelerated Curing”.

5 Marking

a) For the purposes of precast concrete unit curing, testing, location and orientation within the final structure, each batch of units, or if continuous production methods are used, each day’s production, must be clearly identified and indelibly marked to show:

   i) unit identification; and

   ii) date of manufacture.

b) Each precast concrete unit must be marked on a surface which is unseen in the final structure.

6 Lifting, handling and storage

a) Precast concrete units must not be lifted or handled until the concrete has cured sufficiently and attained the minimum concrete compressive strength for lifting as specified on the Design Drawings.

b) The Contractor must detail in the Construction Documentation the measures to be taken to minimise handling stresses for precast concrete units, in particular those due to demoulding.

c) The Contractor must carefully handle precast concrete units using methods that will not damage them or their connections. Units must be handled from the approved lifting points shown on the Design Drawings. Beams and slabs must be lifted and supported with the top surfaces uppermost at all times, unless shown otherwise on the Design Drawings.

d) Precast concrete units must be stored clear of the ground and supported on non-staining timber bearers only at specified lifting points. The thickness and width of the bearers must be compatible with the strength group of the timber used, the type of precast concrete unit and the Site. The bearers must support the units over their full width at the specified lifting points. The units must be supported on the bearers only and be clear of the ground at all times. The bearers must rest on a firm foundation and adequate precautions must be taken to prevent subsidence.

e) Travelling with the load suspended must be performed on and over even ground. If travelling with the load suspended over rough or uneven ground, then the concrete must attain the minimum concrete compressive strength for transport as shown on the Design Drawings.

7 Transportation

a) Precast concrete units must not be transported until the concrete has cured sufficiently and attained the minimum concrete compressive strength for transport as shown on the Design Drawings.

b) Precast concrete units must be inspected by the Principal, which will constitute a **Hold Point**. The relevant precast concrete unit must not be installed until this Hold Point has been released.

c) The Contractor must make available, as part of the Quality Management Records, a closed production Work Lot demonstrating the precast concrete unit is compliant with the Contract Documents, which will constitute a **Witness Point**. The Contractor must not transport the relevant unit from the yard until the Contractor has proceeded beyond the Witness Point.

d) Prior to incorporating the relevant unit into the Works, the Contractor must inspect the unit to confirm compliance with the Contract Documents.

e) Precast concrete units must be securely fixed to the transporter by ties fitted with suitable tensioners. Provision must be made to protect the units from damage caused by these ties.

f) Precast concrete units must not be installed or incorporated into the Works until the required characteristic (28-day or 56-day if appropriate) concrete compressive strength has been attained.

8 Specific requirements for precast prestressed concrete units

a) The Contractor must ensure that:

   i) the concrete in the units is uniform in composition, consistency, compaction and strength;

   ii) the hog of precast prestressed concrete units must be as uniform as practicable;

   iii) the curing conditions are as uniform as practicable;

   iv) the concrete in each unit is approximately the same age when prestressed; and

v) the units are cast within as short a period of time as is reasonably practicable.

b) Precast prestressed concrete units must comply with the tolerances in Table ST-SC-S3 8-1.

c) The requirements of ST-SC-C1 “Pre-Tensioned Concrete” apply to the cutting tendons for precast prestressed concrete.

Table ST-SC-S3 8-1 Tolerances

Property	Maximum permissible value
Twist	0.5° per length of unit
Variation in hog between any 2 units	20 mm
Deviation from the specified profile in the horizontal plane	±7 mm or ±0.06% of the length of the unit, whichever is greater

9 Hold Points and Witness Points

a) Table ST-SC-S3 9-1 details the review period or notification period, and type (documentation or construction quality) for each Witness Point referred to in this Master Specification Part.

b) Table ST-SC-S3 9-2 details the review period or notification period, and type (documentation or construction quality) for each Witness Point referred to in this Master Specification Part.

Table ST-SC-S3 9-1 Hold Points

Section reference	Hold Point	Documentation or construction quality	Review period or notification period
7b)	Inspection of precast concrete units	Construction Quality	48 hours notification

Table ST-SC-S3 9-2 Witness Points

Section reference	Witness Point	Documentation or construction quality	Review period or notification period
7c)	Evidence of Work Lot compliance prior to transportation	Documentation	24 hours review