TS 01738:1.0

Specification

Precast Concrete Members

(ATS 5325-23, Ed 1.0 MOD)

Issue date: 12 December 2024

Effective date: 30 April 2025

© State of NSW through Transport for NSW 2024

Disclaimer

This document has been prepared by Transport for NSW (TfNSW) specifically for its own use and is also available for use by NSW public transport agencies for transport assets.

Any third parties considering use of this document should obtain their own independent professional advice about the appropriateness of using this document and the accuracy of its contents. TfNSW disclaims all responsibility and liability arising whether directly or indirectly out of or in connection with the contents or use of this document.

TfNSW makes no warranty or representation in relation to the accuracy, currency or adequacy of this document or that the document is fit for purpose.

The inclusion of any third party material in this document, does not represent an endorsement by TfNSW of any third party product or service.

For queries regarding this document, please email Transport for NSW Asset Management Branch at standards@transport.nsw.gov.au or visit www.transport.nsw.gov.au

© State of NSW through Transport for NSW 2024

Document information

Owner: Director Civil Engineering Infrastructure
Asset Management
Planning, Integration and Passenger

Mode: Roads

Discipline: Civil

Document history

Revision	Effective date	Summary of changes
1.0	30/04/2025	First issue as TS 01738. Modified adoption of ATS 5325-23.

© State of NSW through Transport for NSW 2024

Preface

This specification is the first issue as TS 01738.

This document:

- supersedes TS 01738.1 *Precast Concrete Members (Not Pretensioned) – QA* and TS 01738.2 *Precast Concrete Members (Not Pretensioned) – DC*
- adopts and modifies Austroads Technical Specification ATS 5325, Ed 1.0 as a TfNSW Specification.

This document sets out the requirements for the manufacture of precast reinforced concrete members ('Precast Members'), including Precast Members which are pretensioned and / or subsequently post-tensioned.

To enable industry preparation for the implementation of the requirements of this standard, there is a transitional period in place for the effective date of this document. This document will come into effect on 30 April 2025.

For the purposes of this document, where TfNSW has identically adopted, or adopted and modified, an ATS document as a Transport Standard, the corresponding Transport Standard should be applied.

© State of NSW through Transport for NSW 2024

Table of contents

© State of NSW through Transport for NSW 2024

1. Scope

1.1 This Specification sets out the requirements for the manufacture of precast reinforced concrete members ('Precast Members'), including Precast Members which are pretensioned and / or subsequently post-tensioned. It excludes:

a. reinforced concrete pipes (refer TS 00129); and

b. box culverts (refer TS 00138 and TS 03256.1).

1.2 The Contractor must ensure that the Manufacturer of the Precast Members complies with this Specification. The Contractor may be the same entity as the Manufacturer.

2. Referenced Documents

2.1 The following documents are referenced in this Specification:

Australian / New Zealand Standards

AS 3610	Formwork for concrete
AS 3610.1	Formwork for concrete Part 1: Documentation and surface finish
AS 3850.3	Prefabricated concrete elements, Part 3: Civil construction
AS 5100.1	Bridge design Part 1: Scope and general principles
AS 5100.2	Bridge design Part 2: Design loads
AS 5100.5	Bridge Design Part 5: Concrete

Austroads

ATS 5306	Supply and Installation of Void Formers
ATS 5321	Maturity Method
ATS 5326	Supply of Pretensioned Concrete members
ATS 5850	Handling, Storage, Transportation and Erection of Structural Members

Transport for NSW standards

TS 00077	Supply and Placement of Steel for the Reinforcement of Concrete – (ATS 5310-20, IDT)
TS 00079	Cementitious Patch Repair of Concrete – (ATS 5340-20, IDT)
TS 00029	Supply of Steel Reinforced Precast Concrete Pipes – (ATS 2210-20, IDT)
TS 00138	Supply of Small Box Culverts – (ATS 2230-20, IDT)
TS 00146	Supply of Special Class Concrete – (ATS 5315, Ed 1.0 MOD)
TS 00149	Placement of Concrete – (ATS 5320-23, Ed 1.0 MOD)
TS 03256.1 (IC-QA-R16)	Precast Reinforced Concrete Box Culverts - QA

© State of NSW through Transport for NSW 2024

3. Definitions

3.1 In addition to the definitions in AS 3850.3, AS 5100.1 and AS 5100.5, the following definitions apply to this Specification.

Manufacturer: The entity responsible for the manufacture of the Precast Member in accordance with this Specification.

Principal's Registration Scheme: Any scheme for the prequalification, registration or approval of products, manufacturers, suppliers and/or Professional Engineers in operation in the jurisdiction where the concrete is to be placed.

Professional Engineer: A person who:

a) has at least 5 years of relevant experience in the design or manufacture (as appropriate) of Precast Members;

b) is registered on any scheme of registration of engineers prescribed by legislation in the applicable jurisdiction;

c) is appropriately registered or prequalified if the Principal has implemented an applicable registration or prequalification scheme; and

d) satisfies at least one of the following requirements:

i) is a Chartered Professional Engineer; or

ii) holds a 4-year civil engineering degree from a university that is accredited under the Washington Accord and is registered in a relevant area of practice on the National Engineering Register (in Australia) or the Register of Chartered Professional Engineers (in New Zealand)

4. Quality System Requirements

4.1 The Contractor must prepare and implement a Quality Plan that includes the documentation in Table 4.1 (in addition to the requirements in TS 00146 and TS 00149).

Table 4.1: Quality Plan

Clause	Description of document
5.3	Name, qualifications and experience of the Professional Engineer
6	Name of the manufacturer and place of manufacture
6.1	Unless a Principal's Registration Scheme applies, procedures and ITP for the manufacture of the Precast Member;
6.14 b	Where an architectural finish is specified, details and procedure for producing an architectural finish, including details of any colouring additives

HOLD POINT 1	
Process Held	Commencement of the manufacture of Precast Units.
Submission Details	The Quality Plan must be submitted to the Principal at least 10 working days prior to the commencement of the manufacture of the Precast Unit.

© State of NSW through Transport for NSW 2024

4.2 The Precast Members must be manufactured under a Quality Management System which is certified by a JAS / ANZ accredited organisation as complying with AS/NZS ISO 9001.

4.3 If the Precast Member is to be placed in a jurisdiction where a Principal's Registration Scheme for companies manufacturing Precast Members is in place, the Manufacturer must be registered or approved under that scheme to the appropriate level and / or category.

5. Design

5.1 In addition to any other design standards / requirements specified in the Contract documents, the Contractor must ensure that the Precast Member is designed in accordance with the design standard specified in Table 5.1.

Table 5.1: Applicable design standard

Design stages	Applicable design standard for the specified design life (1)
In-service design (2) (provides for the performance of the element as part of the permanent structure)	For a design life ≤ 50 years or > 50 years: AS 5100.1
Erection design (provides for the element to resist all construction loads, temporary surcharge loads as applicable, handling forces, including impact, arising from stripping, storage, transport, lifting, temporary bracing and propping)	AS 5100.2 and AS 5100.5

1. *Unless specified otherwise in the Contract documents.*
2. *Not applicable if the Principal has provided the design of the Precast Member.*

5.2 The design documents include design calculations and drawings showing the profile dimensions of the element, erection documentation required under AS 3850.3, reinforcement details, grade of concrete, cover to reinforcement, exposure classification and calculated mass.

5.3 The Contractor must submit certification to the Principal from a Professional Engineer that the Precast Members comply with Clause 5.1.

HOLD POINT 2	
Process Held	Commencement of the manufacture of Precast Units.
Submission Details	The design documents (unless the Principal has provided the design) and the certification from a Professional Engineer must be submitted to the Principal at least 10 working days prior to the commencement of the manufacture of the Precast Unit.

© State of NSW through Transport for NSW 2024

6. Manufacture

General

6.1 The Quality Plan must include:

a. Name of the manufacturer and place of manufacture;

b. The following information, unless a Principal's Registration Scheme applies:

i. Procedures for manufacture;

ii. Inspection and Test Plans, including method for verification of the member dimensions; and

iii. Procedures / methodology and materials for localised repairs to a Precast Member in accordance with TS 00079.

Formwork

6.2 Except for the circumstances listed in Clause 6.3 or where a special finish has been specified in the Contract documents, formwork must be constructed from metal. Timber formwork is not acceptable for precast concrete.

6.3 In the case of flat panel work only, the following exceptions to metal formwork apply:

a. use of timber edge forms for custom panels,

b. use of proprietary form liners or other suitable material as a form liner for patterned panels, and

c. polystyrene to form custom blockouts.

6.4 Formwork must conform to AS 3610. All forms must be surface smooth, mortar-tight and have sufficient rigidity to maintain the tolerances specified when subjected to fresh concrete and intense vibration.

6.5 All forms must be set and maintained to line and level such that the finished concrete must conform within the specified dimensional tolerances, and to the proper dimensions and contours as shown in the Drawings.

6.6 All forms must be cleaned and coated with the lightest practical coating of release agent prior to pour. Reinforcing steel, prestressing strand and construction joints must not be contaminated with release agent.

© State of NSW through Transport for NSW 2024

6.7 Where a hole or void in the concrete is shown on the drawings, the formwork or void former must be removed after casting in a manner that does not damage or crack the Precast Member. Methods such as the use of air pressure to release void formers or cold water or other fluid to cool the void former are not permitted. Permanent hole formers are not permitted unless shown on the Drawings. All void formers shall be in accordance with ATS 5306.

6.8 Cores for forming transverse holes in the finished work or other forming devices which may restrict longitudinal strains in the member must be loosened so that concrete shrinkage and thermal movements are not restrained.

6.9 Unless otherwise shown in the Drawings or Contract documents, all corners must be provided with 15 mm x 15 mm chamfers or fillets of equivalent radius.

6.10 The form's original shape, strength, rigidity, mortar tightness and surface smoothness must be maintained. Damaged or forms which are out of tolerance must not be used.

6.11 Formwork must not be removed from the concrete, or the product lifted until the concrete has attained a strength not less than 60% of the specified 28-day characteristic strength. Curing must continue as soon as practical, but no later than one hour after removal of formwork. Minimum stripping times to also comply with Table 4.4.1(A) of AS 5100.5

6.12 Subject to satisfactory performance, the Contractor may submit a proposal to the Principal for early stripping or lifting of the product, but in no case before the concrete has attained a compressive strength which is higher than all the following:

a. 40% of the specified 28-day strength;

b. 16 MPa; and.

c. any minimum lifting strength shown on the Drawings.

Production

6.13 Concrete must be supplied, placed, cured and finished in accordance with TS 00146 and TS 00149. Reinforcing steel must be supplied and placed in accordance with TS 00077. Refer to ATS 5321 if the maturity method is used.

WITNESS POINT 1	
Process	Commencement of concrete placement for the first Precast Member of each type.
Notification Period	At least 3 working days before the commencement of placing concrete.

Test Panel

6.14 Where the production of:

a. a sample Precast Member; or

© State of NSW through Transport for NSW 2024

b. an architectural finish

is specified, the first Precast Member produced which satisfies the requirements of this Specification must be made available for inspection by the Principal. An architectural finish includes reinforced soil structural panels, coloured concrete panels, exposed aggregate finish, patterned finish and boat ramp panels.

WITNESS POINT 2	
Process	Manufacture of subsequent Precast Members.
Notification	Notification that the first Precast Member is ready for inspection must be submitted 3 working days prior to removal of the formwork.

6.15 If requested by the Principal, the Contractor must ensure that a conforming Precast Member ("Reference Panel") is retained in the production facility or on Site for the purpose of comparison with each Precast Member subsequently produced.

Surface Finish

6.16 Unless specified otherwise in the Contract documents, the standard of surface finish must not be less than Class 2 in accordance with AS 3610.1.

6.17 In addition to the requirements specified in TS 00149, Precast Members must not have:

a. any individual crack longer than 300 mm; or

b. a cumulative crack length of more than 500 mm.

6.18 Dents not exceeding 3 mm in depth and bulges not exceeding 3 mm in height are permitted provided these do not extend over the surface for a distance of more than 180 mm and the specified cover is maintained.

6.19 If a Reference Panel has been prepared in accordance with Clause 6.15, the finish on all manufactured panels must match that of the Reference Panel within the tolerances specified in AS 3610.1 or as specified on the Drawings. Any residues on the surfaces arising from the process to produce a special finish must be removed.

6.20 Where surface treatment for a class of surface finish not covered by AS 3610 is specified, the surface must match the description in Table 6.20.

Table 6.20: Other finishes

Finish	Description
Sandblast	Brush finish – sandblasting must remove the surface laitance and expose only the cement matrix. There must be no projection of the coarse aggregate from the concrete surface.

© State of NSW through Transport for NSW 2024

Finish	Description
	Light finish – sandblasting must expose the fine aggregate with occasional exposure of coarse aggregate. Projection of the coarse aggregate must not exceed 2 mm above the finished concrete surface.
	Medium finish – sandblasting must be such as to expose the coarse aggregate which must project no more than 4 mm above the finished concrete surface.
	Heavy finish – sandblasting must expose the coarse aggregate so as to provide a rough and uneven finished surface. The maximum projection of the large aggregate must be 6 mm above the finished concrete surface.
Exposed aggregate	The prepared surface must have an exposed coarse aggregate finish free from loose aggregate and laitance.
Scabbled	Scabbling must remove all laitance and loose or porous material without leaving excessive depressions. Exposed aggregate must be firmly embedded in the concrete.
Broomed	The concrete surface must be broomed in a direction at right angles to the bridge centre line with a stiff-bristled broom not less than 400 mm wide or using a suitable mechanical grooving device to produce a uniformly roughened surface texture with an average depth of not less than 0.9 mm.

Prestressing of Precast Members

6.21 If the Precast Members will be pre-tensioned, the prestressing materials and stressing operations must comply with ATS 5326.

6.22 If the Precast Members will be post-tensioned, the work must comply with the additional requirements for the supply and installation of ducts, anchorages and any other components required for post-tensioning included in ATS 5527.

7. Stock Items

7.1 This Clause 7 applies to Precast Members which are manufactured to a standard design for use in multiple contracts (“Stock Item”). Stock Items are:

a. limited to low-risk products

b. manufactured under controlled conditions; and

c. have a 50-year design life.

7.2 The Contractor may submit a proposal to the Principal that the notification requirements applicable to Hold Point 1 and Witness Point 1 are waived for a Stock Item, subject to the following being submitted to the Principal prior to the Stock Item being delivered to site:

a. the documentation required under Clause 6; and

© State of NSW through Transport for NSW 2024

b. Records demonstrating compliance with this Specification in accordance with Clause 11.

7.3 The Principal is under no obligation to accept any such proposal.

7.4 If the documentation required under Clause 6 has been previously submitted to the Principal, but not earlier than 36 months prior to the scheduled date for installation, the Principal may waive the requirement to re-submit the documentation.

8. Provision for Lifting

8.1 This Clause 8 specifies requirements which are in addition to those specified in Clause 5.1 for Erection Design.

8.2 Subject to formwork stripping and lifting time in Section 6.11. A Precast Member must not be lifted until it has attained the minimum compressive strength for lifting specified on the Drawings or calculated by the Professional Engineer.

8.3 Unless a lifting anchor is to be encapsulated in a subsequent concrete pour, the lifting anchor material must comply with the following:

Exposure classification C2: Stainless steel (Grade 316, unless specified otherwise).

Less severe exposure classifications: Hot dip galvanized to AS 4680 or stainless steel.

8.4 The specified concrete cover to reinforcement (excluding any contribution from mortar used to fill the recess) must be maintained at each lifting anchor recess.

8.5 Unless specified otherwise, holes and lifting anchor recesses must be filled with an approved polymer modified cementitious repair mortar in accordance with TS 00079. Prior to filling, the recess surface must be roughened by removing the surface layer to expose small particles of well bound aggregate to ensure a satisfactory mechanical bond of the mortar onto the concrete substrate.

8.6 All lifting anchors must be permanently marked or tagged by the manufacturer with the working load limit, which must be clearly visible.

8.7 With the exception of small symmetrical Precast Members less than 100 kg, a minimum of two lifting points must be provided on all products and used for lifting in accordance with the rigging diagram,

8.8 Any lifting anchor which is damaged must not be used without inspection and certification by a Professional Engineer.

9. Tolerances

9.1 Unless shown otherwise on the Drawings, the dimensions of Precast Members as measured at the age of 28 days must conform to the tolerances given in Table 9.1. Refer to AS 5100.5 for the tolerance on the position of reinforcement and tendons.

© State of NSW through Transport for NSW 2024

Table 9.1: Tolerances for precast members

Item		Tolerance
General		
Placing of sheathings for post tensioned segmental members		5 mm
Cross section		
Dimension [1]	< 2 m > 2 m	0 to +3 mm 0 to +6 mm
Out of square [1]		Maximum 5 mm
Squareness of Ends Dimension	 < 500 mm > 500 mm	Deviation from a plane perpendicular to the longitudinal axis of a member, or from the specified end plane: 3 mm 6 mm per metre (10 mm maximum)
Parapet units and new jersey barriers		The deviation from a place perpendicular to the longitudinal axis must not exceed 3 mm.
Length		
Diagonal length for precast unit		5 mm
Overall length or length centre to centre of bearings (for beams and slabs)		0.06% x specified length (max 20 mm)
Centre to centre spacing of holes for transverse rods or bolts		5 mm
Overall length for parapets and new jersey barriers		3 mm
Profile in a vertical plane (camber)		The deviation of a unit from the design camber, after allowance has been made for the deflection due to the mass of the member, must not exceed 0.10% of the length of the unit with a maximum of 6 mm. Measurement of camber must be made at the mid point of the member which must be supported at the bearing positions.
Profile in a horizontal plane (bow)		The deviation of a unit from the required profile must not exceed 6 mm or 0.10% of the length of the unit, whichever is the greater. Bow in precast parapet units and new jersey barriers must not exceed 3 mm.

1. *Also applies to cast in place concrete s/ barriers and cast in situ off-structure concrete barriers. In addition, any vertical or horizontal misalignment between adjacent segments must not exceed 5 mm.*

© State of NSW through Transport for NSW 2024

9.2 If a Precast Member will be installed prior to an age of 28 days, the Contractor must develop and implement a procedure to verify that the anticipated dimensions of the Precast Member at an age of 28 days will conform to Table 9.1.

10. Marking, Handling, Storing and Transportation

10.1 Precast Members must be handled, lifted, stored and transported in accordance with ATS 5850.

10.2 On each Precast Member, the following information must be clearly and permanently marked on a surface which is not be on permanent display when erected:

a. date of manufacture;

b. unique identification number;

c. manufacturer's name or registered mark; and

d. maximum mass of the element.

10.3 Precast deck and kerbs must be permanently marked with the above information on both end vertical faces and in addition, have the identification number and casting date scratched in the top surface immediately after casting.

10.4 Unless specified otherwise, piles must be clearly and indelibly marked at 0.25 m intervals, commencing at 3 m from the toe of the pile and extending to the head of the pile for the purpose of monitoring the driving of the pile. Length marks must be permanently numbered at 1 m intervals with figures at least 75 mm high, showing the length of the pile from the toe.

10.5 Where necessary to identify the Precast Member within the casting facility, a temporary marking may be used prior to the application of the permanent marking.

10.6 All Precast Members must be traceable from the completion of manufacture to their final location by a unique identification number.

10.7 The manufacturer may attach temporary advertising labels or supplier's logos to the Precast Members. However, any such labels or logos must be fastened in such a way that they can be easily removed without solvents. Paint must not be used for the temporary labels or logos.

11. Inspection and Records

11.1 Prior to leaving the casting yard, the Contractor must ensure that each Precast Member has been inspected for compliance with the requirements of this Specification.

11.2 The Contractor must provide a certificate of compliance and report containing evidence of compliance with the Specification on, or prior to, delivery of the Precast Members to the Site. At a minimum, this report must include:

© State of NSW through Transport for NSW 2024

a. Confirmation that the Precast Members have been manufactured under a quality system certified to AS/NZS/ISO 9001 by a JASANZ accredited organisation.

b. Certification of the lifting mechanism from the Professional Engineer.

c. Design details (including exposure classification, product code/drawing number), if the Principal has not provided the design of the Precast Member.

d. For each Precast Member:

    i. Individual unit unique identification number;

    ii. Concrete test reports and curing temperature charts;

    iii. Dimension accuracy checks; and

    iv. Visual Inspection report.

HOLD POINT 3	
Process Held	Incorporation of the Precast Members into the Works.
Submission Details	The certificate of compliance and report must be provided at least 24 hours prior to the incorporation of the Precast Member into the Works.

© State of NSW through Transport for NSW 2024

Annexure A Summary of Hold Points, Witness Points and Records

The following is a summary of the Witness Points/Hold Points that apply to this Specification and the Records that the Contractor must submit to the Principal to demonstrate compliance with this Specification.

Clause	Hold point	Witness point	Identified Records
4.1	1. Commencement of the manufacture of Precast Units.		Quality Plan
5.3	2. Commencement of the manufacture of Precast Units		Design documents and the certification
6.13		1. Manufacture of Precast Members	
6.14		2. Sample Precast Member	
11.1	3. Incorporation of the Precast Members into the Works		Certificate of Compliance and Conformance Report

© State of NSW through Transport for NSW 2024