



AUS-SPEC

Infrastructure Specifications

1353 Precast box culverts

1353 PRECAST BOX CULVERTS

IMPORTANT: This document has been adapted from the NATSPEC suite of specification templates for use in the Cessnock City Council area by both Council and industry. NATSPEC regularly updates the base templates (currently in April and October each year), and Council may incorporate changes into its version of AUS-SPEC from time to time. To assist in highlighting any changes made by Council to the NATSPEC templates, the following conventions are used.

- See ANNEXURE M at the end of this document which contains (where practical) Cessnock City Council customisations (also known as 'office master' text). References to the Annexure are to also be inserted at relevant clauses in the main body of the document.
- Where content is added to the main body of the document, it is to be shown **in brown text like this**.
- Where content is deleted or excluded from the main body of the document, it is to be shown ~~struck through like this~~. Such clauses are to have no effect.

Where there is a conflict between main body text and Cessnock City Council specific clauses, Council's specific clauses shall prevail.

1 GENERAL

1.1 RESPONSIBILITIES

General

General: Provide precast box culvert units including construction of base slabs, as documented.

1.2 CROSS REFERENCES

General

Requirement: This worksection is not a self-contained specification. In addition to the requirements of this worksection, conform to the following:

- 0136 General requirements (Construction).
- 0152 Schedule of rates (Construction).
- 0161 Quality management (Construction).
- 0319 Auxiliary concrete works.
- 1101 Traffic management.
- 1112 Earthworks (Road reserve).
- 1121 Open drains .
- 1141 Flexible pavement base and subbase.
- 1172 Subsoil and formation drains.
- 1351 Stormwater drainage (Construction).
- 1354 Drainage structures.

1.3 STANDARDS

General

Small culverts: To AS 1597.1 (2010)

Supply of small box culverts: To Austroads ATS 2230 (2020).

Large culverts: To AS 1597.2 (2013).

Planning, construction, design, transportation and installation: To AS 3850.3 (2021).

Concrete Structures: AS 3600.

Prefabricated Concrete Elements General: AS 3850.01.

1.4 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given in AS 1597.1 (2010), AS 1597.2 (2013), as appropriate, and the following apply:

- Cofferdam: A structure, usually temporary, built to support the surrounding ground or to exclude water and soil sufficiently to permit work to proceed safely without excessive pumping.
- Large culvert unit: Culvert unit with a span from 1200 mm to 4200 mm and a height from 1200 mm to 4200 mm.
- Small culvert unit: Culvert unit not exceeding 1200 mm span and 1200 mm height.

1.5 TOLERANCES

General

Inlet and outlet invert levels: ± 10 mm from documented levels.

Cast in situ base slabs: Conform to the following:

- Invert levels: ± 10 mm.
- Grade: 1:500.
- Plan position: ± 50 mm.
- Surface irregularities: < 5 mm step in surface.
- Flatness: Maximum 8 mm deviations from a 3 m straightedge laid in any direction on a plane surface.

1.6 SUBMISSIONS

Execution details

Construction loads: Design to be certified by Professional engineer (Structural) as defined in 0010 Quality requirements for design worksection. Such certification (with assumptions) is to be shown on the Drawings for review by the Principal Certifier.

Construction of cofferdams: Submit details of the cofferdam, formwork required, and proposed clearances.

Diversion and disposal of water: Submit details for managing water flows 1 week before starting diversion works.

Products and materials

Minimum design life for manufacture and installation of culvert system: 100 years unless otherwise required by DA consent conditions or REF recommendations.

Product conformity: Submit manufacturer's certificate of conformance to AS 1597.1 (2010) and AS 1597.2 (2013), as appropriate, for the box culverts before dispatch to site. Identify the item, source, and record the inspection and test records that verify conformity.

Manufacturer's data and installation recommendations: Submit to AS 1597.1 (2010) Appendix A and AS 1597.2 (2013) Appendix A, as appropriate.

Tests

Results: Submit test requirements to AS 1597.1 (2010) Table 3.1 and AS 1597.2 (2013) Table 4.1.

1.7 INSPECTIONS

Notice

General: Give notice so that inspection may be made of the following:

- Precast box culvert on delivery to site, for dimensional accuracy and defects.
- Diversion works for managing water flows.
- Cofferdam installed with the required bracing in place.
- Completed cast in situ or precast base slab bedding.
- Reinforcement for the cast in situ base slab before concreting.
- Completed jointing between precast units.
- Backfill sequence, including of side zones and overlay fill.
- Cofferdam removal.

2 MATERIALS

2.1 PRECAST BOX CULVERTS

General

Requirement: Proprietary precast box culvert to the size and load class documented and conforming to AS 1597.1 (2010), Austroads ATS 2230 (2020) and AS 1597.2 (2013), as appropriate.

Joint type: Butt joint, **unless documented otherwise**.

Marking: Apply marking on each culvert, conforming to the following:

- Small culverts: To AS 1597.1 (2010).
- Large culverts: To AS 1597.2 (2013).

Handling, delivery and storage

Handling and storage: Avoid damage to the units.

2.2 CEMENT MORTAR

Materials

Cement: To AS 3972 (2010).

Water: Clean and free from any deleterious matter.

Sand: Fine aggregate with a low clay content and free from efflorescing salts, selected for colour and grading.

Proportions (water:cement:sand): 0.4:1:3 by mass.

2.3 FILL MATERIAL

Material

General: To AS 1597.1 (2010) clause 1.4.2.7 and AS 1597.2 (2013) clause 1.4.2.7, as appropriate.

2.4 IN SITU CONCRETE

General

In situ concrete base slabs: To *0319 Auxiliary concrete works*.

2.5 DRAINAGE STRUCTURES

General

Requirement: To *1354 Drainage structures*.

3 EXECUTION

3.1 COFFERDAMS

General

Requirement: Construct a cofferdam as required by the site specific conditions to allow dewatering of the construction area and diversion of the water course.

Construction

General: Construct as documented and as follows:

- Sufficiently watertight to prevent damage to in situ concrete structures, by percolation or seepage through the sides.
- Founded sufficiently below the culvert foundation level to prevent loosening of the foundation materials by water rising through the bottom of the excavation.
- Braced to prevent weakness or damage to the structure on removal of the cofferdam.

Clearances: Adjust cofferdams that have tilted or moved laterally to maintain the documented clearances.

3.2 ESTABLISHMENT

Diversion and disposal of water

Requirement: Divert and/or dispose of water from the construction area as required, without causing damage to any portion of the works or surrounding properties.

3.3 EXCAVATION

General

Requirement: To *1351 Stormwater drainage (Construction)*.

Trench width: As documented or the width of the base slab plus 150 mm minimum each side.

Line and level: Excavate earth and rock foundations to line and level of the underside of the bedding. Do not disturb material below this level.

Unsuitable material: Remove and dispose of inadequate foundation material and replace with ordinary fill.

Batter slopes: Evenly transition over 10 m length from the edge of the wingwall to match culvert wingwall slopes.

Rock foundations

Preparation: Thoroughly clean out all minor fissures and refill with concrete, mortar or grout. Remove all loose material.

Surface correction: Provide mass concrete to form a uniform bearing surface at least 50 mm above the highest points of rock to correct over-excavation or uneven surfaces.

Excavation methods should not result in cracking or layering of rock foundations which would allow seepage to erode select bedding material.

Partial rock foundation: If rock is encountered over part of the foundation, prepare as follows:

- Excavate the whole of the foundation to a depth of 300 mm below the documented level of the bottom of the base concrete slab.
- Replace and compact this additional excavation with ordinary fill to provide uniform bearing conditions.

Excavate existing stream bed

Joining: Excavate inlet and outlet channels as documented and extend to the existing stream bed to *1121 Open drains*.

3.4 BEDDING

Cast in situ base slabs

General: Select bedding from the following alternatives:

- Mass concrete bedding.
- CRB20-2 bedding as follows:
 - . CRB20-2 material to *1141 Flexible pavement base and subbase*.
 - . Lightly bound and compacted to *1351 Stormwater drainage (Construction)*.
 - . Place to the line and level of the underside of the base slab.
 - . Level tolerance: ± 10 mm.

Finish: Screed to a smooth surface finish.

Precast base slabs

Foundation support as follows:

- Small culverts: Select backfill to AS 1597.1 (2010).
- Large culverts: Select backfill to AS 1597.2 (2013).
- Compacted depth: > 100 mm.

3.5 INSTALLATION

General

Inlet and outlet invert levels: As documented with a smooth, uniform gradient throughout each culvert length.

Installation: Conform to the following:

- Small culvert units: To AS 1597.1 (2010) Section 4.
- Large culvert units: To AS 1597.2 (2013) Section 5.

Cast in situ base slabs

Requirement: Conform to *0319 Auxiliary concrete works*. Construct cast in situ base slabs to the documented dimensions.

Traffic: Prevent construction or public traffic access over the base slab for 7 days after placement.

Recesses: Form recesses in the base slab to accommodate the walls of the precast crown units to the documented dimensions.

Placement of precast units

General: Conform to AS 3850.3 (2021).

Base slab: Make sure the base slab has reached a compressive strength of at least 20 MPa before installing precast crown units.

Temporary plug: If required, seal the ends of the culvert with a temporary plug to exclude water, sand or other deleterious materials.

Mortar bed in recess: Install precast crown units on a cement mortar bed in the base slab recess. Pack any gaps between the side walls and the sides of the recess with cement mortar.

Lifting holes and butt joints between the ends of units: Seal with cement mortar or grout.

- **Grout type:** As documented.

Slabs on U-shaped units or link slabs between crown units: Before placing slabs, clean the support bearing area and cover with a cement mortar bed, minimum 5 mm thick.

Lifting hooks: Cut lifting hooks and coat the exposed steel to prevent corrosion.

- **Coating material:** As documented.

Multi-cell box culverts: Provide a 15 mm gap between adjacent cells. Fill gap with cement mortar or grout.

Curing of joints: Protect all mortar joints from the sun and cure for at least 48 hours before placing backfill.

Joint covering: Cover the external surfaces of joints between precast crown units, both laterally and longitudinally for the full length, with minimum 250 mm wide strips of non-woven geotextile of minimum mass 270 grams/m² to Austroads AGPT04G (2009).

3.6 BACKFILLING AND COMPACTION

General

Backfilling: To *1354 Drainage structures*.

Removal of formwork: Remove all bracing and formwork before backfilling.

Subsoil drain: Provide a subsoil drain enclosed in a seamless tubular filter fabric at the outer walls of the precast crown sections and at wingwalls as documented and to *1172 Subsoil and formation drains*.

Horizontal terraces: If the sides of the excavation are steeper than 1V:4H, cut benches in the form of horizontal terraces at least 1 m in width before placing backfill.

Side zones and overlay zone fill

Backfilling: Place select fill in the side zones of box culverts, and 300 mm deep in the overlay zone of box culverts.

Sequence: Start backfilling and compaction at the box culvert wall. Place backfill equally balanced on both sides of the box culvert with a maximum 600 mm level difference.

Trench and embankment fill

Backfilling: Backfill the remainder of the excavation or embankment to *1112 Earthworks (Road reserve)*.

Compaction

Compaction: To *1351 Stormwater drainage (Construction)*.

3.7 COMPLETION

General

Requirement: Remove and replace precast box culverts if required for any of the following reasons:

- Not within the tolerances.
- Settlement after installation.
- Damage during backfilling, compaction or subsequent operations.

Flushing: Flush clean all culverts from end to end and maintain in working order until completion of the works.

Removal of cofferdams

Timber and bracing: Remove from the concrete and the backfill of the completed structure.

Cofferdams: Remove, including temporary piles, at least to the culvert invert level after completion of the structure. Prevent material associated with the cofferdam or dewatering from entering the culvert.

Construction loading on culverts

Requirement: Prevent the passage of construction vehicles and plant over the box culvert until 28 days after placing the concrete base slab or until the compressive strength of the concrete base slab has reached 32 MPa.

Loading restrictions: To AS 1597.1 (2010) clause 4.7 and AS 1597.2 (2013) clause 5.7, as appropriate.

4 ANNEXURE A**4.1 ANNEXURE – SUMMARY OF HOLD AND WITNESS POINTS**

For private developments, certain Hold and Witness Points where specifically noted below require representatives of both the Superintendent and the Principal Certifier (e.g. Council) to authorise release.

Clause and description	Type	Submission/Inspection details	Submission/Notice times	Process held
SUBMISSIONS Execution details Construction of cofferdams	H	Details of proposed cofferdams and conformance with requirements	10 days before commencement.	Construction of cofferdam
SUBMISSIONS Execution details Diversion and disposal of water	H	Details of managing waterflow	7 days before starting diversion works	Diversion and disposal of water
SUBMISSIONS Products and materials Product conformity	H	Certificate of conformance for dimensional accuracy and defects	5 days before delivery	Delivery of precast box culverts
SUBMISSIONS Products and materials Manufacturer's data and installation recommendations	H	To AS 1597.1 (2010) Appendix A and AS 1597.2 (2013) Appendix A, as appropriate	5 days before installation	Precast material supply
SUBMISSIONS Tests	H	To AS 1597.1 Table 3.1 and AS 1597.2 Table 4.1 to demonstrate compliance of precast units	5 days before installation	Precast material supply and installation
INSPECTIONS Notice Precast box culvert	W – Superintendent and Principal Certifier	On delivery to site, check dimensions and for any defects	5 days before installation	Precast material supply
INSPECTION Notice Diversion of water	W – Superintendent and Principal Certifier	Diversion works	Proceeding	Cofferdam construction establishment
INSPECTION	H	Cofferdam installed with	5 days before	Base slab

Clause and description	Type	Submission/Inspection details	Submission/Notice times	Process held
Notice Cofferdam installation		the required bracing in place	excavation for the base slab	excavation
INSPECTIONS Notice Base slab bedding	H – Superintendent and Principal Certifier	Completed bedding for the cast in situ or precast base slab	5 days before installation of base slab	Installation of base slab
INSPECTIONS Notice Cast in situ base slab	W – Superintendent and Principal Certifier	Reinforcement in place before concreting	1 day	Base slab concrete placement
INSPECTIONS Notice Placement of precast units	W – Superintendent and Principal Certifier	Completed jointing between units	1 day	Backfilling
INSPECTIONS Notice Backfilling	W – Superintendent and Principal Certifier	Backfill sequence, including side zones and overlay fill	1 day	Completion of backfilling and compaction
INSPECTIONS Notice Removal of cofferdams	W	Timber and bracing and cofferdam removal	3 days	Cofferdams removal
Note: H = Hold point, W = Witness point				

4.2 ANNEXURE – PAY ITEMS

This Annexure applies to Council projects. For private development works use of this schedule is optional, at the Superintendent's discretion.

Pay items	Unit of measurement	Schedule rate scope
1353.1 In situ base slab	m ³ of reinforced concrete in place. Volume to be calculated from length, width and depth of slab as documented or directed by the Superintendent.	All cost associated with foundation preparation, bedding and all activities associated with the construction of the base slab to 0319 Auxiliary concrete works. Include the following: -Lightly bound CRB20-2. -Concrete, reinforcement, formwork.
1353.2 Precast base slab for small culverts	m ³ of reinforced concrete in place. Volume to be calculated from length, width and depth of slab as documented or directed by the Superintendent.	All costs associated with the supply, delivery and installation of precast units.
1353.3 Precast concrete box culverts (supply and install)	Linear m of actual length installed for each size of box culvert as documented.	All costs associated with supply, installation and jointing of the precast units including selected backfilling and testing of the units.
Traffic management	Lump sum.	To 1101 Traffic management.
Headwalls and wingwalls		To 1354 Drainage structures
Excavation		To 1351 Stormwater drainage (Construction).

Pay items	Unit of measurement	Schedule rate scope
Excavation for inlet and outlet channels		To 1121 Open drains.
Subsoil drains		To 1172 Subsoil and formation drains.
Trench and embankment fill		To 1112 Earthworks (Road reserve).

4.3 ANNEXURE - REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

AS 1597		Precast reinforced concrete box culverts
AS 1597.1	2010	Small culverts (not exceeding 1200 mm span and 1200 mm height)
AS 1597.2	2013	Large culverts (exceeding 1200 mm span or 1200 mm height and up to and including 4200 mm span and 4200 mm height)
AS 3850		Prefabricated concrete elements
AS 3850.3	2021	Civil construction
AS 3972	2010	General purpose and blended cements
Austrroads AGPT		Guide to pavement technology
Austrroads AGPT04G	2009	Geotextiles and geogrids
Austrroads ATS		Austrroads technical specifications
Austrroads ATS 2230	2020	Supply of small box culverts
EN 15804	2012	Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
ISO 14025	2006	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 21930	2017	Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services
AS 3600	2018	Concrete Structures
AS 3850.01	2015	Prefabricated concrete elements general

5 ANNEXURE M – CESSNOCK CITY COUNCIL SPECIFIC CLAUSES

M1.	Variations to or non-conformances with Council's AUS-SPEC are to be evaluated with reference to the procedure in Council's <i>Development Engineering Handbook</i> . Acceptance is to be obtained in writing from: an authorised representative of Council's Director of Infrastructure and Engineering Services.	Variation procedure
M2.	This specification applies in addition to any development consent (DA) conditions. If there is any inconsistency, the conditions of consent shall prevail.	DA Conditions
M3.	Refer to the Cessnock City Council <i>Development Engineering Handbook</i> for final inspection, works-as-executed and handover requirements.	Completion

6 AMENDMENT HISTORY

0	15/01/2024	First Published
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