



**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 MidCoast 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) MidCoast 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 MidCoast 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 and supply of small precast box culverts to ATS 2230.

Large culverts: To AS 1597.2.

**1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in AS 1597.1, AS 1597.2, 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 exceeding 1200 mm up to 4200 mm and a height from 1200 mm up to 4200 mm.
- Small culvert unit: Culvert unit with a span up to 1200 mm and a height up to 1200 mm.

## 1.5 TOLERANCES

### General

Inlet and outlet invert levels:  $\pm 10$  mm from documented levels.

Cast in situ base slabs: Conform to the following:

- Invert levels:  $\pm 10$  mm.
- Grade: 1:500.
- Plan position:  $\pm 50$  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 coffer dam, 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 and AS 1597.2, 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 Appendix A and AS 1597.2 Appendix A, as appropriate.

## 1.7 INSPECTIONS

### Notice

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

- Handling, delivery and storage: Precast box culvert on delivery to site.
- Removal of cofferdams: Timber and bracing and cofferdam removal.
- Diversion and disposal of water: Diversion works.
- Cast in situ base slab: Completed bedding.
- Precast base slab: Completed bedding.
- Cast in situ base slab: Minimum compressive strength.
- Placement precast units: Completed jointing between units.
- Side zones and overlay fill: Backfill sequence.

## 2 MATERIALS

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### 2.1 PRECAST BOX CULVERTS

#### General

Requirement: Proprietary precast box culvert to the size and load class documented and conforming to AS 1597.1, ATS 2230 and AS 1597.2, 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.
- Large culverts: To AS 1597.2.

**Handling, delivery and storage**

Handling and storage: Handle and load store precast box culverts to prevent damage to the units.

Delivery inspection: Inspect batches of precast box culverts for dimensional accuracy and defects.

**2.2 CEMENT MORTAR****Materials**

Cement: To AS 3972.

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 clause 1.4.2.7 and AS 1597.2 clause 1.4.2.7, as appropriate.

**2.4 IN SITU CONCRETE****General**

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

**2.5 DRAINAGE STRUCTURES****General**

Requirement: To the *1354 Drainage structures* worksection.

**3 EXECUTION**

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**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 of cofferdams**

General: Construct cofferdams as follows:

- Sufficiently watertight to prevent damage to insitu 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 the *1351 Stormwater drainage (Construction)* worksection.

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 transitioned 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.

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 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 the *1121 Open drains* worksection.

### **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:  $\pm 10$  mm.
  - . Finish: Screed to a smooth surface finish.

#### **Precast base slabs**

Foundation support as follows:

- Small culverts: Select backfill to AS 1597.1.
- Large culverts: Select backfill to AS 1597.2.
- 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 Section 4.
- Large culvert units: To AS 1597.2 Section 6.

#### **Cast in situ base slabs**

Requirement: 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 to accommodate the walls of the precast crown units in the base slab to the documented dimensions.

Minimum comprehensive strength: 20 MPa before installation of precast crown units.

#### **Placement of precast 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 of a consistency to make sure void is filled.

- **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 more than 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/m<sup>2</sup> to AUSTRROADS AGPT04G.

### 3.6 BACKFILL

#### General

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 4H:1V, cut benches in the form of horizontal terraces at least 1 m in width before placing backfill.

Wingwalls: Do not backfill against wingwalls less than 21 days after placing concrete.

#### Side zones and overlay zone fill

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

Compaction: Compact in layers. with a maximum compacted thickness of 150 mm.

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 the *1112 Earthworks (Road reserve)* worksection.

### 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.
- Damaged 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 the 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 clause 4.7 and AS 1597.2 clause 5.7, as appropriate.

## 4 ANNEXURES

### 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<br>Products and materials<br><br>Product conformity    | H   | Certificate of conformance for dimensional accuracy and defects           | 5 days before delivery                  | Delivery of precast box culverts     |
| SUBMISSIONS<br>Execution details<br><br>Construction of cofferdams | H   | Details of proposed cofferdams and compliance with requirements           | 10 days before commencement.            | Construction of cofferdam            |
| INSPECTIONS<br>Notice<br><br>Handling, delivery and storage        | W –<br>Superintendent<br>and Principal<br>Certifier | Precast box culvert on delivery to site. Check dimensions and any defects | 5 days before installation              | Precast material supply              |
| INSPECTION<br>Notice<br><br>Diversion and disposal of water        | W –<br>Superintendent<br>and Principal<br>Certifier | Diversion works   | Proceeding                              | Cofferdam construction establishment |
| INSPECTIONS<br>Notice<br><br>Cast in situ base slab                | H –<br>Superintendent<br>and Principal<br>Certifier | Completed bedding   | 5 days before installation of base slab | Installation of base slab            |
| INSPECTIONS<br>Notice<br><br>Precast base slab                     | H –<br>Superintendent<br>and Principal<br>Certifier | Completed bedding   | 5 days before installation of base slab | Installation of base slab            |
| INSPECTIONS<br>Notice<br><br>Cast in situ base slab                | W   | Minimum compressive strength  | 1 day                                   | Cast in situ base slab               |
| INSPECTIONS<br>Notice<br><br>Placement precast units               | W –<br>Superintendent<br>and Principal<br>Certifier | Completed jointing between units  | 1 day                                   | Precast base slabs                   |
| INSPECTIONS<br>Notice<br><br>Side zones and overlay fill           | W –<br>Superintendent<br>and Principal<br>Certifier | Backfill sequence   | 1 day                                   | Backfill                             |
| INSPECTIONS<br>Notice  | W   | Timber and bracing and cofferdam removal                                  | 3 days                                  | Cofferdams removal                   |

| Clause and description | Type* | Submission/Inspection details | Submission/Notice times | Process held |
|------------------------|-------|-------------------------------|-------------------------|--------------|
| Removal of cofferdams  |       |                               |                         |              |

#### 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   |
|--|--|---|
| <b>1353.1 In situ base slab</b>                                  | m <sup>3</sup> 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. Including the following types:<br>- -Lightly bound CRB20-2.<br>- -Concrete, reinforcement, formwork. |
| <b>1353.2 Precast base slab for small culverts</b>               | m <sup>3</sup> 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.   |
| <b>1353.3 Precast concrete box culverts (supply and install)</b> | 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.   |
| <b>Traffic management</b>  | Lump sum.  | To the 1101 Traffic management worksection.   |
| <b>Headwalls and wingwalls</b>                                   |  | To the 1354 Drainage structures worksection   |
| <b>Excavation</b>  |  | To the 1351 Stormwater drainage (Construction) worksection.   |
| <b>Excavation for inlet and outlet channels</b>                  |  | To the 1121 Open drains worksection.  |
| <b>Cast in situ base slab</b>                                    |  | To the 0319 Auxiliary concrete works worksection.   |
| <b>Subsoil drains</b>  |  | To the 1172 Subsoil and formation drains worksection.   |
| <b>Trench and embankment fill</b>                                |  | To the 1112 Earthworks (Road reserve) worksection.  |

#### 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 width and 900 mm depth)   |
| 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 3972             | 2010 | General purpose and blended cements   |
| Austrroads AGPT     |      | Guide to pavement technology  |
| Austrroads AGPT04G  | 2009 | Geotextiles and geogrids  |
| Austrroads ATS 2230 | 2020 | Supply of small box culverts  |



**5 ANNEXURE M – MIDCOAST 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: <ul style="list-style-type: none"> <li>a) an authorised representative of Council's Director of Infrastructure and Engineering Services, or</li> <li>b) an accredited certifier where they are the Principal Certifier and hold the relevant accreditation category for the type of work.</li> </ul> | <b>Variation procedure</b> |
| M2. | This specification applies in addition to any development consent (DA) conditions. If there is any inconsistency, the conditions of consent shall prevail.  | <b>DA conditions</b>       |
| M3. | Refer to the MidCoast Council <i>Development Engineering Handbook</i> for final inspection, works-as-executed and handover requirements.  | <b>Completion</b>          |

**6 AMENDMENT HISTORY**

|   |            |                 |
|---|------------|-----------------|
| 0 | 14/12/2020 | First Published |
|---|------------|-----------------|