<table>
<thead>
<tr>
<th>Publication Number:</th>
<th>MITS 03C Edition 1 Revision 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Effect:</td>
<td>July 2019</td>
</tr>
<tr>
<td>Supersedes:</td>
<td>Standard Specification for Urban Infrastructure Works Section 03 Edition 1 Revision 0 September 2002</td>
</tr>
<tr>
<td>Endorsed By:</td>
<td>Karl Cloos, Director, Infrastructure Planning</td>
</tr>
<tr>
<td>Approved By:</td>
<td>Ken Marshall, Executive Branch Manager</td>
</tr>
</tbody>
</table>

**Document Information**

<table>
<thead>
<tr>
<th>Document Title</th>
<th>Key Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document Title</td>
<td>MITS 03C Precast box culverts</td>
</tr>
<tr>
<td>Next review date</td>
<td></td>
</tr>
<tr>
<td>Key words</td>
<td></td>
</tr>
<tr>
<td>AUS-SPEC Base Document</td>
<td>1353 Precast box culverts</td>
</tr>
</tbody>
</table>

**Revision Register**

<table>
<thead>
<tr>
<th>Edition/ Revision Number</th>
<th>Clause Number</th>
<th>Description of Revision</th>
<th>Authorised By</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CONTENTS

1 PRECAST BOX CULVERTS .................................................................................................................. 4
  1.1 General ........................................................................................................................................ 4
    1.1.1 Responsibilities .................................................................................................................. 4
    1.1.2 Cross references .................................................................................................................. 4
    1.1.3 Referenced documents ........................................................................................................ 4
    1.1.4 Standards ............................................................................................................................ 5
    1.1.5 Interpretation ......................................................................................................................... 5
    1.1.6 Hold points and witness points ........................................................................................... 6
  1.2 Materials .................................................................................................................................... 7
    1.2.1 General ................................................................................................................................. 7
    1.2.2 Precast concrete .................................................................................................................. 7
  1.3 Execution ..................................................................................................................................... 8
    1.3.1 Provision for traffic .............................................................................................................. 8
    1.3.2 Site establishment ............................................................................................................... 8
    1.3.3 Handling, delivery and storage .......................................................................................... 8
    1.3.4 Excavation .......................................................................................................................... 8
    1.3.5 Foundations ....................................................................................................................... 9
    1.3.6 Installation ........................................................................................................................... 9
    1.3.7 Backfill ................................................................................................................................ 11
    1.3.8 Finishing ............................................................................................................................ 11
  1.4 Completion .................................................................................................................................. 12

2 MEASUREMENT AND PAYMENT ................................................................................................. 13
  2.1 Measurement .............................................................................................................................. 13
  2.2 Pay items .................................................................................................................................... 14

LIST OF TABLES

Table 3C-1 Hold point table .................................................................................................................. 6
Table 3C-2 Witness point table ........................................................................................................... 6
Table 3C-3 Pay items table .................................................................................................................. 14
1 PRECAST BOX CULVERTS

1.1 General

1.1.1 Responsibilities

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

1.1.2 Cross references
General: The following documents are related to this Specification.

1.1.2.1 ACT Legislation
Road Transport (General) Act
Public Roads Act
Scaffolding and Lifts Act
Scaffolding and Lifts Regulation
Work Health and Safety Act

1.1.2.2 Specifications
Requirement: Conform to the following:

MITS 00 Preliminaries
MITS 01 Traffic Management
MITS 02 Earthworks
MITS 03A Trenching for underground services
MITS 03B Pipe drainage
MITS 04 Flexible pavement construction
MITS 06 Concrete kerbs, footpaths and minor works
MITS 08 Incidental works
MITS 09 Landscape
MITS 10 Concrete works

1.1.3 Referenced documents

1.1.3.1 Standards
General: The following documents are incorporated into this Specification by reference:

Australian standards

AS 1379 Specification and supply of concrete
AS 1478 Chemical admixtures for concrete, mortar and grout
AS 1478.1 Admixtures for concrete
AS/NZS 1554 Structural steel welding
AS/NZS 1554.3  Welding of reinforcing steel
AS 1597  Precast reinforced concrete box culverts
AS 1597.1  Small culverts (not exceeding 1200mm span and 1200mm height)
AS 1597.2  Large culverts (exceeding 1200mm span or 1200mm height and up to and including 4200m span and 4200mm height)
AS 2758  Aggregates and rock for engineering purposes
AS 2758.1  Concrete aggregates
AS 3600  Concrete structures
AS 3610  Formwork for concrete
AS 3610.1  Documentation and surface finish
AS 3972  General purpose and blended cements
AS/NZS 4671  Steel reinforcing materials
AS/NZS ISO 9001  Quality management systems – Requirements

1.1.3.2  Other publications
Austroads
AGPT  Austroads Guide to Pavement Technology
AGPT04G  Part 4G: Geotextiles and Geogrids
National Precast Concrete Association Australia
NP:PCH  Precast Concrete Handbook

1.1.4  Standards
1.1.4.1  General
Small culverts including all link slabs: To AS 1597.1.
Large culverts including all link slabs: To AS 1597.2.
Precast culverts: To the recommendations in NP: PCH Precast Concrete Handbook.
Proprietary products: To TCCS Products previously considered for use list

1.1.5  Interpretation
1.1.5.1  Abbreviations
General: For the purposes of this Specification the abbreviations given below apply.

RCBC:  Reinforced Concrete Box Culvert
TCCS:  Transport Canberra and City, ACT Government, and its successors.

1.1.5.2  Definitions
General: For the purposes of this Specification the definitions given in AS 1597.1, AS 1597.2, as appropriate and below apply:

Large culvert unit: Culvert unit with a span exceeding 1200mm up to 4200mm and a height from 1200mm up to 4200mm.
Precast box culvert: Includes link slabs and precast reinforced concrete crown sections.
Small culvert unit: Culvert unit with a span up to 1200mm and a height up to 1200mm.

1.1.6 Hold points and witness points

1.1.6.1 Notice

General: Give written notice to the Authorised Person so that the documented inspection and submissions may be made to the Hold point table and the Witness point table.

Table 3C-1 Hold point table

<table>
<thead>
<tr>
<th>Item</th>
<th>Clause title</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Materials</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3C.1</td>
<td>Precast Concrete - General</td>
<td>Submit certificate of conformance</td>
<td>3 working days prior to dispatch</td>
<td>Authorised Person</td>
</tr>
<tr>
<td></td>
<td><strong>Execution</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3C.2</td>
<td>Handling, delivery and storage - General</td>
<td>Inspect box culvert units for dimensional accuracy and defects</td>
<td>3 working days prior to installation</td>
<td>Authorised Person</td>
</tr>
<tr>
<td>3C.3</td>
<td>Installation – Cast in situ base and link slabs</td>
<td>Submit certification that installation of reinforcement and compliance of formwork conforms with MITS 10 Concrete works and the Drawings and give notice for inspection.</td>
<td>1 working day before pouring concrete</td>
<td>Authorised Person</td>
</tr>
<tr>
<td>3C.4</td>
<td>Installation - Placement of units</td>
<td>Present joints and seals for before backfilling</td>
<td>1 working day</td>
<td>Authorised Person</td>
</tr>
<tr>
<td>3C.5</td>
<td>Completion - Construction loading on culvert</td>
<td>Provide certification base slab concrete has achieved minimum compressive strength of 32MPa.</td>
<td>28 days</td>
<td>Authorised Person</td>
</tr>
</tbody>
</table>

Table 3C-2 Witness point table

<table>
<thead>
<tr>
<th>Item</th>
<th>Clause title</th>
<th>Requirement</th>
<th>Notice for inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>3C.1</td>
<td>Installation - Cast in situ base slabs</td>
<td>Supply certification that concrete has achieved minimum compressive strength of 20MPa</td>
<td>1 working day</td>
</tr>
<tr>
<td>3C.2</td>
<td>Backfill - General – Balancing backfill</td>
<td>Backfill layers simultaneously on both sides to avoid differential loading</td>
<td>1 working day</td>
</tr>
</tbody>
</table>
1.2  Materials

1.2.1  General

1.2.1.1  Materials and Components

Pipes: To MITS 03B Pipe drainage.

Structures: To MITS 03D Drainage structures.

Concrete, reinforcement and formwork: To MITS 10 Concrete works.

Cast in inserts: Provide structural steel cast in lifting items as shown on the Drawings.

1.2.2  Precast concrete

1.2.2.1  General

Concrete: To AS 1379.

Type of joint: Butt joint.

Certification: Provide precast box culvert unit certificate of conformance with the following:

- Small culvert units: To AS 1597.1.
- Large culvert units: To AS 1597.2.

This is a HOLD POINT.

Marking: Mark each unit at time of manufacture with the following, using 75mm high letters in an easily visible location which is hidden once the unit is installed:

- Type and size.
- Casting date.
- Manufacturer’s name.
- Inspection pass date.
- Batch number.
1.3 Execution

1.3.1 Provision for traffic

1.3.1.1 General
Requirement: Conform to MITS 01 Traffic Management.

1.3.2 Site establishment

1.3.2.1 Survey
Requirement: Conform to MITS 00A General Requirements.

1.3.3 Handling, delivery and storage

1.3.3.1 General
Lifting: Provide lifting holes, galvanized lifting points or steel lifting eyes in the culvert units, link and base slabs for all culverts larger than 600 x 450. Handle and load precast box culvert units to prevent any damage to the units.

Delivery and storage: Do not transfer completed precast box culvert units from the place of manufacture until the following is achieved:

> 70% of the minimum concrete strength.
> Small culvert units: Cured to AS 1597.1 clause 2.6.3.
> Large culvert units: Cured to AS 1597.2 clause 2.6.3.

Inspection: Inspect batches of precast box culvert units for dimensional accuracy and defects following delivery to installation location. Conform to the following:

> Small culvert unit: To AS 1597.1.
> Large culvert unit: To AS 1597.2.

This is a HOLD POINT.

1.3.4 Excavation

1.3.4.1 General
Excavation: Conform to MITS 03A Trenching for underground services and MITS 02B Bulk Earthworks.

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

1.3.5.1 Rock foundations
Level: Excavate foundations in rock neatly to the underside of the bedding as shown on the drawings.

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

Rock: If rock is encountered over part of the foundation, excavate the whole of the foundation to a depth of 300mm below the level of the bottom of the base concrete slab.

Backfill: Replace and compact this additional excavation with backfill material to provide uniform bearing conditions. Conform to MITS 03A Trenching for underground services, Grading limits for bed and haunch zones (stormwater) table.

1.3.5.2 Bedding
Bedding: Unless note otherwise, provide DGB20 bedding for cast insitu base slabs:

> DGB20 material: To MITS 04 Flexible pavement construction.
> Lightly bound and compacted: To MITS 03A Trenching for underground services.
> Dimensions: As shown on the drawings.
> Place to the line and level of the underside of the base slab: ± 10mm in level and ± 5mm in line.
> Finish: Smooth surface finish by screeding.

1.3.6 Installation

1.3.6.1 General
Inlet and outlet invert levels: As shown on the drawings ± 10mm and smooth, uniform gradient throughout each culvert length.

Installation: Conform to the following:

> Small culvert units: To AS 1597.1 Section 4, the Drawings, MITS 10 Concrete works and this Specification.
> Large culvert units: To AS 1597.2 Section 5, the Drawings, MITS 10 Concrete works and this Specification.

This is a HOLD POINT.

1.3.6.2 Cast insitu base and link slabs
Requirement: Construct cast insitu base slabs to the dimensions shown on the Drawings and in conformance with this Specification.

Formwork and reinforcement: Certify that the installation of reinforcement and compliance of formwork conforms with MITS 10 Concrete works and the Drawings. The placed reinforcement shall be inspected by the Authorised Person prior to the concrete being poured.

This is a HOLD POINT.

Traffic: Prevent construction or public traffic over the base slab within 7 days of placement.
Tolerance: Conform to the following:

- Invert levels: -10mm, +10mm.
- Grade: 5mm in 2.5m (1 in 500).
- Plan position: ±50mm.
- Surface irregularities: < 5mm abrupt and 8mm over a 3m straightedge.

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

Minimum strength requirement: Provide NATA test certificate to confirm the base slab has attained the required compressive strength specified on the Drawings. Do not install precast units until after the base slab has attained the minimum compressive strength.

This is a WITNESS POINT.

1.3.6.3 Placement of units

Pre-cast or cast in situ base slabs: When two or more rows of parallel box sections are to be constructed together, they shall be laid on a single base slab.

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

Cement mortar: 0.4 : 1 : 3, Water : Cement : Sand ratio by mass.

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

Voids: Seal lifting holes and butt joints between the ends of units with cement mortar or grout of a consistency that ensures the void is filled.

Mortar bed on supports: Thoroughly clean the bearing areas of the supports before placement of top slabs on U-shaped units or link slabs on adjacent crown units and cover with a bed of mortar.

Thickness of mortar bed: >5mm after placement of precast units.

Lifting hooks: Cut lifting hooks and seal the exposed steel with an anti corrosion coating approved by the Authorised Person.

Multi-cell: In the case of multi-cell culverts, provide a gap between adjacent cells as shown on the drawings or typically 15mm. Fill this gap with cement mortar or grout.

Curing of joints: Protect all mortar joints from the sun and cure in an approved manner > 48 hours prior to placing backfill.

Joint covering: Cover all external surfaces of joints between precast crown units, both laterally and longitudinally for the full length, and minimum 250mm width, with strips of non-woven geotextile of minimum mass 270 grams/m2 in conformance with AGPT04G/09.

Check inspection: Prior to backfill placing inspect and make good all seals, joints and levels.

This is a HOLD POINT.
1.3.7 Backfill

1.3.7.1 General
Removal of formwork: Remove all bracing and formwork prior to backfilling.

Embankments: Unless otherwise specified, construct culverts in conjunction with or prior to filling embankments.

Zones: Place selected backfill in the side zones of the box culverts and wingwalls, and to a depth of 300mm in the overlay zone of the culverts.

Backfill: Conform to *MITS 03A Trenching for underground services, Grading limits for side and overlay zones (stormwater) table*. Alternatively, cementitious flowable fill with a compressive strength in the range 0.6Mpa to 3 Mpa may be used. Backfilling shall not take place until the cast-in place reinforced concrete base slab, if any, has reached its specified 28-day strength.

Compaction: Compact in layers > 150mm compacted thickness.

Ordinary backfill: Backfill the remainder of the excavation with General Fill in conformance with *MITS 02B Bulk earthworks*.

Wingwalls: Do not place backfill against wingwalls until concrete has gained sufficient strength as directed in the Drawings.

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 shown on the drawings and in conformance with *MITS 03J Subsoil and foundation drains*.

Balancing backfill: Place backfill layers simultaneously on both sides of the culvert with a maximum 600mm level difference to avoid differential loading. Commence backfilling and compaction at the wall and proceed away from it.

This is a WITNESS POINT.

Horizontal terraces: If the slopes bounding the excavation are steeper than 4H:1V, cut benches in the form of successive horizontal terraces at least 1m in width before the backfill is placed.

1.3.8 Finishing

1.3.8.1 General
Requirement: Remove and replace a precast box culvert if required for any of the following reasons:

> Any culvert is not within tolerances true to line.
> The level or grade shows settlement of the culvert after installation.
> Damage occurs during backfilling, compaction or subsequent operations.

Flushing: Flush clean all culverts from end to end and maintain in proper working order until the completion of works.
1.3.8.2 Construction loading on culverts
Constraint: Prevent the passage of construction vehicles and plant over the culvert until 28 days after the casting of the base slab or until the compressive strength of the base slab concrete has reached 32MPa.

This is a HOLD POINT.

Construction vehicles or plant: Where construction vehicles or plant with axle loads > 50t submit proposed procedure for prevention of early loading and method for approval.

Loading restrictions: Provide construction vehicle loads on culverts for various design fill heights to conform to manufacturers specifications.

1.4 Completion
1.4.1.1 Submissions
Work as Executed Records: To MITS 00B Quality Requirements.
2 MEASUREMENT AND PAYMENT

2.1 Measurement

2.1.1.1 General
Payments made to the Bill of Quantities: To MITS 00A General requirements, this Specification, the drawings and Pay items.

2.1.1.2 Methodology
The following methodology will be applied for measurement and payment:

- Allow for all work, materials, testing and quality assurance requirements in each Pay Item.
- Embankment backfill: To MITS 02B Bulk earthworks.
- Excavation, bedding, support and backfill material for precast reinforced box culverts: Conform to MITS 03A Trenching for underground services, paid under this Specification.
- Backfill under roads, paths and driveways: Extra over to MITS 03H Road openings and restorations.
- Cast-insitu headwalls and wingwalls: To MITS 03D Drainage structures.
- Subsoil drains: To MITS 03J Subsoil and foundation drains.
- Excavation for inlet and outlet channels: To MITS 02B Bulk earthworks.
- Miscellaneous minor concrete work not included in the pay items in this Specification: Conform to MITS 10 Concrete works.
- All costs associated with removal of water from excavations shall be included within respective excavation rates for stormwater pipes and drainage structures.
- No Additional payment will be made for excavation in rock, overbreak of trench due to ground conditions or over excavation of trenches.

2.1.1.3 Deductions
Insitu concrete strength: Deductions made as follows:

- Scheduled rate of payment is reduced by 2% for each 1%, or fraction thereof, by which the strength of the specimen fails to reach the specified strength, up to a maximum deficiency of 10%.
- If the deficiency in strength exceeds 10%, the concrete represented by the specimens may be rejected, in which case no payment will be made.
## 2.2 Pay items

### Table 3C-3 Pay items table

<table>
<thead>
<tr>
<th>Item No</th>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule of rates scope</th>
</tr>
</thead>
</table>
| **3C.1** | Cast insitu base slab | Number              | All activities associated with the construction of cast insitu base slabs including excavation for the slab in all types of material encountered including rock, over excavation for bedding, shoring, foundation preparation, bedding, supply and installation of concrete, reinforcement and formwork. A separate pay item shall be included in the Contract for each culvert including a description of the slab dimensions. For example;  
3C.1.1 Culvert 1: 1200x3000x200 base slab  
3C.1.2 Culvert 2: 2x5000x4500x250 base slab  
Etc... |
| **3C.2** | Precast RCBC           | Number              | All activities associated with the construction of Precast RCBC’s including supply and installation of the units. This pay item shall include excavation for the units in all types of material encountered including rock, shoring, jointing including “sand bands”, sealing, backfilling and compaction. A separate pay item shall be included in the Contract for each culvert dimension. For example;  
3C.2.1 900Wx450H  
3C.2.2 3000Wx1200H  
Etc... |
| **3C.3** | Cast insitu link slab  | Number              | All activities associated with the construction of cast insitu link slabs including excavation for the slab in all types of material encountered including rock, over excavation for bedding, foundation preparation, bedding, supply and installation of concrete, pinning, reinforcement and formwork. A separate pay item shall be included in the Contract for each culvert including a description of the slab dimensions. For example;  
3C.3.1 Culvert 1: 5000x4500x200 link slab  
Etc... |
| **3C.4** | Modify precast RCBC    | Number of precast units modified | All activities extra over Precast RCBC associated with the adjustment of precast units to suit splays or skewed headwalls as specified. This pay item shall include cutting, sealing, finishing and legal disposal of off-cuts. |