

# CAPRICORN MUNICIPAL DEVELOPMENT GUIDELINES

## PRECAST BOX CULVERTS

C222

# CONSTRUCTION SPECIFICATION



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**Keeping the Capricorn Municipal Development Guidelines up-to-date**

The Capricorn Municipal Development Guidelines are living documents which reflect progress of municipal works in the Capricorn Region. To maintain a high level of currency that reflects the current municipal environment, all guidelines are periodically reviewed with new editions published and the possibility of some editions to be removed. Between the publishing of these editions, amendments may be issued. It is important that readers assure themselves they are using current guideline, which should include any amendments which may have been published since the guideline was printed. A guideline will be deemed current at the date of development approval for construction works.

## GENERAL

### C222.01 SCOPE

1. This Specification covers the installation of precast concrete box culverts and should be read in conjunction with the Specification for STORMWATER DRAINAGE - GENERAL.

2. The work to be executed under this Specification consists of:

***Extent of Work***

- (a) preparation of foundations;
- (b) provision of bedding;
- (c) construction of base slabs;
- (d) installation of precast culvert units;
- (e) headwalls and wingwalls;
- (f) backfilling against structures;
- (g) excavation of inlet and outlet channels.

3. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification for STORMWATER DRAINAGE - GENERAL C220 - Annexure C220A Part for Quality Requirements.

***Quality***

### C222.02 REFERENCE DOCUMENTS

1. Documents referenced in this Specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated.

***Documents  
Standards Test  
Methods***

#### (a) Council Specifications

- C213 - Earthworks
- C220 - Stormwater Drainage - General
- C224 - Open Drains, including Kerb and Gutter
- C242 - Flexible Pavements
- C271 - Minor Concrete Works

#### (b) Australian Standards

- AS1597.1 - Precast reinforced concrete box culverts - Small culverts
- AS1597.2 - Precast reinforced concrete box culverts - Large culverts
- AS/NZS ISO 9001:2000 – Quality Management System Requirements

Quality Systems - Model for Quality Assurance in Production, Installation and Servicing.

#### (c) Other

- AUSTROADS - Guide to Geotextiles

## **MATERIALS**

### **C222.03 CULVERT UNITS, LINK AND BASE SLABS**

1. The supply and testing of precast reinforced concrete box culvert units, link and base slabs shall be in accordance with AS 1597.1 for small culverts not exceeding 1200mm width and 900mm depth and AS 1597.2 for large culverts from 1500mm span and up to and including 4200mm span and 4200mm height **Supply**
2. Each unit shall be marked at time of manufacture with: **Marking**
  - (a) Type and size
  - (b) Casting date
  - (c) Manufacturer's name
  - (d) Inspection pass and date.

### **C222.04 CONCRETE**

1. The concrete and reinforcement for cast-in-situ base slabs shall comply with the Specification for MINOR CONCRETE WORKS C271. **Quality**

### **C222.05 SELECTED BACKFILL**

1. The quality of selected backfill shall comply with the requirements in AS 1597.2. **Quality**

### **C222.06 ORDINARY BACKFILL**

1. Ordinary backfill is material obtained from culvert excavations, cuttings and/or borrow areas which are to be in accordance with the requirements for the upper 1.0m of embankment construction as detailed in the Specification for EARTHWORKS C213. **Quality**

## **CONSTRUCTION**

### **C222.07 EXCAVATION**

1. Excavation shall be carried out in accordance with the provisions in the Specification for STORMWATER DRAINAGE – GENERAL C220. **Specification**
2. The excavated trench width shall be, the width of the base slab plus 150mm minimum each side. **Trench Width**

### **C222.08 FOUNDATIONS**

1. Rock foundations shall be neatly excavated to the underside of the mass concrete or selected fill bedding shown on the Drawings. All minor fissures shall be thoroughly cleaned out and refilled with concrete, mortar or grout. All loose material shall be removed. **Rock Foundations**

- |   |   |
|---|---|
| 2. Where rock is encountered over part of the foundation only and lies within 300mm below the underside of the mass concrete or selected fill, all material shall be removed to a depth of 300mm below the mass concrete or selected fill for the full width of the foundation over the length where the rock is encountered. This additional excavation shall be backfilled with ordinary backfill material. | <b><i>Additional<br/>Excavation</i></b> |
| 3. Over-excavation or uneven surfaces shall be corrected with mass concrete so as to provide a uniform surface at least 50mm above the highest points of rock.  | <b><i>Uniform<br/>Surface</i></b>       |
| 4. Earth foundations shall be finished to line and level to the underside of bedding shown on the Drawings. Care shall be taken to avoid disturbing material below this level.  | <b><i>Line and Level</i></b>            |
| 5. All soft, yielding or unsuitable material shall be removed and replaced with ordinary backfill material as directed by the Superintendent and backfilled in accordance with the Specification for STORMWATER DRAINAGE – GENERAL C220.  | <b><i>Unsuitable<br/>Material</i></b>   |

### **C222.09 BEDDING**

#### **(a) Cast-In-Situ Base Slabs**

- |  |                             |
|--|-----------------------------|
| 1. No bedding material shall be placed until the foundations have been inspected and approved by the Superintendent.   | <b><i>Inspection</i></b>    |
| 2. Bedding shall be either mass concrete or lightly bound paving material which complies with the requirements of at least a Type 2, Subtype 2.4 material as defined in the Specification for FLEXIBLE PAVEMENTS C242, whichever is shown on the Drawings.   | <b><i>Type</i></b>          |
| 3. Mass concrete bedding shall be of the same compressive strength as for the base slab and shall not be less than 50mm thick over any point in the foundation. It shall be laid to the line and level of the underside of the base slab to a tolerance of $\pm 10$ mm in level and $\pm 5$ mm in line. The bedding shall be finished to a smooth surface. | <b><i>Mass Concrete</i></b> |

#### **(b) Precast Base Slabs**

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|--|-----------------------------|
| 1. Precast base slabs, U-shaped culvert units and one piece culvert units shall be supported on a bed zone of selected backfill of minimum compacted depth 150mm in accordance with AS 1597.2. | <b><i>Selected Fill</i></b> |
|--|-----------------------------|

### **C222.10 CAST-IN-SITU BASE SLABS**

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|--|--------------------------------------|
| 1. Cast-in-situ base slabs shall be constructed to the dimensions shown on the Drawings and in accordance with the requirements of the Specification for MINOR CONCRETE WORKS C271. The invert levels shall be within $\pm 10$ mm of the design level, grade shall not vary from design by more than 5mm in 2.5m (1 in 500) and shall not vary from the design position by more than $\pm 50$ mm.. | <b><i>Construction</i></b>           |
| 2. Recesses to accommodate the walls of the precast crown units shall be formed in the base slab to the dimensions shown on the Drawings.  | <b><i>Recesses for<br/>Walls</i></b> |

### **C222.11 INSTALLATION OF PRECAST UNITS**

- |  |                                    |
|--|------------------------------------|
| 1. Precast units shall not be installed until the base slab has attained a minimum compressive strength of 20 MPa. | <b><i>Minimum<br/>Strength</i></b> |
|--|------------------------------------|

## PRECAST BOX CULVERTS

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2. Precast crown units shall be placed on a bed of mortar in the recesses in the base slab. Any gaps between the side walls and the sides of the recesses shall be packed with cement mortar. Lifting holes and butt joints between units shall be packed or sealed with cement mortar or grout. **Mortar Bed in Recess**
3. Before placement of top slabs on U-shaped units or link slabs on adjacent crown units, the bearing areas of the supports shall be thoroughly cleaned and covered with a bed of mortar of minimum thickness 5mm after placement of precast unit. **Mortar Bed on Supports**
4. Steel lifting hooks shall be cut flush with the surface of the concrete, cleaned to bright metal and coated with two coats of coal tar epoxy. Alternatively, they shall be cut off 12mm below the surface of the unit and the recess sealed with epoxy mortar. **Lifting Hooks**
5. In the case of multi-cell culverts, a nominal 15mm gap shall be provided between adjacent cells. This gap shall be filled with cement mortar or grout. **Gap Between Cells**
6. All mortar joints shall be protected from the sun and cured in an approved manner for not less than 48 hours. **Curing of Joints**
7. All external surfaces of joints between precast crown units, both laterally and longitudinally, shall be covered full length, and minimum 250mm width, with strips of non-woven geotextile of minimum mass 270 g/m<sup>2</sup> in accordance with AUSTRROADS Guide to Geotextiles. **Joint Covering**

### C222.12 BACKFILL

1. All bracing and formwork shall be removed prior to backfilling. **Removal of Formwork**
2. Selected backfill shall be placed in the side zones of the box culverts and wingwalls, and to a depth of 300mm in the overlay zone of the culverts, in layers with a maximum compacted thickness of 150mm in accordance with the backfilling and compaction requirements of AS 1597.2. The remainder of the excavation shall be backfilled with ordinary embankment fill in accordance with the Specification for EARTHWORKS C213. **Selected Fill**
3. No backfill shall be placed against wingwalls until 21 days after casting. **Wingwalls**
4. Backfill layers shall be placed simultaneously on both sides of the culvert with a maximum 600mm level difference to avoid differential loading. Backfilling and compaction shall commence at the wall and proceed away from it. **Sequence**
5. Where the slopes bounding the excavation are steeper than 4:1, they shall be cut in the form of successive horizontal terraces of at least 1m width before the backfill is placed. **Horizontal Terraces**

### C222.13 EXCAVATION OF INLET AND OUTLET CHANNELS

1. Excavation of inlet and outlet channels shall be carried out as shown on the Drawings and shall extend to join the existing stream bed in a regular manner as detailed in the Specification for OPEN DRAINS INCLUDING KERB AND GUTTER C224. **Extent**

### C222.14 CONSTRUCTION LOADING ON CULVERTS

1. Construction vehicles and plant shall not pass over the culvert until 28 days after the casting of the base slab or until the cylinder compressive strength of the base slab concrete has reached 32MPa. **Traffic Over Culvert**
2. Construction vehicle loads on culverts for various design fill heights shall be in accordance with AS 1597.2. **Loading Restrictions**



## LIMITS AND TOLERANCES

### C222.15 SUMMARY OF LIMITS AND TOLERANCES

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 222.15.1 below:

**Table 222.15.1 - Summary of Limits and Tolerances**

Item	Activity	Limits/Tolerances	Spec Clauses
1.	<b>Mass Concrete Correction</b>		
	a) Over highest points of rock	50mm	C222.08
2.	<b>Mass Concrete Bedding</b>		
	a) Level	± 10mm	C222.09
	b) Line	± 5mm	C222.09
3.	<b>Culvert Location</b>		
	a) Invert Level	±10mm	C222.10
	b) Grade	5mm in 2.5m (1 in 500)	C222.10
	c) Plan Position	±50mm	C222.10