DEVELOPMENT CONSTRUCTION SPECIFICATION

C222

PRECAST BOX CULVERTS

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GENERAL

C222.01 SCOPE

Scope

1. This Specification covers the installation of precast concrete box culverts and should be read in conjunction with Specification C220 - 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) Provision and removal of coffer dams;
(h) Excavation of inlet and outlet channels.

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) Other 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
ISO 9001:2000		Quality Systems.

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 with the following alterations or additional requirements: *Supply*

(a) Proof load testing shall be arranged by the Contractor in batches as specified in either AS 1597.1 or AS1597.2 as appropriate.

(b) Lifting holes, galvanised lifting points or steel lifting eyes shall be provided in the culvert units, link and base slabs.

(c) The end units shall have factory installed starter bars for headwall and wingwall construction.

(d) Delivery and unloading shall be the Contractor's responsibility.

2. The Supplier shall implement and maintain a Quality System in accordance with ISO 9001:2000 to ensure materials and manufacture conform to the appropriate Standards.

3. A conformance certificate for the box culvert units shall be submitted at least 3 working days prior to despatch.

4. Each unit shall be marked at time of manufacture with:

(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 Specification C271 – MINOR CONCRETE WORK. ***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 is in accordance with the requirements for the upper 1.0m of embankment construction as detailed in Specification C213 -EARTHWORKS. ***Quality***

CONSTRUCTION

C222.07 COFFER DAMS

1. At some sites it may be expedient for the Contractor to construct a cofferdam.

2. Cofferdams shall be sufficiently watertight to prevent damage of the concrete by percolation or seepage through the sides, and shall be taken sufficiently below the level of the foundations to prevent loosening of the foundation materials by water rising through the bottom of the excavation. Coffer dams shall be adequately braced and shall be so constructed that removal will not weaken or damage the structure. ***Construction***

3. A cofferdam may be constructed to the actual size of the reinforced concrete invert slab and used as side forms for the concrete. The details of the cofferdam and formwork, and the clearances proposed shall be subject to the approval of the Council's Development Engineer.

4. Cofferdams that have tilted or have moved laterally during sinking shall be righted or ***Specified***

enlarged to provide specified clearances. *Clearances*

5. No timber or bracing shall be left in the concrete or in the backfill of the finished structure. Cofferdams, including temporary piles, shall be removed at least to the level of the invert after completion of the structure. *Removal*

C222.08 EXCAVATION

1. Excavation shall be carried out in accordance with the provisions in Specification C220 – STORMWATER DRAINAGE - GENERAL. *Specification*

2. The trench width shall be the width of the base slab plus 150mm minimum each side. *Trench Width*

C222.09 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, or 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. *Additional Excavation*

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. *Uniform Surface*

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. *Line and Level*

5. All soft, yielding or unsuitable material shall be removed and replaced with ordinary backfill material as directed by the Council's Development Engineer and backfilled in accordance with Specification C220 - STORMWATER DRAINAGE - GENERAL. *Unsuitable Material*

C222.10 BEDDING

(a) In-Situ Base Slabs

1. No bedding material shall be placed until the foundations have been inspected and approved by the Council's Development Engineer. *Inspection*

2. Bedding shall be either mass concrete or lightly bound DGB20 in accordance with Specification C242 – FLEXIBLE PAVEMENTS, whichever is shown on the Drawings. *Type*

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 ± 10mm in level and ± 5mm in line. The bedding shall be finished to a smooth surface. *Mass Concrete*

(b) Precast Base Slabs

1. Precast base slabs will not be permitted

C222.11 IN-SITU BASE SLABS

1. Cast-in-situ base slabs shall be constructed to the dimensions shown on the Drawings and in accordance with the requirements of Specification C271 - MINOR CONCRETE WORKS. The invert levels shall be within -10mm to +10mm, grade 5mm in *Construction*

2.5m (1 in 500) and plan position ±50mm.

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. ***Recesses for Walls***

C222.12 BACKFILL

1. All bracing and formwork shall be removed prior to backfilling. ***Removal of Formwork***

2. Selected fill 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 Specification C213 – EARTHWORKS. ***Selected Fill***

3. No fill 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 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 Specification C224 – OPEN DRAINS INCLUDING KERB AND GUTTER. ***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 TOLERANCES

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

Item	Activity	Tolerance	Spec Clauses
1.	**Mass Concrete Bedding**		
	a) Level	± 10mm	C222.10
	b) Line	± 5mm	C222.10
2.	**Culvert Location**		
	a) Invert Level	±10mm	C222.11
	b) Grade	5mm in 2.5m (1 in 500)	C222.11
	c) Plan Position	±50mm	C222.11

Table C222.1 - Summary of Limits and Tolerances