

COFFS HARBOUR CITY COUNCIL



**DEVELOPMENT SPECIFICATION
DESIGN**

1354 Drainage structures

Version 1 01 January 2009

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| 1354 DRAINAGE STRUCTURES |
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1 SCOPE AND GENERAL

1.1 SCOPE

This worksection covers the construction of drainage structures and shall be read in conjunction with 1351 *Stormwater drainage (Construction)* and 1352 *Pipe drainage*, 1353 *Precast box culverts* and 1121 *Open drains, including kerb and channel (gutter)*, as applicable.

The work to be executed under this worksection consists of the construction of headwalls, wingwalls, pits, gully pits, inspection pits, junction boxes/pits, drop structures, inlet and outlet structures, energy dissipators, batter drains and other supplementary structures as shown on the Drawings.

1.2 QUALITY

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are given in 0161 *Quality (Construction)*.

1.3 REFERENCED DOCUMENTS

The following documents referred to in this worksection shall be deemed as the latest edition of the Australian Standards, including amendments and supplements.

Worksections

- 0161 *Quality (Construction)*
- 0310 *Minor concrete works*
- 1102 *Control of erosion and sedimentation*
- 1112 *Earthworks (Roadways)*
- 1121 *Open drains, including kerb and channel (gutter)*
- 1351 *Stormwater drainage (Construction)*
- 1352 *Pipe drainage*
- 1353 *Precast box culverts*

Standards

- AS 3996 Metal access covers, road grates and frames

2 MATERIALS

2.1 STRUCTURES

Drainage structures shall be constructed in concrete and in accordance with 0310 *Minor concrete works*.

All structures shall be constructed as soon as practicable and shall be completed not later than 28 days after the construction of the associated culverts, unless otherwise approved by the Superintendent.

2.2 PRECAST UNITS

Handling and installation

Where precast units, including kerb inlet lintels, are provided in the design they shall be handled and installed in accordance with the manufacturer's instructions.

Replacing cast-in-situ with precast units

If the Contractor proposes to use precast units in place of cast-in-situ units, detailed drawings and complete details of installation procedures shall be submitted for the approval of the Superintendent.

Delivery

Unless otherwise approved by the Superintendent, precast units shall not be delivered to the site before satisfactory documentary evidence has been submitted to the Superintendent that quality tests have been carried out.

This action constitutes a HOLD POINT.

The Superintendent's approval to the quality test documentation is required prior to the release of the hold point.

3 CONSTRUCTION

3.1 ALIGNMENT OF HEADWALLS, PITS AND WINGWALLS

Unless otherwise shown on the Drawings, headwalls and pits shall be constructed parallel to the road centreline and wingwalls at 135° to the headwall.

Where the culvert is laid skew to the road, the wingwalls and headwalls shall be splayed so that the front edge of the wing bisects the angle between the centreline of the culvert and the headwall.

Energy dissipators shall be constructed in accordance with the Drawings and with centreline on the axis of the culvert.

3.2 HEADWALLS AND WINGWALLS**Batter retention**

The wingwalls shall be constructed to retain the batters effectively. Where the dimensioned drawings do not satisfy this requirement the Superintendent shall be notified before the headwalls and wingwalls are constructed.

The Superintendent shall direct the Contractor as to the action to be taken.

Rock foundations

Where rock is encountered at the bottom of excavations for wingwalls and headwalls, and after approval is given by the Superintendent, the depth of cut-off walls in uniform rock over the full width of the foundations may be reduced to less than that shown in the Drawings, but must be not less than 150 mm into sound rock.

3.3 PITS**Construction**

All new pits, including access covers, gully grates and frames complying with AS 3996, shall be constructed to the details shown on the Drawings.

Modification of existing pits is only to be carried out if such is shown on the Drawings.

Full depth rock excavation

Where the full depth of the excavation is in sound rock, and the Superintendent approves, part of the concrete lining of gully pits and sumps may be omitted, provided that a neatly formed pit of the required dimensions is constructed.

In all such cases the wall of the pit adjacent to and parallel to the road shall be constructed of concrete.

Step irons

Step irons shall be installed in accordance with the Drawings.

Step irons shall be either fixed firmly in the formwork prior to pouring the concrete for the pit walls or by using blockout formers to make recesses in the concrete to receive the arms of the step irons or alternatively, installed at a later date by drilling the pit wall.

Holes may only be drilled using a rotary masonry bit or similar. Percussion tools shall not be used to form the hole for the step iron.

Where the step irons are installed in recesses or drill holes after the concrete wall is poured, the step irons shall be fixed in position by using an epoxy resin in accordance with the step iron and epoxy resin manufacturer's instructions and specifications.

The Contractor shall ensure that no movement of the step irons occurs until the epoxy resin has reached the specified strength.

Inlet and outlet pipes

Inlet and outlet pipes shall be integrally cast into the pit at the time of pouring the concrete for the pit walls.

Subsoil drain

A subsoil drain shall be installed into the pit or headwall in accordance with 1352 *Pipe drainage*.

3.4 BULKHEADS

Concrete bulkheads shall be constructed on all pipe stormwater drainage lines where the pipe gradient of the line exceeds 5%.

Bulkheads shall be constructed at the spacings and to the details shown on the Drawings.

3.5 JOINTING

Where drainage structures abut concrete paving, kerb and gutter or other concrete structures, a 10 mm wide joint shall be provided between the structure and paving or kerb and gutter or other concrete structure.

The joint shall consist of preformed jointing material of bituminous fibreboard or equivalent approved by the Superintendent.

3.6 FOUNDATION FOR CONCRETE BASES**Mass concrete bedding for concrete bases**

Mass concrete bedding for reinforced concrete bases shall not be placed on earth or rock foundations until the foundations have been inspected and approved by the Superintendent.

Following such approval, the surface of the foundation shall be dampened and a layer of concrete not less than 50 mm thick, shall be placed over the excavated surface and shall be finished to a smooth even surface.

Foundation preparation constitutes a HOLD POINT.

The Superintendent's approval of the foundation is required prior to the release of the hold point.

Unreinforced Concrete Base

Unreinforced concrete bases may be cast on earth or rock foundations without the mass concrete bedding.

Foundation preparation constitutes a HOLD POINT.

The Superintendent's approval of the foundation is required prior to the release of the hold point.

3.7 BACKFILL**Commencement**

Backfilling shall not commence until the compressive strength of concrete has reached at least 15 MPa unless otherwise approved by the Superintendent.

Selected backfill

Selected backfill shall be placed against the full height of the vertical faces of structures for a horizontal distance equal to one-third the height of the structure.

Composition

Selected backfill shall consist of a granular material in accordance with 1112 *Earthworks (Roadways)*.

Horizontal terraces

Special care shall be exercised to prevent wedge action against vertical surfaces during the backfilling.

Where the sides of the excavation are steeper than 4 horizontally to 1 vertically they shall be cut in the form of successive horizontal terraces at least 600 mm in width, as the backfill is placed.

Backfill on both sides of the structure shall be carried up to level alternately in layers so as to avoid wedge action or excessive horizontal forces.

Backfilling and compaction shall commence at the wall. Compaction shall be in accordance with 1351 *Stormwater drainage (Construction)*.

4 LIMITS AND TOLERANCES

The limits and tolerances applicable to this worksection are summarised in Table 4.1.

Table 4.1 Summary of limits and tolerances

| Activity | Limits/Tolerances | Clause Worksection Reference |
|--|-------------------|--------------------------------------|
| Headwalls and wingwalls – cut off walls | | |
| – Depth into sound rock | >150 mm | Headwalls and Wingwalls |
| Foundation for concrete bases | | |
| – Mass concrete bedding depth | >50 mm | Foundation for Concrete basis |

5 MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

Payment shall be made for all the activities associated with completing the work detailed in this worksection on a schedule of rates basis, in accordance with the Pay Items 1354.1 to 1354.3 inclusive.

A lump sum price for any of these items shall not be accepted.

If any item, for which a quantity of work listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in other items for the cost of the activity which has not been priced.

Excavation is measured and paid in accordance with 1351 *Stormwater drainage (Construction)*.

Backfill is measured and paid in accordance with this worksection and not 1112 *Earthworks (Roadways)*.

Drainage structures are measured and paid in accordance with this worksection and not 0310 *Minor concrete works*.

Miscellaneous minor concrete work not included in the pay items in this worksection shall be in accordance with pay items described in 0310 *Minor concrete works*.

5.2 PAY ITEMS

1354.1 Concrete headwalls and wingwalls

The unit of measurement shall be cubic metre of concrete as calculated from the dimensions on the Drawings.

The Schedule Rate shall include formwork, supply and fixing of steel reinforcement, supply, placing and curing of concrete, stripping, finishing and backfilling.

1354.2 Pits, dissipators, channel basins and other supplementary structures

The unit of measurement shall be 'each' for the completed structures as scheduled.

The rate shall include all activities and materials required to complete the structures as shown on the Drawings, including the supply and installation of all cast in metalwork, frames, grates, lintels and lids, finishing and backfilling.

1354.3 Bulkheads

The unit of measurement shall be 'each' bulkhead completed.

The rate shall include all activities and materials required to complete the bulkhead structures as shown on the Drawings, including formwork, supply and fixing of steel reinforcement, supply, placing and curing of concrete, stripping and selected backfilling.