



WESTERN AUSTRALIA SPECIFICATION

223

DRAINAGE STRUCTURES

Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
<i>EXAMPLE 1</i>	<i>Provision for acceptance of nonconformance with deduction in Payment</i>	<i>XYZ.00</i>	<i>AP</i>	<i>KP</i>	<i>2/6/97</i>

SPECIFICATION 223 - DRAINAGE STRUCTURES

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SPECIFICATION 223 : DRAINAGE STRUCTURES

GENERAL

223.01 SCOPE

1. This Specification covers the construction of drainage structures and shall be read in conjunction with the Specification for STORMWATER DRAINAGE - GENERAL and other drainage Specifications as applicable:

Associated Specifications

- | | | |
|-----|---|----------------------|
| 221 | - | Pipe Drainage |
| 222 | - | Precast Box Culverts |
| 224 | - | Open Drains |

2. The work to be executed under this Specification 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.

Extent of Work

3. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements.

Quality

223.02 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

- | | | |
|-----|---|-------------------------------|
| 213 | - | Earthworks |
| 220 | - | Stormwater Drainage - General |
| 221 | - | Pipe Drainage |
| 222 | - | Precast Box Culverts |
| 224 | - | Open Drains |
| 271 | - | Minor Concrete Works |

(b) Australian Standards

- | | | |
|---------|---|---|
| AS 3996 | - | Metal Access Covers, Road Grates and Frames |
|---------|---|---|

MATERIALS

223.03 GENERAL

1. Drainage structures shall be constructed in concrete and in accordance with the Specification for MINOR CONCRETE WORKS.

Concrete Work

2. 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.

Time for Completion

223.04 PRECAST UNITS

1. Where precast units, including kerb inlet units, are provided in the design they shall be handled and installed in accordance with the manufacturer's instructions.
2. 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.
3. 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.

Manufacturer's Instructions

Approval

Delivery

HP

CONSTRUCTION

223.05 ALIGNMENT

1. Unless otherwise shown on the Drawings, headwalls and pits shall be constructed parallel to the road centreline and wingwalls at 135° to the headwall.
2. 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.
3. Energy dissipators shall be constructed in accordance with the Drawings and with centreline on the axis of the culvert.

Skew Angle

Energy Dissipators

223.06 HEADWALLS AND WINGWALLS

1. 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.
2. 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 150mm into sound rock.

Batter Retention

Rock Foundations

223.07 PITS

1. 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.

Construction

2. 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.

***Full Depth
Rock
Excavation***

3. Step irons shall be installed in accordance with the Drawings." Key words "Step Irons

Step Irons

4. 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.

***Fixing
Methods***

5. Where the step irons are installed in recesses or drillholes 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 manufacturers' instructions and specifications. The Contractor shall ensure that no movement of the step iron occurs until the epoxy resin has reached the specified strength.

Epoxy Fixing

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

***Cast-in
Pipes***

7. For clayey conditions, a subsoil drain shall be installed into the pit or headwall in accordance with the general requirements in the Specification for PIPE DRAINAGE.

Subsoil Drain

223.08 BULKHEADS

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

Gradient >5%

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

***Spacings and
Details***

223.09 JOINTING

1. Where drainage structures abut concrete paving, kerb and gutter or other concrete structures, a 10mm wide joint shall be provided between the structure and paving or kerb or other concrete structure. The joint shall consist of preformed jointing material of bituminous fibreboard or equivalent approved by the Superintendent.

***Preformed
Jointing
Material***

223.10 FOUNDATION FOR CONCRETE BASES

1. 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 50mm 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.

***Mass Concrete
Base
Foundation
Inspection***

HP

2. 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.

***Unreinforced
Concrete Base***

HP

DRAINAGE STRUCTURES

223.11 BACKFILL

1. Backfilling shall not commence until the compressive strength of concrete has reached at least 15 MPa unless otherwise approved by the Superintendent. **Commencement**
2. 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. **Selected Backfill**
3. Selected backfill shall consist of a granular material in accordance with the requirements in the Specification for EARTHWORKS. **Composition**
4. 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 600mm in width, as the backfill is placed. **Horizontal Terraces**
5. 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 the Specification for STORMWATER DRAINAGE - GENERAL. **Procedure**

SPECIAL REQUIREMENTS

223.12 RESERVED

223.13 RESERVED

LIMITS AND TOLERANCES

223.14 SUMMARY OF LIMITS AND TOLERANCES

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 223.1 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Cut-off Walls Depth into sound rock	>150mm	223.06
2.	Mass Concrete Bedding	>50mm	223.10

Table 223.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT

223.15 PAY ITEMS

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis, in accordance with the Pay Items 223(a) to 223(c).
2. A lump sum price for any of these items shall not be accepted.
3. 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.
4. Excavation is measured and paid in accordance with the Specification for STORMWATER DRAINAGE - GENERAL.
5. Backfill is measured and paid in accordance with this Specification and not with the Specification for EARTHWORKS.
6. Drainage structures are measured and paid in accordance with this Specification and not with the Specification for MINOR CONCRETE WORKS.
7. Miscellaneous minor concrete work not included in the pay items in this Specification shall be in accordance with pay items described in the Specification for MINOR CONCRETE WORKS.

Pay Item 223(a) CONCRETE HEADWALLS AND WINGWALLS

1. The unit of measurement shall be cubic metre of concrete as calculated from the dimensions on the Drawings.
2. The Schedule Rate shall include formwork, supply and fixing of steel reinforcement, supply, placing and curing of concrete, stripping, finishing and backfilling.

Pay Item 223(b) PITS, DISSIPATORS, CHANNEL BASINS AND OTHER SUPPLEMENTARY STRUCTURES

1. The unit of measurement shall be "each" for the completed structures as scheduled.
2. 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.

Pay Item 223(c) BULKHEADS

1. The unit of measurement shall be "each" bulkhead completed.
2. 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.