

**QPRC**



**QUEANBEYAN PALERANG  
REGIONAL COUNCIL**

**DEVELOPMENT CONSTRUCTION  
SPECIFICATION**

**C223**

**DRAINAGE STRUCTURES**

**VERSION 2 – APRIL 2018**

**TRIM REF: SF140543  
C1850406**

## 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 |
|------------------------|------------------------------------|-----------------------|----------------|-----------------|----------------|
| VERSION 1              | Specification Version 1 referenced | C223.01.1             | A              | KD              | 13/03/10       |
|                        | Inspection requirements added      | C223.01.4             |                |                 |                |
|                        | Specification Version 1 reference  | C223.02.1             |                |                 |                |
|                        | Specification Version 1 reference  | C223.03.1             |                |                 |                |
|                        | Hold Point added                   | C223.03.2             |                |                 |                |
|                        | Witness Point added.               | C223.06.2             |                |                 |                |
|                        | Specification Version 1 reference  | C223.06.7             |                |                 |                |
|                        | Witness Point added.               | C223.07.3             |                |                 |                |
|                        | Hold Point added.                  | C2230.08.1            |                |                 |                |
|                        | Hold Point added.                  | C2230.09.1            |                |                 |                |
|                        | Hold Point added.                  | C223.09.2             |                |                 |                |
|                        | Witness Point added.               | C223.10.1             |                |                 |                |
|                        | Specification Version 1 reference  | C223.10.3 & C223.10.5 |                |                 |                |
|                        | Specification Version 1 reference  | C223.15               |                |                 |                |
|                        | Annexure added                     | C223-A                |                |                 |                |
| VERSION 2              | References to QPRC amended         |                       | M              | CS              | 5/09/2017      |

## SPECIFICATION C223 – DRAINAGE STRUCTURES – VERSION 2

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## SPECIFICATION C223 : DRAINAGE STRUCTURES – VERSION 2

## GENERAL

## C223.01 SCOPE

1. This Specification covers the construction of drainage structures and shall be read in conjunction with the Specification for STORMWATER DRAINAGE – GENERAL - VERSION 2 and other drainage Specifications as applicable: **Associated Specifications**

|      |   |                                                    |
|------|---|----------------------------------------------------|
| C221 | - | Pipe Drainage - Version 2                          |
| C222 | - | Precast Box Culverts - Version 2                   |
| C224 | - | Open Drains, including Kerb and Gutter – Version 2 |

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**

4. The Contractor shall give notice so that inspection may be made of all **HOLD POINTS** and **WITNESS POINTS** documented in this specification and tabulated in Annexure C223-A. Release of **HOLD POINTS** and **WITNESS POINTS** shall be made by the Superintendent, with the concurrence of the Principal Certifying Authority &/or Council, where stipulated in Annexure C223-A. **Inspections**

## C223.02 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 - Version 2                             |
| C220 | -  | Stormwater Drainage – General - Version 2          |
| C221 | -  | Pipe Drainage - Version 2                          |
| C222 | -  | Precast Box Culverts - Version 2                   |
| C224 | -- | Open Drains, including Kerb and Gutter - Version 2 |
| C271 |    | Minor Concrete Works – Version 2                   |

## (b) Australian Standards

|                    |                                                                                          |
|--------------------|------------------------------------------------------------------------------------------|
| AS 1012-Various    | Methods of testing concrete                                                              |
| AS 1379-2007       | Specification and supply of concrete                                                     |
| AS 1478            | Chemical admixtures for concrete, mortar and grout                                       |
| AS 1478.1-2000     | Admixtures for concrete                                                                  |
| AS/NZS 1554        | Structural steel welding                                                                 |
| AS/NZS 1554.3:2008 | Welding of reinforcing steel                                                             |
| AS 1657-1992       | Fixed platforms, walkways, stairways and ladders - Design, construction and installation |
| AS 1726-1993       | Geotechnical site investigations                                                         |
| AS 2758            | Aggregates and rock for engineering purposes                                             |
| AS 2758.1-1998     | Concrete aggregates                                                                      |
| AS 3600-2009       | Concrete structures                                                                      |

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|                  |                                               |
|------------------|-----------------------------------------------|
| AS 3610          | Formwork for concrete                         |
| AS 3610.1-2010   | Documentation and surface finish              |
| AS 3735-2001     | Concrete structures retaining liquids         |
| AS 3972-1997     | Portland and blended cements                  |
| AS 3996:2006     | - Metal access covers, road grates and frames |
| AS/NZS 4671:2001 | Steel reinforcing materials                   |
| AS 5100-Various  | Bridge design                                 |
| NP:PCH-2009      | Precast concrete handbook                     |

### (c) Other publications

|              |                                                 |
|--------------|-------------------------------------------------|
| Austrroads   |                                                 |
| AGPT04G:2009 | Guide to geotextiles – Geotextiles and geogrids |

## CONSTRUCTION

### C223.03 GENERAL

1. Drainage structures shall be constructed in concrete and in accordance with the Specification for MINOR CONCRETE WORKS - VERSION 2. **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. This action constitutes a **HOLD POINT**. **Time for Completion (HP)**

### C223.04 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. **Skew Angle**
3. Energy dissipators shall be constructed in accordance with the Drawings and with centreline on the axis of the culvert. **Energy Dissipators**

### C223.05 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. **Batter Retention**
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. **Rock Foundations**

### C223.06 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. **Modification**

## DRAINAGE STRUCTURES

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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. Approval by the Superintendent constitutes a **WITNESS POINT**. 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 (WP)**
3. Step irons shall be installed in accordance with the Drawings. **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 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 manufacturers' instructions and specifications. The Contractor shall ensure that no movement of the step irons 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. **Casting Pipes**
7. A subsoil drain shall be installed into the pit or headwall in accordance with the general requirements in the Specification for PIPE DRAINAGE - VERSION 2. **Subsoil Drain**
8. Kerb and Gutter is to be stamped with the words "**S/W to river**" adjacent to each stormwater pit **K&G to be stamped S/W to river**

### C223.07 PRECAST UNITS

1. Where precast units including kerb and inlet lintels, are provided in the design they shall be handled and installed in accordance with the manufacturer's instructions. **Manufacturer's Instructions**
2. If the Contractor proposes to use precast units, detailed drawings and complete details of installation procedures shall be submitted for the approval of the Superintendent. **Contractor's Responsibility**
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**. **Delivery (HP)**

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### C223.08 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 and gutter or other concrete structures. The joint shall consist of preformed jointing material of bituminous fibreboard or equivalent approved by the Superintendent. This is a **HOLD POINT**.
- Preformed  
Jointing Material  
(HP)**

### C223.09 MASS CONCRETE BEDDING

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**.
- 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**.
- Unreinforced  
Concrete Base  
(HP)**

### C223.10 BACKFILL

1. Backfilling shall not commence until the compressive strength of concrete has reached at least 15MPa unless otherwise approved by the Superintendent. This constitutes a **WITNESS POINT**.
- Commencement  
(WP)**
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 - VERSION 2.
- 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. - VERSION 2
- Procedure**

## SPECIAL REQUIREMENTS

### C223.11 REQUIREMENTS FOR GROSS POLLUTION TRAP (GPT)

1. Selection of GPT unit type and design will require consultation with Council. Design shall be submitted for approval by Council. This action constitutes a **HOLD POINT**.
2. The maintenance period for GPT's shall be 3 years from the date it is first brought into full service to handover. All GPT's shall be thoroughly cleaned prior to handover. A bond may be required for the maintenance period.

***GPT Selection  
(HP)***

***Maintenance,  
Handover and  
Bond***

### C223.12 RESERVED

### C223.13 RESERVED

## LIMITS AND TOLERANCES

### C223.14 SUMMARY OF LIMITS AND TOLERANCES

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table C223.1 below:

| Item | Activity                                      | Limits/Tolerances | Spec Clause |
|------|-----------------------------------------------|-------------------|-------------|
| 1.   | <b>Cut-off Walls</b><br>Depth into sound rock | >150mm            | C223.05     |
| 2.   | <b>Mass Concrete Bedding</b>                  | >50mm             | C223.09     |

**Table C223.1 - Summary of Limits and Tolerances**



**MEASUREMENT AND PAYMENT****C223.15 PAY ITEMS**

1. Payment shall be made for all activities associated with completing the work detailed in this Specification, in accordance with the Pay Items C223(a) and C223(b).
2. 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.
3. Excavation is measured and paid in accordance with the Specification for STORMWATER DRAINAGE – GENERAL - VERSION 2.
4. Backfill is measured and paid in accordance with this Specification and not with the Specification for EARTHWORKS - VERSION 2.
5. Drainage structures are measured and paid in accordance with this Specification and not with the Specification for MINOR CONCRETE WORKS - VERSION 2.
6. 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 - VERSION 2.

**Pay Item C223(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 C223(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.

## ANNEXURE C223- A

## INSPECTIONS

Give notice so inspection may be made of the following:

## Summary of HOLD POINTS

| Clause title/Item                                           | Requirement                        | Notice for inspection             | Release by                                     |
|-------------------------------------------------------------|------------------------------------|-----------------------------------|------------------------------------------------|
| <b>MATERIALS</b>                                            |                                    |                                   |                                                |
| <b>Precast units</b>                                        |                                    |                                   |                                                |
| <b>C223.07.3 - Delivery</b>                                 | Provide conformance certificate    | 3 working days prior to dispatch  | Superintendent                                 |
| <b>CONSTRUCTION</b>                                         |                                    |                                   |                                                |
| <b>Jointing</b>                                             |                                    |                                   |                                                |
| <b>C223.08.1 – Preformed Jointing Material</b>              | Submit joint material for approval | 5 working days                    | Superintendent                                 |
| <b>Mass Concrete Bedding</b>                                |                                    |                                   |                                                |
| <b>C223.09.1 - Mass Concrete Base Foundation Inspection</b> | Foundation preparation             | 1 working day                     | Superintendent                                 |
| <b>C223.09.2 - Unreinforced concrete base</b>               | Foundation preparation             | 1 working day                     | Superintendent                                 |
| <b>SPECIAL REQUIREMENTS</b>                                 |                                    |                                   |                                                |
| <b>Requirements for Gross Pollution Trap (GPT)</b>          |                                    |                                   |                                                |
| <b>C223.11.1 – GPT Selection</b>                            | Council approval                   | 14 working days prior to delivery | Superintendent – Council concurrence required. |

## Summary of WITNESS POINTS

| Clause title/Item                             | Requirement                                                              | Notice for inspection |
|-----------------------------------------------|--------------------------------------------------------------------------|-----------------------|
| <b>CONSTRUCTION</b>                           |                                                                          |                       |
| <b>Pits</b>                                   |                                                                          |                       |
| <b>C223.06.2 - Full Depth Rock Excavation</b> | Request for reduction in concrete lining depth where rock is encountered | Progressive           |
| <b>Backfill</b>                               |                                                                          |                       |
| <b>C223.10.1 - Commencement</b>               | After compressive strength of concrete reaches 15 MPA                    | Progressive           |