

**Construction Specification
for Civil Works**

C223 – Drainage Structures

TABLE OF CONTENTS

CLAUSE	CONTENTS	PAGE
	ORIGIN OF DOCUMENT, COPYRIGHT	2
	REVISIONS: C223 - DRAINAGE STRUCTURES.....	2
	GENERAL.....	3
C223.01	SCOPE.....	3
C223.02	DEFINITIONS	3
C223.03	REFERENCE DOCUMENTS.....	3
	CONSTRUCTION	5
C223.04	GENERAL	5
C223.05	ALIGNMENT	5
C223.06	HEADWALLS AND WINGWALLS	5
C223.07	PITS.....	5
C223.08	PRECAST UNITS	6
C223.09	JOINTING	6
C223.10	MASS CONCRETE BEDDING	6
C223.11	BACKFILL	6
	LIMITS AND TOLERANCES.....	8
C223.12	SUMMARY OF LIMITS AND TOLERANCES	8

ORIGIN OF DOCUMENT, COPYRIGHT

This document was originally based on AUS-SPEC - Development Construction Specification C223 - Drainage Structures. Substantial parts of the original AUS-SPEC document have been deleted and replaced in the production of this Armidale Regional Council Specification for Civil Works. The parts of the AUS-SPEC document that remain are still subject to the original copyright.

This document has been developed for use with the construction of civil works within the Armidale Regional Council local government area.

This is not a controlled document. A full copy of the latest version of this document can be found on the Armidale Regional Council Internet website: <https://www.armidaleregional.nsw.gov.au/development/planning-controls-guidelines/construction-specifications/construction-specifications>

REVISIONS: C223 - DRAINAGE STRUCTURES

REVISION	CLAUSES AMENDED	AMENDMENT DETAILS	DATE
0		Original Issue	25/09/2023

GENERAL

C223.01 SCOPE

This Specification is for the construction of drainage structures and shall be read in conjunction with C220 - *Stormwater Drainage* and other drainage specifications as applicable.

Associated Specifications

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 dissipaters, batter drains and other supplementary structures as shown on the approved design drawings.

Extent of Work

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in *CQC-Quality Control Requirements Sub-Annexure B2*.

Quality

C223.02 DEFINITIONS

The Works – Defined as follows:

The Works

- **Developer Infrastructure Works** - work includes subdivisions and any public infrastructure work associated with an approved Development in the ARC local government area requiring a construction certificate.
- **Contracted Works** – infrastructure work undertaken by a Principal Contractor or subcontractor formally appointed by ARC and supervised by ARC.
- **Internal Works** - infrastructure work undertaken by ARC's day labour workforce.

Constructor – Defined as the organisation responsible for construction of the Works and the Principal Contractor as defined in the *Work Health and Safety Act 2011*.

Constructor

ARC Representative – Defined as follows:

ARC Representative

- **Developer Infrastructure Works** – Nominated ARC officer(s) for the approved Development.
- **For Contracted Works** – the Superintendent.
- **For Internal Works** – ARC Asset Owner

Constructor's Representative – Defined as follows:

Constructor's Representative

- **Contracted Works** – the Principal Contractor's nominated representative as per the relevant contract.
- **Internal Works** – ARC officer responsible for delivery.

Developer's Representative– Defined as the person or organisation appointed by the Developer to administer the Constructor responsible for the delivery of Developer Infrastructure Works.

Developer's Representative

C223.03 REFERENCE DOCUMENTS

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

Where not otherwise specified in the relevant Armidale Regional Council (ARC) Construction Specifications or the approved design drawings, the Constructor shall use the latest versions of the Reference documentation, including amendments and supplements, listed in the ARC Construction Specifications at the time of the Works approval.

Currency

(a) Armidale Regional Council (ARC) Specifications

- C213 - Earthworks.
- C220 - Stormwater Drainage.
- C221 - Pipe Drainage.
- C271 - Minor Concrete Works.

ARC Specifications

CQC - Quality Control Requirements

(b) Australian Standards

References in this Specification or on the approved design drawings to Australian Standards are noted by their prefix AS or AS/NZS.

Australian Standards

AS 3996 - Access Covers and Grates.

(c) ARC Standard Drawings Applicable to this Section:

ARC Standard Drawings

- 080-026 Interallotment Property Drainage Connections.
- 080-027 Property Stormwater Connection to Kerb Inlet Gully Pit.
- 080-028 Precast Components for Kerb Inlet Lintels.
- 080-029 Precast Components for Stormwater Pits.
- 080-031_1 Rear Access Gully Pit Pipes up to DN600.
- 080-031_2 Rear Access Gully Pit Pipes greater than DN600.
- 080-032 Standard Junction Pit.
- 080-033 Standard Grated Gully Pit in Concrete Accessways.
- 080-034 Surface Inlet Pit Concrete Lid.
- 080-035 Standard Grated Kerb Inlet Pit.
- 080-036 Standard Surface Inlet Surcharge Pits.
- 080-037 Standard Pathway Grated Kerb Inlet Pit.
- 080-038 Standard Straight Headwall.
- 080-039 Cast Insitu Grated V Drain Pit For Rollover Kerb or Dish Drain.
- 080-040 Precast Stormwater Pit Installation.
- 080-041 Bandage Joint Details.
- 080-042 Sandbag Headwall.
- 080-043 Riprap Outlet Protection DN300 to DN600.
- 080-044 Riprap Outlet Protection DN750 to DN2100.
- 080-045_1 Drainage Pit Inlet Capacities.
- 080-045_2 Drainage Pit Inlet Capacities.
- 080-046 Pit Static Headloss Coefficients.

ARC Standard Drawings shall take precedence over ALL other drawings related to the Works.

Precedence

Where any ARC Standard Drawings conflicts with this Specification, the requirements of this Specification shall take precedence. Proposals to deviate from this Specification shall constitute a **HOLD POINT**.

HOLD POINT

Hold Point

All proposed deviations from the approved design drawings, ARC Standard Drawings, this Specification or the documents referenced within it, shall be submitted for approval to the ARC Representative with supporting evidence at least five (5) working days prior to the work being undertaken.

PROCESS HELD: The lot or element affected by the proposed deviation.

CONSTRUCTION

C223.04 GENERAL

Drainage structures shall be constructed in concrete and in accordance with C271 - *Minor Concrete Works*. **Concrete Work**

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. **Time for Completion**

Any drainage structure placed within the maintenance path of a device requiring servicing by heavy vehicles, (i.e. Pollution Control Devices), must be installed with heavy duty grates or maintenance hole covers. **Grates or Maintenance Hole Covers**

C223.05 ALIGNMENT

Unless otherwise shown on the approved design drawings, headwalls and pits shall be constructed parallel to the road centreline and wingwalls at 135 degrees 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. **Skew Angle**

Energy dissipaters shall be constructed in accordance with the approved design drawings and with centreline on the axis of the culvert. **Energy Dissipaters**

C223.06 HEADWALLS AND WINGWALLS

The wingwalls shall be constructed to retain the batters at the nominated design grade. Where the approved design drawings do not satisfy this requirement, the Constructor shall consult with the designer to adjust the drainage structure to achieve the nominated design grade. Design amendments shall be submitted to the ARC Representative for approval. **Batter Retention**

Where non-erodible rock is encountered at the bottom of excavations for wingwalls and headwalls, and after approval is given by the ARC Representative, 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 approved design drawing, but must be not less than 150mm into sound rock. 50mm weepholes at 1800mm centres shall be provided in the face of each headwall and wingwall at the downstream outlet end of the culvert and shall be located 100mm above the outlet invert level. **Rock Foundations**

Headwalls should not protrude above the finished road pavement level. Where there is protrusion, the Constructor shall be responsible for the rectification. All costs associated with the rectification shall be borne by the Constructor. **Headwall Protrusion**

C223.07 PITS

All new pits, including access covers, gully grates and frames complying with AS 3996, shall be constructed to the details included in the relevant ARC Standard Drawing unless specific requirements are shown in the approved design drawings. **Modification**

Where the full depth of the excavation is in sound rock, and subject to the approval of the ARC Representative, 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**

Step irons, or ladders shall be installed in accordance with the approved design drawings and relevant ARC Standard Drawings. Where there is a discrepancy, the requirements of the ARC Standard Drawings will prevail. **Step Irons**

Step irons or ladders shall be either fixed firmly in the formwork prior to pouring the concrete for the pit walls or by using block-out 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**

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

Epoxy Fixing

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

Casting Pipes

A subsoil drain shall be installed into the pit or headwall in accordance with the general requirements in *C221 - Pipe Drainage*.

Subsoil Drain

C223.08 PRECAST UNITS

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

Manufacturer's Instructions

If the Constructor proposes to use precast units, detailed design drawings and complete details of installation procedures shall be submitted for the approval of the ARC Representative.

Constructor's Responsibility

Precast units shall not be delivered to the Works site before satisfactory documentary evidence has been submitted to the ARC Representative and/or the Developer's Representative (for Developer Infrastructure Works) that demonstrates the precast units conform to the approved design drawings and relevant specifications.

Delivery

If precast units are proposed for use to construct drainage pits, the base units (or any other riser units to which incoming drainage pipes will be joined) must be manufactured specifically to suit the design configuration of the particular pit with pre-formed knockouts only in the walls that require them.

Precast Units

C223.09 JOINTING

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.

Preformed Jointing Material

C223.10 MASS CONCRETE BEDDING

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 ARC Representative. 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.

Mass Concrete Base Foundation Inspection

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

Unreinforced Concrete Base

HOLD POINT

Inspection and approval of the foundations by the ARC Representative at least three (3) working days prior to the placement of the mass concrete bedding.

PROCESS HELD: Placement of the mass concrete bedding.

Hold Point

C223.11 BACKFILL

Backfilling shall not commence until the compressive strength of concrete has reached at least 80% of the concrete design strength.

Commencement

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 unless specified otherwise on the approved design drawings.

Selected Backfill

Selected backfill shall consist of a granular material in accordance with the requirements in *C213 - Earthworks*.

Composition

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**

Backfill on both sides of the structure shall be carried up to level alternately in 300mm thick 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 *C220 - Stormwater Drainage*. Layer thickness shall not exceed 150mm.

Procedure

LIMITS AND TOLERANCES

C223.12 SUMMARY OF LIMITS AND TOLERANCES

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	Cut-off Walls		
	Depth into sound rock	>150mm	C223.06
2	Mass Concrete Bedding		
	Mass Concrete Bedding Thickness	> 50mm	C223.10
3	Layer Thickness		
	Layer Thickness	< 150mm	C223.11

Table C223.1 - Summary of Limits and Tolerances

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