



Construction Specification for Civil Works

C274 – Masonry Walls

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GENERAL

C274.01 SCOPE

This Specification covers the laying of concrete, brick or stone masonry units and construction for retaining walls, walls for detention basins, free-standing walls such as noise attenuation, dwarf and feature walls for landscaping or similar structures.

The work to be executed under this Specification consists of excavation for foundations, construction of reinforced concrete footing, placement of masonry units, backfill and subsurface drainage to the wall as shown on the approved design drawings.

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in *CQC-Quality Control Requirements Sub-Annexure B13*.

Quality

C274.02 DEFINITIONS

The Works – Defined as follows:

- **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.

The Works

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:

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

ARC Representative

Constructor’s Representative – Defined as follows:

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

Constructor’s Representative

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

C274.03 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

- C211 – Control of Erosion and Sediment.
- C230 – Subsurface Drainage – General.

ARC Specifications

C231 – Subsoil and Foundation Drains.

C271 – Minor Concrete Works.

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 1012.3.1 - Determination of properties related to the consistency of concrete - Slump test.
- AS 1012.9 - Determination of the compressive strength of concrete specimens.
- AS 1141.11 - Particle size distribution by dry sieving.
- AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.
- AS/NZS 4680 - Hot-dip galvanised (zinc) coatings on fabricated ferrous articles.
- AS 2758.1 - Concrete aggregates.
- AS 3700 - Masonry in buildings (SAA Masonry Code).
- AS 3972 - Portland and blended cements
- AS 4455 - Masonry units and segmental pavers
- AS 4678 - Earth-retaining structures

(c) Other Publications

NSW Building and Construction Authority Training Committee Limited.
Cleaning of Masonry Code of Practice, 1985.

Other Publications

C274.04 CONTROL OF EROSION AND SEDIMENTATION

The Constructor shall install and maintain effective erosion and sedimentation control measures during the construction of the masonry wall in accordance with *C211 – Control of Erosion and Sedimentation*.

Erosion and Sediment Control

MATERIALS

C274.05 MASONRY

Masonry units shall comply with *AS/NZS 4455* and shall be manufactured from either:

Type

- (a) autoclaved aerated concrete;
- (b) calcium silicate (sand-lime);
- (c) concrete (dense or lightweight);
- (d) dimension stone (cut or dressed); or
- (e) fired clay (with or without shale).

The masonry unit material, type and category shall be as shown on the approved design drawings.

For concrete masonry, irregular faced units shall be either split face, profiled, textured or rock-faced as shown on the approved design drawings.

Concrete Masonry

The colour of masonry units shall be as shown on the approved design drawings.

Colour

Dimension stone shall be of the type and quality, and to the dimensions as shown on the approved design drawings.

Dimensions

Masonry units shall not be placed in position until the Constructor has produced documentary evidence to the ARC Representative and/or the Developer's Representative (for Developer Infrastructure Works) that the units conform to the requirements of this Specification and AS/NZS 4455. This action constitutes a **HOLD POINT**. The ARC Representative and/or the Developer's Representative (for Developer Infrastructure Works) approval of the documentary evidence is required prior to the release of the hold point.

Conformance

HOLD POINT

A Certificate of Conformance for masonry units indicating compliance with this Specification and AS/NZS 4455 shall be submitted to the ARC Representative and/or the Developer's Representative (for Developer Infrastructure Works) at least five (5) working days prior to the delivery of pavement materials to site.

Process Held: Placing of masonry units.

Hold Point

C274.06 CEMENT

The cement used shall be Type GP Portland cement complying with AS 3972.

Cement

C274.07 SAND

The sand shall conform to AS 2758.1. It shall be clean, sharp and free from salts, vegetable matter and impurities.

Sand

C274.08 MORTAR

The mortar class shall be Class M4 in accordance with AS 3700 and shall consist of 1 part of Portland cement, 4 parts of sand and 0.005 parts of a cellulose based water thickener. Suitable colouring pigments shall be used to match the colour of the adjacent units.

Mortar

C274.09 CONCRETE

Concrete supplied and placed for the reinforced concrete footing and 50mm mass concrete blinding layer shall comply with C271 – *Minor Concrete Works*.

Concrete

Unless otherwise indicated on the approved design drawings, the concrete shall have a compressive strength not less than 20MPa when tested in accordance with AS 1012.9, with a maximum nominal size of aggregate of 20mm and a nominated slump at the point of placement not exceeding 80mm as determined by AS 1012.3.1.

C274.10 STEEL REINFORCEMENT

Steel reinforcement provided for concrete shall comply with C271 – *Minor Concrete Works*.

Steel Reinforcement

In addition, where galvanising of reinforcing steel is indicated on the approved design drawings or otherwise specified, such galvanising shall be an average minimum coating thickness of 85µm of not less than 98% by mass of zinc when tested in accordance with AS/NZS 4680.

Galvanising

SITING AND EXCAVATION

C274.11 SET OUT

The Constructor shall set out masonry wall structures as shown on the approved design drawings in sufficient detail to identify the wall location, length and height.

Setting Out

Should the Constructor propose changes to location, length, height, design levels or strength, to suit the Constructor's purposes or construction techniques, the Constructor's proposals shall be presented for the ARC Representative for approval. Changes to suit the Constructor's construction procedures shall be at the Constructor's cost.

The Constructor shall present the masonry wall structure set out, including any changes proposed by the Constructor, for the ARC Representative's approval prior to commencing excavation. This action constitutes a **HOLD POINT**. The ARC Representative's approval of the set out is required prior to the release of the hold point.

HOLD POINT

The Constructor shall present the masonry wall structure set out, including any changes proposed by the Constructor, for the ARC Representative's approval at least two (2) working days prior to the commencing of excavation for the masonry wall structure.

Process Held: Commencement of excavation for the masonry wall structure.

Hold Point

C274.12 FOUNDATION LEVEL

The foundation level shall be defined as the level at the underside of the 50mm mass concrete blinding layer below the reinforced concrete footing.

The levels and dimensions of foundations shall be recognised as subject to confirmation or alteration before construction, and the ARC Representative may direct such changes of the levels and of dimensions of footings as may be necessary to ensure a satisfactory foundation.

Levels and Dimensions

C274.13 EXCAVATION

Excavation shall be undertaken to the required width, depths and dimensions of footings shown on the approved design drawings, including the 50mm mass concrete blinding layer. All loose material shall be removed. Minor fissures in rock shall be thoroughly cleaned out and filled with concrete, mortar or grout.

Excavation

The base of the excavation shall be compacted in accordance with the requirements of Clause C274.23 and trimmed to ensure that at no point the level is more than 25mm above the design Foundation Level. The levels of the base of the excavation shall be confirmed by survey.

Base of Excavation

Any over-excavation in rock below foundation level shall be filled with concrete of the same quality as that of the footing, while over-excavation in earth below foundation shall be backfilled and recompacted to the requirements of Clause C274.23.

Over-excavation

Surplus excavated material shall be used in the construction of embankments, or spoiled as directed by the ARC Representative and/or the Developer's Representative (for Developer Infrastructure Works).

Surplus Material

The Constructor shall supply and erect any necessary sheeting and bracing to support the excavation in a safe manner and in accordance with statutory requirements. The excavation shall be kept free of water.

Sheeting and Bracing

Following excavation to Foundation Level, the Constructor shall present the foundation on which the footing for the wall is to be placed for inspection and approval by the ARC Representative. If the foundation is composed of material which the ARC Representative deems to be unsuitable to support the proposed structure, such material shall be excavated to the extent directed by the ARC Representative, backfilled with sound material, and recompacted to the requirements of Clause C274.23. The foundation shall then be presented again for the approval of the ARC Representative. The unsuitable material from the excavation below Foundation Level shall be spoiled as directed by the ARC Representative. This action constitutes a **HOLD POINT**. The ARC Representative's approval of the foundation is required prior to the release of the hold point.

Approval from the ARC Representative

HOLD POINT

Hold Point

The Constructor shall present the foundation on which the footing for the wall is to be placed for inspection and approval by the ARC Representative at least two (2) working days prior to the construction of masonry wall footing.

Process Held: Construction of masonry wall footing.

CONSTRUCTION

C274.14 REINFORCED CONCRETE FOOTING

The reinforced concrete footing shall be constructed to the details as shown on the approved design drawings.

Unless otherwise indicated on the approved design drawings, forms shall be used for all vertical concrete surfaces. All formwork shall comply with *C271 – Minor Concrete Works*.

Forms

For the reinforced concrete footing and 50mm mass concrete blinding layer, the placement and compaction of concrete, including joints, finishing, curing and protection of concrete, and the placement of the reinforcing steel, including starter bars, shall comply with *C271 – Minor Concrete Works*.

Concrete

The finished concrete footing shall not vary by more than 10mm from the specified levels and by more than 25mm from the specified horizontal alignment.

C274.15 MASONRY

All workmanship and site control in masonry construction shall be in accordance with *AS 3700*.

Workmanship

The surface on which the first course is to be laid shall be clean. It shall be checked for vertical and horizontal alignment and any excessive discrepancy shall be corrected before masonry construction is commenced.

First Course Surface

Masonry shall be placed in horizontal courses and to the details as shown on the approved design drawings.

Placement

Weepholes shall be provided in the walls as shown on the approved design drawings.

Weepholes

C274.16 MORTAR JOINTS

Bed joints and perpendicular joints shall be 10mm thick. In hollow and core filled masonry units, mortar shall be face bedded and for structural work. To control cracking, joint reinforcement, consisting of two 3.0mm galvanised wires in accordance with *AS 3700* shall be incorporated at a maximum of 600mm centres. All joints shall be ironed on both sides.

Mortar Joints

C274.17 CONTROL MOVEMENT JOINTS

(a) Location and Detail

Control movement joints shall be built into masonry where shown on the approved design drawings and at all points of potential cracking. The joint spacing shall not be greater than 10 metres.

Control Movement Joints

The joints shall be 12mm wide and completely clean and free from any hard or width incompressible material for the full width and depth of the joint.

(b) Joint Filling

After completion of the walls, a suitable backing rod shall be inserted on both sides of the joint and the joint filled with an elastic polyurethane joint sealant approved by the ARC Representative.

Sealing of joints shall be carried out in accordance with the Sealant Manufacturer's instructions and recommendations.

Joint Sealing

The colour of the joint sealant shall be shown on the approved design drawings.

C274.18 REINFORCEMENT

Vertical steel reinforcement shall be tied to steel starter bars through cleanout holes in each reinforced hollow unit and fixed in position at the top of the wall by plastic clips. Horizontal steel may be laid in contact with rebated webs. It shall be held in position by plastic clips when vertical steel is to be positioned subsequent to wall construction. Cover to horizontal steel in lintel blocks shall be maintained by the use of wheel type plastic clips. The minimum cover to the inside face of the block shall be 15mm unless specified otherwise.

Reinforcement

C274.19 CONCRETE GROUT

Concrete grout shall be a minimum Portland cement content of 300kg/cubic metre, sufficient slump to permit it to completely fill the hollow units and a minimum compressive cylinder strength of 20MPa when tested to AS 1012.9.

Compressive Strength

The Constructor shall ensure that the bottoms of hollows are cleaned of loose material before being filled with grout.

C274.20 RATE OF CONSTRUCTION

The rate of new construction shall be limited so as to eliminate any possibility of joint deformation, slumping or instability which may reduce bond strength in the wall.

C274.21 CLEANING OF MASONRY

Cleaning of masonry shall comply with the publication "*Cleaning of Masonry Code of Practice - 1985*".

Cleaning

Where the wall is constructed as a free standing wall, both sides of the wall shall be cleaned of all mortar splashes and stains.

Where acid cleaning is required, the following shall apply:

Acid Cleaning

- (a) The acid mixture shall be 1 part of hydrochloric acid to 15 parts of water.
- (b) Mortar joints must be a minimum of 7 days old before cleaning commences.
- (c) All masonry being cleaned shall be thoroughly wetted by hosing before any acid solution is applied and kept wet ahead of the acid application.
- (d) The acid mixture shall be thoroughly hosed off as the cleaning proceeds.

If high pressure water jet method is used for cleaning, extreme care shall be taken to avoid "blowing out" the joints.

C274.22 BACKFILLING FOR RETAINING WALLS

Where masonry walls are constructed as retaining walls, all timbering, bracing and rubbish of all descriptions shall be removed before backfill is placed. No backfilling shall be placed against retaining walls until the Constructor can demonstrate that 95% of the design strength of the masonry wall has been achieved. This action constitutes a **HOLD POINT**. The ARC Representative's approval of the 95% design strength documentation is required prior to the release of the hold point.

Backfilling

HOLD POINT

The Constructor shall provide documentary evidence to the ARC Representative that demonstrates that 95% of the design strength of the masonry wall has been achieved.

Process Held: Backfilling against retaining walls.

Hold Point

Behind the masonry wall, and for the full height of the wall, a continuous granular drainage layer of width as shown on the approved design drawings (measured perpendicular to the face of the wall) shall be progressively placed in layers not exceeding 150mm and compacted in accordance with Clause C274.23. It shall consist of broken stone or river gravel, consisting of clean, hard, durable particles graded from 50mm to 10mm to AS 1141.11 such that:

**Granular
Drainage Layer**

- (a) The maximum particle dimension shall not exceed 50mm; and
- (b) No more than 5% by mass shall pass the 9.5mm AS sieve.

Geocomposite Sheet Drain fixed to the structure is an approved alternative to the granular drainage layer as described above.

**Geocomposite
Sheet Drain**

A subsoil drainage line shall be constructed at the base of the drainage layer as shown on the approved design drawings. It shall outlet either into adjacent stormwater gully pits or headwalls, or alternatively through adjacent fill batter, and be suitably marked. The subsoil drain shall comply with the requirements of C230 – *Subsurface Drainage* and C231 – *Subsoil and Foundation Drains* and shall consist of 100mm diameter slotted corrugated plastic pipe and seamless tubular filter fabric, surrounded by a maximum of 100mm of Type A Filter Material contained within a layer of geotextile. Unless shown otherwise on the approved design drawings, the subsoil pipe shall be laid to an even line and uniform grade of not less than 2% fall towards the outlet.

Subsoil Drainage

Except as specified above, excavations for foundations and for the construction of the masonry walls shall be backfilled to the level of the surrounding ground with material from cuttings, or with other material acceptable to the ARC Representative, and compacted in accordance with Clause C274.23.

Backfilling

Complete sealing utilising compacted earth, capping units or other treatment as shown on the approved design drawings, shall be provided at the top of masonry walls over the full length and at the vertical edge at both ends of all masonry walls to the satisfaction of the ARC Representative.

**Top of Masonry
Walls**

Where erosion is likely to occur, the ARC Representative may direct that backfilling around the ends of walls be of stone fill or lean mix concrete.

Erosion

C274.23 COMPACTION

Foundations and backfill shall be compacted to the following requirements when tested in accordance with AS 1289.5.4.1 for standard compactive effort:

- (a) Foundations or base of excavation to a depth of 150 mm below foundation levels - 95%;
- (b) Granular drainage layer, subsoil filter material, material replacing unsuitable material and backfill material - 95%.

All material shall be compacted in layers not exceeding 150mm compacted thickness.

LIMITS AND TOLERANCES

C274.24 SUMMARY OF LIMITS AND TOLERANCES

The limits and tolerances applicable to the various clauses in this Specification are summarised in Table C274.1.

Item	Activity	Limits/Tolerances	Spec Clause
1	Excavation		
	(a) Foundation Level	Level of foundation for footing at any point shall not be more than 25mm.	C274.13
2	Reinforced Concrete Footing		
	(a) Finished Level	Finished level of footing shall not vary more than 10mm from the specified levels.	C274.14
	(b) Horizontal Alignment	Horizontal alignment of footing shall not vary more than 25mm from the specified alignment.	C274.14
3	Masonry		
	(a) Control Movement Joint	Spacing 10m	C274.17a

Table C274.1 - Summary of Limits and Tolerances

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