
# AUS-SPEC

# Infrastructure Specifications

# 0292 Masonry walls

# 0292 MASONRY WALLS

IMPORTANT: This document has been adapted from the NATSPEC suite of specification templates for use in the Cessnock City Council area by both Council and industry. NATSPEC regularly updates the base templates (currently in April and October each year), and Council may incorporate changes into its version of AUS-SPEC from time to time. To assist in highlighting any changes made by Council to the NATSPEC templates, the following conventions are used.

- See ANNEXURE M at the end of this document which contains (where practical) Cessnock City Council customisations (also known as 'office master' text). References to the Annexure are to also be inserted at relevant clauses in the main body of the document.
- Where content is added to the main body of the document, it is to be shown in brown text like this.
- Where content is deleted or excluded from the main body of the document, it is to be shown ~~struck through like this~~. Such clauses are to have no effect.

Where there is a conflict between main body text and Cessnock City Council specific clauses, Council's specific clauses shall prevail.

## 1 GENERAL

### 1.1 RESPONSIBILITIES

**General**

Requirement: Provide masonry walls including footings, subsoil drains and backfilling, as documented.

### 1.2 CROSS REFERENCES

**General**

Requirement: This worksection is not a self-contained specification. In addition to the requirements of this worksection, conform to the following:

- *0136 General requirements (Construction)*.
- *0152 Schedule of rates (Construction)*.
- *0161 Quality management (Construction)*.
- *0319 Auxiliary concrete works.*
- *1101 Traffic management*.
- *1102 Control of erosion and sedimentation (Construction)*.
- *1111 Clearing and grubbing*.
- *1112 Earthworks (Road reserve)*.
- *1171 Subsurface drainage.*
- *1172 Subsoil and formation drains.*

### 1.3 STANDARDS

**General**

Masonry structures: To AS 3700 (2018).

Earth retaining structures: To AS 4678 (2002).

Note: Include CMAA RW01 (2013) for reinforced concrete masonry cantilever retaining walls.

### 1.4 INTERPRETATION

**Definitions**

General: For the purposes of this worksection the following definitions apply:

- Foundation level: The level at the underside of the 50 mm thick mass concrete blinding layer, below the reinforced concrete footing.

- Masonry: A preformed component, intended for use in masonry construction, either with or without mortar joints.

## 1.5 TOLERANCES

**Construction**

Construction tolerances: To AS 4678 (2002) Table 6.1.

**Footings**

Finished level: ±10 mm.

Horizontal alignment: ±25 mm.

**Masonry construction**

Standard: To AS 3700 (2018) clause 12.5 and Table 12.1.

## 1.6 SUBMISSIONS

**Products and materials**

Masonry units: Submit evidence that masonry units conform to the requirements of this worksection and AS/NZS 4455.1 (2008).

Steel reinforcement: If galvanized coatings are documented, submit evidence of conformity for galvanized coating mass and thickness.

**Samples**

Face units: Submit face units of each type, illustrating the range of variation available including colour, texture, surface irregularities, defective arrises, and shape.

- Number of each type: 6.

Sealants: Submit samples of each type, showing the finished colour.

- Quantity: Minimum two of each colour to be used.

Facework sample panel: Provide, in a suitable position, a sample panel of each type of facework including pigmented face or pointing mortar.

- Minimum size (face of panel): 1200 mm high x 1190 mm or closest unit module long.

**Tests**

Results: Submit results of testing to **ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

**Variations**

Design changes: If changes are proposed to the location, length, height, design levels or strength, submit details for approval before start of excavation.

**Warranties**

Requirement: Submit the following:

- All necessary documentation to enable Council as the future asset owner to claim on warranties and guarantees for the performance and/or replacement of all components, with terms and durations in accordance with any DA consent conditions and approved plans, or if none are specified, in line with the standard warranties offered by industry or major competing suppliers. Alternatively submit analysis to demonstrate that the product with a lesser warranty duration represents a superior whole-of-life cost for Council.

## 1.7 INSPECTIONS

**Notice**

General: To **ANNEXURE – SUMMARY OF HOLD AND WITNESS POINTS**. Give notice so that inspection may be made of the following:

- Set-out: Including location of walls, and levels and dimensions of footings.
- Foundation: Foundation for footings on completion of excavation. If unsuitable foundation material is found, give notice for further inspection after backfilling and re-compaction with sound material.
- Subsoil drains: Drainage line in place.
- Reinforced concrete footing: Steel reinforcement in place before the commencement of concrete placement.
- Reinforcement: Steel reinforcement in place before grouting.
- Wall strength: Before backfilling, demonstrate that the wall has achieved 95% of the design strength.

- Clean up before backfilling: Removal of bracing, after completion of clean up with geotextile in place.

## 2 MATERIALS

### 2.1 MASONRY UNITS

**Properties**

Standard: To AS/NZS 4455.1 (2008).

Type: Provide one of the following:

- Autoclaved aerated concrete.
- Calcium silicate (sand-lime).
- Concrete (dense or lightweight).
- Dimension stone (cut or dressed).
- Fired clay (with or without shale).

Concrete facing units: Conform to AS/NZS 4455.1 (2008) and the following:

- Dimensional category: DW4.
- Minimum characteristic compressive strength: 10 MPa.
- Salt attack resistance grade: General purpose to AS/NZS 4455.1 (2008) Table 2.3.

Concrete units for reinforced masonry walls: Conform to AS/NZS 4455.1 (2008) and the following:

- Salt attack resistance grade generally: General purpose to AS/NZS 4455.1 (2008) Table 2.3.
- Salt attack for severe environments: Exposure grade to AS/NZS 4455.1 (2008) where the masonry is:
  - Subject to saline wetting and drying.
  - In aggressive soils.
  - In severe marine environments.
  - Subject to saline or contaminated water, including tidal splash zones.
  - In other severe environments such as subject to attack by corrosive liquids or gases or within 1 km of manufacturing industries where there are chemical pollutants.
- Minimum characteristic compressive strength: 15 MPa, as documented.

Chipped or broken concrete units: Do not use. If required, cut units with a saw.

Colour: Within the approved agreed range.

### 2.2 CEMENT

**Properties**

Standard: To AS 3972 (2010).

Type: GP.

### 2.3 SAND

**Properties**

Standard: To AS 2758.1 (2014).

Requirement: Clean and free of salts, organic matter and impurities.

### 2.4 MORTAR

**Properties**

Standard: To AS 3700 (2018) clause 11.4.

Mix: To AS 3700 (2018) Table 11.1.

Pigments: To match the colour of the masonry units.

### 2.5 CONCRETE

**Properties**

Standard: To AS 3600 (2018).

Minimum compressive strength: 20 MPa.

Maximum nominal size of aggregate: 20 mm.

Maximum nominated slump at the point of placement: 80 mm.

### 2.6 CONCRETE GROUT

**Properties**

- Minimum cement content: 300 kg/m$^3$.
- Minimum compressive cylinder strength: 20 MPa.
- Maximum aggregate size: 10 mm.
- Slump: 200 mm nominal.

### 2.7 STEEL REINFORCEMENT

**Protective treatment**

Galvanizing: If required, conform to the following:

- Average minimum coating thickness: 85 µm of minimum 98% by mass of zinc.

Separation of materials: Do not combine galvanized and uncoated components.

### 2.8 JOINT SEALANT

**Type**

Requirement: Elastic polyurethane joint sealant.

### 2.9 TESTING

**Quality**

Requirement: Test for all characteristics in conformance with **ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

Quality verification: If material/product quality verification can be obtained from the supplier, documented tests need not be repeated.

## 3 EXECUTION

### 3.1 ESTABLISHMENT

**Set-out**

Requirement: Using recovery pegs, set out the location, length and height of masonry walls, as documented.

**Foundation**

Levels and dimensions: Before setting out, confirm levels and dimensions of the footings to provide satisfactory and stable foundation.

### 3.2 EXCAVATION

**General**

Site preparation: To *1111 Clearing and grubbing.*

Excavation and foundation preparation: To *1112 Earthworks (Road reserve)*.

Requirement: Excavate to the required width, depths and plan dimensions of footings, including the 50 mm mass concrete blinding layer.

Loose material: Remove.

Minor rock fissures: Clean out and fill with concrete, mortar or grout.

Surplus excavated material: Use in the construction of embankments or remove from site to a site with an approved development consent to receive fill, or (for contaminated fill) a licenced disposal facility or waste management centre.

**Compaction**

Base of excavation: Conform to **COMPACTION** and trim so that all levels are 25 mm maximum above the design foundation level.

Base of excavation level: Confirm by survey.

**Over-excavation**

Over-excavation below foundation level: Conform to the following:

- In rock: Fill with concrete of the same quality as the footing.
- In soil: Backfill and re-compact in conformance with **COMPACTION**.

**Foundation**

Foundation material: If deemed unsuitable to support the proposed structure, excavate and backfill with sound material, and re-compact in conformance with **COMPACTION**.

Unsuitable foundation material: Remove from site.

**Safety**

Excavation safety control measures: Provide measures, including sheeting, bracing, formwork and falsework as recommended by the *Excavation work Code of Practice (2018)* and the *General guide for formwork and falsework (2014)* by *Safe Work Australia*.

Dewater: Keep the excavation free of water.

### 3.3 SUBSOIL DRAINS

**General**

Requirement: Provide subsoil drainage conforming to *1171 Subsurface drainage* and *1172 Subsoil and formation drains* consisting of the following:

- 100 mm diameter slotted corrugated plastic pipe with seamless tubular filter fabric.
- Maximum 100 mm thick Type A filter material, contained within a layer of geotextile fabric, surrounding the plastic pipe.

Location: Provide drainage line at the base of the drainage layer, as documented.

Laying: To an even line and uniform grade of 2% minimum fall towards the outlet.

Outlets: Discharge into adjacent stormwater gully pits or headwalls, or alternatively, through adjacent fill batter.

- Markings: Make sure discharge point markings are clearly visible.

**Drainage layer**

Geotextile: Provide a layer of geotextile, conforming to *1171 Subsurface drainage*, between the back of the wall units and the granular drainage layer.

Granular layer: Provide a continuous granular drainage layer behind walls as follows:

- To the full height of the wall.
- In required width, measured perpendicular to the face of the wall.
- Progressively placed in layers of 150 mm maximum, compacted in conformance with **COMPACTION**.

Granular layer material: Broken stone or river gravel of clean, hard, durable particles graded from 10 mm to 50 mm to AS 1141.11.1 (2020) as follows:

- Maximum particle dimension: 50 mm.
- Passing the 9.5 mm AS sieve: Not more than 5% by mass.

### 3.4 REINFORCED CONCRETE FOOTING

**General**

Requirement: Provide reinforced concrete footings, as documented.

**Concrete blinding slab**

Requirement: Provide a 50 mm concrete blinding slab at the base of the excavation for the footings.

**Formwork**

Requirement: Provide formwork for vertical concrete surfaces to AS 3610.1 (2018), as documented.

**Placement and compaction**

Requirement: Conform to *0319 Auxiliary concrete works* for the following:

- Placement of steel reinforcement.
- Placement and compaction of concrete.
- Finishing.
- Curing.
- Joints.

## 3.5 MASONRY WALL CONSTRUCTION

**General**

Wall construction: To AS 3700 (2018) Section 12.

**Laying**

First course laying surface: Clean and check for alignment. Correct excessive discrepancies before start of masonry construction.

Placement: Place masonry in horizontal courses, as documented.

Weepholes: Provide weepholes in the wall, as documented.

Rate of construction: Limit the rate of new construction to prevent joint deformation, slumping or instability.

**Mortar joints**

Bed and perpend joint thicknesses: 10 mm.

Hollow masonry units: Face shell bedding.

Structural work: Ironed mortar joint.

Joint reinforcement: Provide horizontal joint reinforcement, consisting of two 3.0 mm galvanized wires at 600 mm maximum centres.

**Control movement joints**

Location: Provide control movement joints built into the masonry as follows:

- Joint spacing: To AS 3700 (2018) clause 4.8.
- Joint width: 12 mm.

**Joint filling**

Joint surfaces: Before filling, make sure joint surfaces are clean and free of hard or incompressible material for the full width and depth of the joint.

Preparation: Insert a suitable backing rod so that it finishes 12 mm below the face of the wall.

Filling: Fill with an elastic polyurethane joint sealant to the sealant manufacturer's recommendations.

**Reinforcement**

Requirement: Provide reinforcement, as documented, and as follows:

- Tie vertical steel to steel starter bars through cleanout holes in each reinforced hollow masonry unit and fix in position at the top of the wall with plastic clips.
- Lay horizontal steel in contact with rebated webs. Hold in position using plastic clips if vertical steel is subsequently positioned to wall construction.
- Maintain cover to horizontal steel in lintel blocks using wheel type plastic clips.
- Provide 15 mm minimum cover to the inside face of the block, unless documented otherwise.

**Concrete grout**

Preparation: Make sure bottoms of the hollow units are free of loose material before grouting.

Grouting: Completely fill hollow units with concrete grout.

**Cleaning masonry**

Standard: Conform to the following:

- Clay masonry: To *Think Brick Manual 13 (2019)*.
- Concrete masonry: To CMAA CM03 (2019).

Free standing wall: Remove all mortar splashes and stains from both sides of the wall.

Acid cleaning: If acid cleaning is required, conform to the following:

- Clay brick acid mixture concentration (hydrochloric acid:water):
  - Light coloured bricks: Maximum 1:20.
  - Other bricks: Maximum 1:10.
- Concrete units, acid mixture concentration (acid:water):
  - Hydrochloric acid: Maximum 1:20.
  - Milder acids: Maximum 1:10.
- Mortar joints: Minimum 7 days old.

- Prewetting: Before applying acid solution, thoroughly wet the wall by hosing. Keep masonry wall saturated so that acid solution is restricted to the face of the masonry.
- Hosing off: Thoroughly hose off the acid mixture progressively. Do not allow acid and debris to dry on the face of wall. Restrict treatment area, as required, to maintain this.
- High pressure water jet: If used for cleaning, conform to *Think Brick Manual 13 (2019)* and CMAA CM03 (2019) to prevent damage to the masonry units and mortar joints.

Mortar joint cleaning: Clean joints minimum 24 to 36 hours after completing masonry work, depending on brick type and weather (drying) conditions.

## 3.6 BACKFILLING FOR RETAINING WALLS

**Clean up before backfilling**

Masonry retaining walls: Remove all timbering, bracing and waste before placing backfill.

**Wall strength**

Curing: Backfill against the retaining walls only after 95% of the design strength of the masonry wall has been achieved.

**Placing**

Granular drainage material: Conform to **SUBSOIL DRAINS**, **Drainage layer**.

Other backfill material: Progressively backfill excavations for foundations and construction of masonry walls, to the level of the surrounding ground, with material from cuttings or with other materials conforming to the following:

- Placed behind the drainage layer, using 10 mm crushed rock or materials with 100 mm maximum particle size.
- In layers not exceeding 200 mm thick.
- Moisture content: Within 2% of Optimum Moisture Content to achieve 85% Standard Proctor density, determined to ASTM D698 (2012).

**Sealing tops and ends of walls**

Sealing: Completely seal tops and ends of walls with compacted earth or other treatment, as documented.

Extent: Conform to the following:

- Top of wall: Over the full length of wall.
- Ends of walls: Full vertical edge.

**Erosion control**

Requirement: Where erosion is likely to occur, backfill around the ends of walls using stone fill or lean mix concrete.

## 3.7 COMPACTION

**General**

Layers: Compact materials in layers not exceeding 150 mm compacted thickness.

Moisture content: Within 2% of Optimum Moisture Content.

**Relative compaction levels table**

| **Foundations or backfill** | **Relative compaction** |
|---|---|
| Foundations or base of excavation to a depth of 150 mm below foundation levels. Includes fill for over excavated foundations. | 95% |
| Granular drainage layer, subsoil filter material, material replacing unsuitable material and backfill material | 95% |
| Note: Compaction for cohesionless soils may be acceptable:<br>- Controlled fill – Class I: Material compacted to minimum 75% density index.<br>- Controlled fill – Class II: Material compacted to minimum 65% density index. | |

### 3.8 TESTING

**Quality**
Requirement: Test for all characteristics in conformance with **ANNEXURE – MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

## 4 ANNEXURE A

### 4.1 ANNEXURE – SUMMARY OF HOLD AND WITNESS POINTS

| Clause and description | Type | Submission/Inspection details | Submission/Notice times | Process held |
|---|---|---|---|---|
| SUBMISSIONS, Products and materials<br>Masonry units | H | Evidence of material conformance. | 2 weeks before commencement | Material ordering and delivery |
| SUBMISSIONS, Variations<br>Design changes | H<br>Superintendent and Principal Certifier | Details of design changes. | 2 weeks before commencement | Setting out |
| INSPECTIONS, Notice<br>Set-out | H | Set-out of walls and footings. | 3 days before inspection | Foundation excavation |
| INSPECTIONS, Notice<br>Foundation | H | Foundation for footings. | 3 days before inspection | Subsoil drainage |
| INSPECTIONS, Notice<br>Subsoil drains | H<br>Superintendent and Principal Certifier | Drainage line in place. | 3 days before inspection | Concrete placing |
| INSPECTIONS, Notice<br>Reinforced concrete footing | H | Footing formwork and reinforcement. | 1 day before inspection | Concrete placing |
| INSPECTIONS, Notice<br>Reinforcement | H | Steel reinforcement before grouting. | 1 day before grouting | Grouting |
| INSPECTIONS, Notice<br>Wall strength | H | Strength of retaining wall before backfilling. | 3 days before inspection | Backfilling |
| INSPECTIONS, Notice<br>Clean up before backfilling | W<br>Superintendent and Principal Certifier | Completed clean up. | 1 day before inspection | - |
| Note: H = Hold Point, W = Witness Point | | | | |

### 4.2 ANNEXURE – MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES

| Activity | Key quality verification requirements | Maximum lot size | Minimum test frequency | Test method |
|---|---|---|---|---|
| Alignment | Set-out | 1 contract | 25 m sections | Survey |
| Footing | Concrete slump | 1 contract | 1 per load | AS 1012.3.1 (2014) |

| Activity | Key quality verification requirements | Maximum lot size | Minimum test frequency | Test method |
|---|---|---|---|---|
| | Concrete strength | 1 contract | 1 per contract or 100 m³ (whichever is the lesser) | AS 1012.9 (2014) |
| Reinforcing | Steel reinforcement coating mass and thickness | 1 contract | 1 per contract | AS/NZS 4680 (2006) Appendix G |
| Concrete grout and mortar | Strength | 1 contract | 1 per contract | AS 1012.9 (2014) |
| Backfilling | Drainage layer grading | 1 contract | 1 per contract | AS 1141.11.1 (2020) |
| Foundations and backfill | Compaction: Generally | 1 contract or 200 linear metres (whichever is the lesser) | 3 per 200 linear metres | AS 1289.5.4.1 (2007) |
| | Compaction: Non-cohesive material | 1 contract or 200 linear metres (whichever is the lesser) | 3 per 200 linear metres | AS 1289.5.6.1 (1998) |

### 4.3 ANNEXURE – PAY ITEMS

This Annexure applies to Council projects. For private development works use of this schedule is optional, at the Superintendent's discretion.

| Pay items | Unit of measurement | Schedule rate inclusions |
|---|---|---|
| **0292.1 Excavation** | m³, measured in bank volume of excavation.<br>Determine the volume by the End Area Method using design cross-sectional areas calculated at each change in height or width of the wall. | Include in the rate for excavation:<br>- Excavation and backfilling of all types of materials, with no separate rates for earth and rock.<br>- The disposal of surplus material.<br>- The control of stormwater runoff.<br>Do not include:<br>- Drying out wet excavated material or replacement of over-excavation beyond the design cross-sectional limits defined above. |
| **0292.2 Unsuitable material below foundation** | m³, measured as bank volume of excavation below foundation level requiring removal and replacement. | All costs associated with excavating and removing unsuitable material below the foundation level of the concrete footing, backfilling with replacement material and compaction to the foundation level. |
| **0292.3 Reinforced concrete footing** | m³ of reinforced concrete. | All costs associated with the supply and placement of formwork, embedments, reinforcement (including starter bars, if required), concrete (including 50 mm mass concrete blinding layer), stepping of footing, joints, curing and backfilling to the footing.<br>Take the volume from the drawings, excluding the volume of the 50 mm mass concrete blinding layer. |
| **0292.4** | m², measured as face area of | All costs associated with the supply and |

| Pay items | Unit of measurement | Schedule rate inclusions |
|---|---|---|
| **Constructed masonry wall** | masonry wall, from the top of the footing to the top of the wall. | placement of materials and workmanship required to complete the documented structure including masonry units, granular drainage layer behind the wall, earth backfill and capping, and subsoil drain at the base of the drainage layer. |
| **Traffic management** | Lump sum. | To *1101 Traffic management*. |
| **Erosion and sedimentation control** | | To *1102 Control of erosion and sedimentation (Construction)*. |
| **Concrete footings** | | Construction of footings, including concrete, reinforcement and formwork to *0319 Auxiliary concrete works*. |
| **Subsoil drainage** | | Drainage, including granular drainage layer, subsoil drainage pipe and filter material to *1171 Subsurface drainage* or *1172 Subsoil and formation drains*, as appropriate. |

### 4.4 ANNEXURE - REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

| | | |
|---|---|---|
| AS 1012 | | Methods of testing concrete |
| AS 1012.3.1 | 2014 | Determination of properties related to the consistency of concrete - Slump test |
| AS 1012.9 | 2014 | Compressive strength tests - Concrete, mortar and grout specimens |
| AS 1141 | | Methods for sampling and testing aggregates |
| AS 1141.11.1 | 2020 | Particle size distribution - Sieving method |
| AS 1289 | | Methods of testing soils for engineering purposes |
| AS 1289.5.4.1 | 2007 | Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio |
| AS 1289.5.6.1 | 1998 | Soil compaction and density tests - Compaction control test - Density index method for a cohesionless material |
| AS 2758 | | Aggregates and rock for engineering purposes |
| AS 2758.1 | 2014 | Concrete aggregates |
| AS 3610 | | Formwork for concrete |
| AS 3610.1 | 2018 | Specifications |
| AS 3700 | 2018 | Masonry structures |
| AS 3972 | 2010 | General purpose and blended cements |
| AS/NZS 4455 | | Masonry units, pavers, flags and segmental retaining wall units |
| AS/NZS 4455.1 | 2008 | Masonry units |
| AS 4678 | 2002 | Earth-retaining structures |
| AS/NZS 4680 | 2006 | Hot-dip galvanized (zinc) coatings on fabricated ferrous articles |
| CMAA CM03 | 2019 | Concrete Masonry - Cleaning and maintenance |
| Think Brick Manual 13 | 2019 | Clay masonry cleaning manual |
| Safe Work Australia | 2018 | Excavation work |
| Safe Work Australia | 2014 | Formwork |
| ASTM D698 | 2012 | Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3)) |
| CMAA RW01 | 2013 | Concrete Masonry - Reinforced Cantilever Retaining Walls |
| EN 15804 | 2012 | Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products |
| ISO 14025 | 2006 | Environmental labels and declarations - Type III environmental declarations - Principles and procedures |
| ISO 21930 | 2017 | Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services |

Cessnock City Council Development Engineering Handbook

## 5 ANNEXURE M – CESSNOCK CITY COUNCIL SPECIFIC CLAUSES

| | | |
|---|---|---|
| M1. | Variations to or non-conformances with Council's AUS-SPEC are to be evaluated with reference to the procedure in Council's *Development Engineering Handbook*. Acceptance is to be obtained in writing from:<br>a) an authorised representative of Council's Director of Infrastructure and Engineering Services. | **Variation procedure** |
| M2. | This specification applies in addition to any development consent (DA) conditions. If there is any inconsistency, the conditions of consent shall prevail. | **DA Conditions** |
| M3. | Refer to the Cessnock City Council Development Engineering Handbook for final inspection, works-as-executed and handover requirements. | **Completion** |

## 6 AMENDMENT HISTORY

| | | |
|---|---|---|
| 0 | 15/01/2024 | First Published |