QUEENSLAND

CONSTRUCTION SPECIFICATION

C278

STONE PITCHED RETAINING WALLS

DEVELOPMENT CONSTRUCTION SPECIFICATION
C278 – STONE PITCHED RETAINING WALLS

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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

DEVELOPMENT CONSTRUCTION SPECIFICATION

C278 – STONE PITCHED RETAINING WALLS

GENERAL

C278.01 SCOPE

This Specification covers the laying of stonepitching and rockwalling and construction for retaining walls and 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 footing, placement of rock walls, backfill and subsurface drainage to the wall as shown on the Drawings.

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

C278.02 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.

(a) Council Specifications

211	-	Control of Erosion and Sedimentation
230	-	Subsurface Drainage - General
231	-	Subsoil and Foundation Drains
271	-	Minor Concrete Works

(b) 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/NZS4680	-	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

C278.03 CONTROL OF EROSION AND SEDIMENTATION

The Contractor shall install and maintain effective erosion and sedimentation control measures during the construction of the masonry wall in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.

MATERIALS

C278.04 MATERIALS

(i) Geotextile Filter Fabric shall be Class A non-woven geotextile filter fabric as specified in Specification R24.
(ii) Insitu Concrete for the coping and foundation shal conform with Specification C271.
(iii) Rock shall be sound igneous rock with a minimum specific gravity of 2.7. the rock shall be dense, durable and resistant to weathering.
(iv) Bedding Material shall comprise crushed rock or gravel whose particle size lies between 19 and 37.5 with at least 40 percent of the material greater than 26.5 mm in size.
(v) Mortar shall consist of one part of Portland Cement to thre parts of fat sand by volume, thoroughly mixed with water to produce mortar having a thick creamy consistency.
(vi) Impervious Material shall conform with the requirements of this Specification.

C278.05 CEMENT

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

C278.06 SAND

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

C278.07 MORTAR

The mortar shall consist of 1 part of portland cement, 3 parts of sand and 0.005 parts of a water thickener approved by the Superintendent. Suitable pigments shall be used to match the colour of the adjacent units.

C278.08 CONCRETE

Concrete supplied and placed for the reinforced concrete footing and 50mm mass concrete blinding layer shall comply with the Specification for MINOR CONCRETE WORKS.

Unless otherwise indicated on the 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.

C278.09 STEEL REINFORCEMENT

Steel reinforcement provided for concrete shall comply with the Specification for MINOR CONCRETE WORKS.

In addition, where galvanising of reinforcing steel is indicated on the Drawings or otherwise specified, such galvanising shall be an average minimum coating thickness of 85µm of not less than 98 per cent by mass of zinc when tested in accordance with AS/NZS4680.

SITING AND EXCAVATION

C278.10 SET OUT

The Contractor shall set out the masonry wall structure as shown on the Drawings in sufficient detail to identify the location, length and height of the wall.

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

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

C278.11 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 Superintendent may direct such changes of the levels and of dimensions of footings as may be necessary to ensure a satisfactory foundation.

C278.12 EXCAVATION

Excavation shall be undertaken to the required width, depths and dimensions of footings shown on the 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.

The base of the excavation shall be compacted in accordance with the requirements of Clause C274.22 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.

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 C278.22.

Surplus excavated material shall be used in the construction of embankments, or spoiled as directed by the Superintendent.

The Contractor 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.

Following excavation to Foundation Level, the Contractor shall present the foundation on which the footing for the wall is to be placed for inspection and approval by the Superintendent. If the foundation is composed of material which the Superintendent deems to be unsuitable to support the proposed structure, such material shall be excavated to the extent directed by the Superintendent, backfilled with sound material, and recompacted to the requirements of Clause C278.16. The foundation shall then be presented again for the approval of the Superintendent. The unsuitable material from the excavation below Foundation Level shall be spoiled as directed by the Superintendent. This action constitutes a **HOLD POINT.** The Superintendent's approval of the foundation is required prior to the release of the hold point.

CONSTRUCTION

C278.13 REINFORCED CONCRETE FOOTING

The reinforced concrete footing shall be constructed to the details as shown on the Drawings.

Unless otherwise indicated on the Drawings, forms shall be used for all vertical concrete surfaces. All formwork shall comply with the Specification for MINOR CONCRETE WORKS.

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 the Specification for MINOR CONCRETE WORKS.

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.

C278.14 STONE PITCHING & CONCRETE JOINTED WALLS

Batter Trimming

After the earthworks of the approach embankments have been placed and compaction has been completed, the batters shall be trimmed back to the slopes shwon on the Drawings. Immediately prior to the start of rock placement, the necessary additional excavation adjacent to the toe of the fill shall be carried out.

Mortar Set Rock Pitching

Pitching shall consist of irregular stories selected to rougly fit together and placed on bedding material having a mean thickness of 100 mm. The stone facing shall have a mean thickness of 300 mm with at least 90 percent of the individual stones having a mass not less than 40 kg. No stones shall hve a mass less than 10 kg.

The stones shall be firmly bedded without any tendency to rock and, where necessary, shall be securely wedged in position by stone spalls. Any stones which break or crumble during placement may be rejected.

As the stones are carefully placed to the slopes specified on the Drawings, the spaces between them shall be completely filled with hand-placed mortar from bottom to top, and the surface shall be cleaned to expose the individual stone faces. All mortared joints shall be raked 5 mm below the adjacent surface of the rock pitching.

The pitching shall be laid in horizontal courses with headers at intervals or in random fashion depending on the stone available. Pitching shall be finished with a horizontal course at the R.L. shown on the Drawing.

Dry Pack Rock Pitching

Dry pack rock pitching shall comprise rock fragments of size range 200 mm to 400 mm with at least 80 percent of the material greater athan 300 mm in size. The rocks shall be placed on the geotextile filter fabric to a mean thickness of 500 mm. They shall be placed dry jointed, but shal be chinked and well interlocked.

The area adjacent to the toe of the rock pack shall be backfilled to existing natural surface level in accordance with this Specification.

Drainage

Position: Provide 100 mm diameter weepholes at 1 m spacings along the toe of the wall or stone pitching. Provide 100 mm diameter weepholes every 2 m^2 elsewhere.

Earth face: Cover rear of weepholes with type 2 geotextile securely taped in place.

Backfilling: Backfilll rock walling progressively with a layer at least 300 mm thick of porous material such as coarse aggregate or crushed rock. In stone pitching, surround weep hole inlets with at least 0.03 m^2 of 10 mm granular drainage material.

Grated outlets: Provide securely fixed grated outlets to all weepholes.

Scour Protection

Cut-off walls: Construct stone pitched cut-off walls at the toe and sides of all stone pitching in waterways (except at the toe where it is protected by a slab or footing). The cut-off walls must be a minimum 0.45 m deep from finished surface and at least 0.3 m wide.

Footings

Select the largest,, flattest and most regular stones for footings. Set them one-third of their depth into the ground.

Copings

Select stones of reasonably uniform size and finish the top of the wall to level.

Retaining Walls

Construction: Where dry stone walls act as retaining walls, construct the stonework to be free draining through the wall. Place Type 3 geotextile between the stonework and the backfill. Batter the face of the wall back 50 – 70 mm for every 300 mm in height. Cap the top of the wall. Backfill progressively with a layer of porous material such as coarse aggergate or crushed rock with a minimum thickness of 300 mm.

Tolerances exposed stone surface

Relative (in 1 metre) tolerance: ± 20 mm.
Relative (in 3 metre) tolerance: ± 30 mm.
Absolute tolerance: ± 20 mm.

Tolerances concrete capping

Vertical alignment: ± 20 mm absolute.
Horizontal alignment: ± 30 mm absolute, ± 10 mm relative to a 3 m straight edge.

C278.15 BACKFILLING FOR RETAINING WALLS

Where 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 Contractor can demonstrate that 95 per cent of the design strength of the masonry wall has been achieved. This action constitutes a HOLD POINT. The Superintendent's approval of the 95 per cent design strength documentation is required prior to the release of the hold point.

Behind the wall, and for the full height of the wall, a continuous granular drainage layer of width as shown on the Drawings (measured perpendicular to the face of the wall) shall be progressively placed in layers not exceeding 150mm and compacted in accordance with Clause C278.16. 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:

(a) The maximum particle dimension shall not exceed 50mm;

(b) No more than 5 per cent by mass shall pass the 9.5mm AS sieve.

A subsoil drainage line shall be constructed at the base of the drainage layer as shown on the 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 the Specifications for SUBSURFACE DRAINAGE - GENERAL and 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 Drawings, the subsoil pipe shall be laid to an even line and uniform grade of not less than two per cent fall towards the outlet.

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 Superintendent, and compacted in accordance with Clause C274.22.

Complete sealing utilising compacted earth, or other treatment as shown on the 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 Superintendent.

Where erosion is likely to occur the Superintendent may direct that backfilling around the ends of walls be of stone fill or lean mix concrete, in which case the extra work will be paid for as a Variation to the Works.

C278.16 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%

Unless otherwise directed by the Superintendent, all material shall be compacted in layers not exceeding 150mm compacted thickness.

SPECIAL REQUIREMENTS

C278.17 RESERVED

C278.18 RESERVED

C278.19 RESERVED

C278.20 RESERVED

MEASUREMENT AND PAYMENT

C278.21 PAY ITEMS

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 Pay Items 278(a) to 278(d) inclusive.

A lump sum price for any of these items shall not be accepted.

If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

Erosion and sedimentation control measures are measured and paid in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.

Construction of footings, including concrete, reinforcement, formwork, etc, is measured and paid in this Specification and not in the Specification for MINOR CONCRETE WORKS.

The granular drainage layer, subsoil drainage pipe and filter material is measured and paid in accordance with this Specification and not in the Specification for SUBSURFACE DRAINAGE - GENERAL or SUBSOIL AND FOUNDATION DRAINS.

Pay Item 278(a) EXCAVATION

The unit of measurement shall be the cubic metre measured in bank volume of excavation.

The volume shall be determined by the End Area Method using design cross-sectional areas calculated at each change in height or width of the wall.

The disposal of surplus material shall be included in the excavation rates.

No additional payment shall be made for drying out wet excavated material or replacement of over excavation beyond the design cross-sectional limits defined above.

The schedule rate for excavation shall allow for excavation and backfilling of all types of materials. Separate rates shall not be included for earth and rock.

The control of stormwater runoff shall be included in the rate for excavation.

Pay Item 278(b) UNSUITABLE MATERIAL BELOW FOUNDATION

The unit of measurement shall be the cubic metre measured as bank volume of excavation below foundation level which is directed to be removed and replaced.

The schedule rate under this Pay Item shall include all operations involved in the excavation and removal to spoil of unsuitable material below foundation level of the concrete footing and the backfilling and compaction to foundation level with replacement material.

Pay Item 278(c) REINFORCED CONCRETE FOOTING

The unit of measurement shall be the cubic metre of reinforced concrete.

The volume shall be taken from the Drawings, excluding the volume of the 50mm mass concrete blinding layer.

The schedule rate under this Pay Item shall include all operations involved in the supply and placement of all formwork, embedments, reinforcement (including starter bars where specified), concrete (including 50mm mass concrete blinding layer), stepping of footing, joints, curing and backfilling to the footing.

Pay Item 278(d) STONE PITCHED WALL

The unit of measurement shall be the square metre, measured as face area of stone pitched wall from the top of the footing to the top of the wall.

The schedule rate under this Pay Item shall include all operations involved in the supply and placement of all materials and workmanship required to provide the completed structure as shown on the Drawings including supply, placement and cleaning of masonry units, and where specified granular drainage layer behind the wall,

earth backfill and capping, and subsoil drain at the base of the drainage layer.

