SPECIFICATION 0293
CRIB RETAINING WALLS

July 2016

© AUS-SPEC (Oct 11)
### SPECIFICATION 0293 – CRIB RETAINING WALLS

<table>
<thead>
<tr>
<th>CLAUSE</th>
<th>CONTENTS</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENERAL</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1.1</td>
<td>RESPONSIBILITIES</td>
<td>1</td>
</tr>
<tr>
<td>1.2</td>
<td>CROSS REFERENCES</td>
<td>1</td>
</tr>
<tr>
<td>1.3</td>
<td>REFERENCED DOCUMENTS</td>
<td>1</td>
</tr>
<tr>
<td>1.4</td>
<td>STANDARDS</td>
<td>1</td>
</tr>
<tr>
<td>1.5</td>
<td>SUBMISSIONS</td>
<td>2</td>
</tr>
<tr>
<td>1.6</td>
<td>INSPECTION</td>
<td>2</td>
</tr>
<tr>
<td>PRE-CONSTRUCTION PLANNING</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2.1</td>
<td>SUBSTITUTION</td>
<td>2</td>
</tr>
<tr>
<td>2.2</td>
<td>DESIGN CHANGES</td>
<td>3</td>
</tr>
<tr>
<td>2.3</td>
<td>CERTIFICATES OF COMPLIANCE</td>
<td>3</td>
</tr>
<tr>
<td>MATERIALS</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>3.1</td>
<td>PRECAST CONCRETE CRIB WALL COMPONENTS</td>
<td>3</td>
</tr>
<tr>
<td>3.2</td>
<td>TREATED TIMBER CRIB WALL COMPONENTS</td>
<td>3</td>
</tr>
<tr>
<td>3.3</td>
<td>CONCRETE</td>
<td>3</td>
</tr>
<tr>
<td>3.4</td>
<td>STEEL REINFORCEMENTS</td>
<td>3</td>
</tr>
<tr>
<td>3.5</td>
<td>BACKFILL MATERIAL</td>
<td>3</td>
</tr>
<tr>
<td>EXECUTION</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>4.1</td>
<td>ESTABLISHMENT</td>
<td>4</td>
</tr>
<tr>
<td>4.2</td>
<td>EXCAVATION</td>
<td>4</td>
</tr>
<tr>
<td>4.3</td>
<td>SUBSOIL DRAINS</td>
<td>4</td>
</tr>
<tr>
<td>4.4</td>
<td>REINFORCED CONCRETE FOOTING</td>
<td>5</td>
</tr>
<tr>
<td>4.5</td>
<td>ERECTION OF CRIB WALL</td>
<td>5</td>
</tr>
<tr>
<td>4.6</td>
<td>BACKFILLING FOR RETAINING WALLS</td>
<td>6</td>
</tr>
</tbody>
</table>
4.7 COMPACITION ....................................................................................................................... 6

LIMITS AND TOLERANCES ............................................................................................................. 7

5.1 APPLICATION........................................................................................................................... 7

MEASUREMENT AND PAYMENT .................................................................................................. 7

6.1 GENERAL ................................................................................................................................... 7
1 GENERAL

1.1 RESPONSIBILITIES

Objectives
General: Provide proprietary timber crib and precast concrete crib retaining walls.

Performance
Quality: Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies to conform with 0161 Quality (Construction).

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- 0136 General requirements (Construction).
- 0161 Quality (Construction).

1.3 REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

Standards
AS 1012 Methods of testing concrete.
AS 1012.3.1-1998 Determination of properties related to the consistency of concrete - Slump test.
AS 1012.9-1999 Determination of the compressive strength of concrete specimens.
AS 1141 Methods for sampling and testing aggregates.
AS 1141.11.1-2009 Particle size distribution – Sieving method.
AS 1289 Methods for testing soils for engineering purposes.
AS 1289.3.3.1-2009 Soil classification tests - Calculation of the plasticity index of a soil
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 1604.1-2010 Sawn and round timber.
AS 1720 Timber structures
AS 1720.1-1997 Design methods
AS 1720.2-2006 Timber properties
AS 1726-1993 Geotechnical site investigations.
AS 3600-2009 Concrete structures.
AS/NZS 4680:2006 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles.
AS 5605-2007 Guide to the safe use of preservative – treated timber

1.4 STANDARDS

General
Formwork design and construction: To AS 3610.
Concrete materials and construction: To AS 3600.
Earth retaining structures: To AS 4678.
Geotechnical site investigation: AS 1726.
Timber construction: To AS 1720.
1.5 SUBMISSIONS

Acceptance criteria
General: All submissions will be subject to the approval of the Superintendent.

Materials
Submit the following:
- Concrete test results.
- Steel reinforcement test results.
- Backfill material.

1.6 INSPECTION

Notice
General: Give notice so that the inspection may be made of the following:

<table>
<thead>
<tr>
<th>Clause/ subclause</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substitution</td>
<td>Submit alternative systems</td>
<td>28 days prior to delivery of components</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Design Changes</td>
<td>Submit proposed changes to design</td>
<td>2 weeks prior to commencing works</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Certificates of compliance</td>
<td>Verify materials quality</td>
<td>1 week prior to using the materials in the works</td>
<td></td>
</tr>
</tbody>
</table>

EXECUTION

Establishment – Founding level
- Level and dimensions of footings
  1 working day prior to covering
  Superintendent

Excavation - Compaction
- Survey to confirm the levels of the base
  1 working day prior to covering
  Superintendent

Excavation – Unsuitable foundation
- Excavate unsuitable material and backfill with sound material and recompact
  1 working day prior to covering
  Superintendent

Subsoil drains - General
- Completed subsoil drains
  2 working days prior to covering
  Superintendent

Drainage layer
- Completed drainage layer
  2 working days prior to covering
  Superintendent

Reinforced concrete footing – Placement and compaction
- Placement of reinforcing steel
  1 working day prior to covering
  Superintendent

Backfilling for retaining walls – Clean up before backfill
- Approval to removal bracing and backfill
  3 working days prior to covering
  Superintendent

2 PRE-CONSTRUCTION PLANNING

2.1 SUBSTITUTION

Proposed alternative
Alternative systems: If an alternative system to the one documented is proposed, submit detailed drawings, design calculations and Engineer’s certification, and full details of installation procedures for approval to the Superintendent a minimum of 28 days prior to delivery of components to site for incorporation into the Works. This is a HOLD POINT.
2.2 DESIGN CHANGES

Proposed changes
Approval: If changes are proposed to location, length, height, design levels or strength, submit details to the Superintendent prior to commencement of excavation. This is a HOLD POINT.
Costs of changes to suit construction procedures: Borne by the Contractor.

2.3 CERTIFICATES OF COMPLIANCE

Verification
Verification: Provide certificates from a NATA registered laboratory. Perform all phases of any particular test at one laboratory. Accompany the certificate with all relevant test results carried out within twelve months of the submission date. This is a HOLD POINT.

3 MATERIALS

3.1 PRECAST CONCRETE CRIB WALL COMPONENTS

Proprietary systems
Type: Provide proprietary precast concrete crib wall systems of reinforced, segmental or prestressed concrete interlocking or pinned stretchers and headers of the dimensions as documented.

3.2 TREATED TIMBER CRIB WALL COMPONENTS

Proprietary systems
Type: Provide proprietary timber crib wall systems of:
- Insect and fungi resistant treated timber: To AS 5605
- Timber design and properties: To AS 1720.1 and 1720.2.
- Minimum Hazard Class: H4 to AS 1604.1.
- Interlocking or pinned stretchers and headers of the dimensions as documented.

3.3 CONCRETE

Specification
General: Provide concrete to AS 3600 such that:
- Compressive strength: greater than 20 MPa.
  - Testing: To AS 1012.9.
- Maximum nominal size of aggregate: 20 mm.
- Nominated slump at the point of placement: less than 80 mm.
  - Testing: To AS 1012.3.1.

3.4 STEEL REINFORCEMENT

Protective treatment
Galvanizing: If documented, provide galvanizing of reinforcing steel as follows:
- Average minimum coating thickness of 85 µm 98% by mass of zinc.
  - Testing: To AS/NZS 4680.

3.5 BACKFILL MATERIAL

Quality
Type: Granular material as follows:
- Free from clay.
- Maximum dimension less than 50 mm.
- Plasticity Index of not less than 2 or more than 12 when tested in accordance with AS 1289.3.3.1.

Alternative material
Backfill: If proposed, submit alternative backfill material details for approval by the Superintendent.
4 EXECUTION

4.1 ESTABLISHMENT

Control of Erosion and Sedimentation

_The Contractor shall install and maintain effective erosion and sedimentation control measures during the construction of the crib wall in accordance with the Specification 1102 Control of Erosion and Sedimentation (Construction)._ 

Set out

Location: Set out the crib wall structure as documented. Identify the location, length and height of the wall, together with the line of the top of the cut batter.

Founding level

Definition: The level at the underside of the 50 mm mass concrete blinding layer below the reinforced concrete footing.

Level and dimensions: Confirm the levels and dimensions of footings before construction. The Superintendent may direct changes to the levels and dimensions of footings necessary to ensure a satisfactory foundation. This is a HOLD POINT.

4.2 EXCAVATION

General

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

Cleaning: Remove all loose material.

Rock: Thoroughly clean out minor fissures and fill with concrete, mortar or grout.

Surplus material: Use surplus excavated or spoiled material in the construction of embankments.

Compaction

Time: After compaction, trim the surfaces so that the level is less than 25 mm above the design foundation level.

Confirmation: Survey to confirm the levels of the base. This is a HOLD POINT.

Over-excavation

Fill and backfill: Fill any over-excavation below foundation level as follows:
- In rock: Use concrete of same quality as that of the footing.
- In soil: Use approved fill material and recompact.

Batter slope trimming

Alignment: From the batter slope and alignment of the excavation ensure that at no point the line of the batter is more than 25 mm inside the line of the specified batter slope, after allowing for the width of the crib wall and the granular drainage layer behind the wall. Confirm the batter slope and alignment of the excavation for the crib wall by survey.

Surplus material: Use surplus excavated or spoiled material in the construction of embankments, as directed by the Superintendent.

Safety

Bracing: Supply and erect any sheeting and bracing to support the excavation in a safe manner.

Dewater: Keep the excavation free of water.

Unsuitable foundation

Unsuitable material: If the foundation material is found to be unsuitable to support the proposed structure, excavate such material and backfill with sound material, and recompact.

Spoil: Discard the unsuitable material.

This is a HOLD POINT.

4.3 SUBSOIL DRAINS

General

Conformance: Conform to the requirements of the 1171 Subsurface drainage and 1172 Subsoil and foundation drains worksections.

Location: Provide a subsoil drainage line at the base of the drainage layer as documented.
Requirements: Provide subsoil drains as follows, unless documented otherwise:
- 100 mm diameter slotted corrugated plastic pipe.
- Seamless tubular filter fabric.
- Surrounded with a minimum of 100 mm of Type A Filter Material contained within a layer of geotextile fabric.

Laying: To an even line and uniform grade of greater than 2% fall towards the outlet. This is a HOLD POINT.

Outlet: Provide outlets that discharge either into adjacent stormwater gully pits, or through adjacent fill batter, or headwalls.

Marking: Mark discharge points to be clearly visible.

**Drainage layer**
Geotextile: Provide a layer of geotextile complying with the 1171 *Subsurface drainage* worksection between the back of the crib wall units and the granular drainage layer.
Granular layer: Provide a continuous granular drainage layer behind the crib wall as follows:
- Full height of the wall.
- Width as documented (measured perpendicular to the face of the wall)
- Progressively placed in layers less than 150 mm and compacted as documented. This is a HOLD POINT.

Composition: Broken stone or river gravel, consisting of clean, hard, durable particles graded from 50 mm to 10 mm to AS 1141.11.1 as follows:
- Maximum particle dimension: 50 mm;
- Passing the 9.5 mm AS sieve: Less than 5% by mass.

### 4.4 REINFORCED CONCRETE FOOTING

**General**
Compliance: Conform to 0319 *Minor concrete works* and AS 3610.

**Drawings**
Conformance: Construct the reinforced concrete footing as documented.

**Concrete blinding slab**
General: Provide a 50 mm concrete blinding slab in the base of excavation for the footings.

**Formwork**
Extent: All vertical concrete surfaces unless otherwise documented.

**Placement and compaction**
Reinforced concrete footing: Provide reinforced concrete footing in accordance with 0319 *Minor concrete works* for:
- Placement and compaction of concrete.
- Joints.
- Finishing.
- Curing and protection of concrete.

Placement of reinforcing steel. This is a HOLD POINT.

**Tolerance**
Requirement: Conform to the Summary of limits and tolerances table.
- Finished level of footing: ± 10 mm from the specified levels.
- Horizontal alignment of footing: ± 25 mm from the specified alignment.

### 4.5 ERECTION OF CRIB WALL

**Manufacturers’ recommendations**
Requirement: Provide all works in crib wall construction to conform with manufacturers’ recommendations, commencing at the lowest part of the wall, with alternating rows of accurately positioned interlocking stretchers and headers.
Course levels and jointing
Requirement: Provide wall units such that they are placed so as to form closely butted joints, and are checked for line and level after each course is laid.

Header unit ends vertical
Vertical alignment: Provide header units that maintain the ends vertical for the full height of the wall, and the ends of stretcher units closely abutted and vertical over the height.

Joints
Bearing: Provide each unit bearing evenly on the underlying unit and connected to it as documented by the manufacturer.
Joints: Provide dry mortarless joints except where otherwise documented. If shown as mortar bedded, provide joints between units properly bedded in a cement mortar containing a sand/cement ratio of 3:1 and an approved bonding additive.

Maintain shape
Slope: Maintain the slope of the batter and a plane face or even curvature over the full area of the work.

4.6 BACKFILLING FOR RETAINING WALLS

Cleanup before backfill
Removal: Remove all timbering, bracing and rubbish before backfill is placed.
This is a HOLD POINT.
Placement of backfilling shall not commence until the Contractor has produced certified evidence from a structural engineer that the wall is structurally adequate to support any loads imposed upon it by the Contractor's activities. Any damage, (including suspect damage in the opinion of the Superintendent), caused by the Contractor’s activities shall be made good at the Contractor’s expense to the satisfaction of the Superintendent.

Progressively placed
Backfill: Progressively place selected backfill within the crib wall as each course of stretchers and headers is installed.
Care: During compaction avoid damaging or distorting the wall.

Backfill material
Backfill: Except as specified above, progressively backfill excavations for foundations and for the construction of the crib walls to the level of the surrounding ground with material from cuttings, or with other material acceptable to the Superintendent.

Sealing tops and ends of walls
Tops and ends of walls: Seal completely using compacted earth or other treatment as documented, the top of crib walls over the full length and the vertical edge at both ends of all crib walls.

Other forms of sealing
Erosion control: Where erosion is likely to occur, backfill around the ends of walls using stone fill or lean mix concrete. In this case the extra work will be paid for as a Variation to the Works.

4.7 COMPACTION

General
Level of compaction: Compact the foundations and backfill in conformance with the Relative compaction levels table.

Relative compaction levels table

<table>
<thead>
<tr>
<th>Foundations or backfill</th>
<th>Relative compaction</th>
<th>Density index</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Foundations or base of excavation to a depth of 150 mm below foundation levels</td>
<td>95%</td>
<td></td>
</tr>
<tr>
<td>(b) Fill placed at over-excavation for footing</td>
<td>95%</td>
<td></td>
</tr>
<tr>
<td>(c) Granular drainage layer, subsoil filter material, material replacing unsuitable material and backfill material</td>
<td>70%</td>
<td></td>
</tr>
</tbody>
</table>

Testing: To AS 1289.5.4.1 or AS 1289.5.6.1 for non-cohesive material.
Layers: Unless otherwise directed by the Superintendent, compact all material in layers of less than 150 mm of compacted thickness.

5 LIMITS AND TOLERANCES

5.1 APPLICATION

General
Summary: The limits and tolerances applicable to this worksection are summarised in Summary of limits and tolerances table.

Summary of limits and tolerances table

<table>
<thead>
<tr>
<th>Activity</th>
<th>Limits/tolerances</th>
<th>Worksection clause reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excavation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foundation level</td>
<td>Level of foundation for footing at any point must not be more than 25 mm above the design level.</td>
<td>Excavation</td>
</tr>
<tr>
<td>Batter slope</td>
<td>Batter slope and alignment of excavation must not be more than 25 mm inside the line of the specified batter slope behind the line of the wall and granular drainage layer.</td>
<td>Excavation</td>
</tr>
<tr>
<td><strong>Reinforced concrete footing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finished level</td>
<td>Finished level of footing shall not vary more than 10 mm from the specified levels.</td>
<td>Reinforced concrete footing</td>
</tr>
<tr>
<td>Horizontal alignment</td>
<td>Horizontal alignment of footing shall not vary more than 25 mm from the specified alignment.</td>
<td>Reinforced concrete footing</td>
</tr>
<tr>
<td><strong>Crib wall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of stretcher units</td>
<td>The level of each course shall not vary more than 25 mm from the specified level.</td>
<td>Erection of crib wall</td>
</tr>
<tr>
<td>Deviation of stretcher units</td>
<td>The departure from the line of each course of stretcher units shall not exceed 10 mm in any 3 metre length.</td>
<td>Erection of crib wall</td>
</tr>
<tr>
<td>Batter slope of wall</td>
<td>The completed crib wall shall not vary more than 25 mm from the specified batter slope.</td>
<td>Erection of crib wall</td>
</tr>
</tbody>
</table>

6 MEASUREMENT AND PAYMENT

6.1 GENERAL

Payment shall be made for all the activities associated with completing the work detailed in this worksection and shown on the drawings, in accordance with provisions made in Contract Document.