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REVISION REGISTER

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<th>Date</th>
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CONSTRUCTION OF REINFORCED SOIL WALLS (CONTRACTOR’S DESIGN)

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IC-DC-R58

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FOREWORD

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BASE SPECIFICATION

This document is based on Specification RMS R58 Edition 3 Revision 7.
RMS SPECIFICATION D&C R58

CONSTRUCTION OF REINFORCED SOIL WALLS
(CONTRACTOR’S DESIGN)

1  GENERAL

1.1  SCOPE

This Specification sets out the requirements for the construction of Reinforced Soil Walls (RSW) to a design provided by the Contractor.

The requirements for the design of the RSW are set out in Specification RMS D&C R57 and must be complied with.

This Specification does not cover the requirements for construction of reinforced slopes or foundations.

1.2  STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.2.1  (Not Used)

1.2.2  Schedules of HOLD POINTS, WITNESS POINTS and Identified Records

The schedules in Annexure R58/C list the HOLD POINTS and WITNESS POINTS that must be observed. Refer to Specification RMS D&C Q6 for the definitions of HOLD POINTS and WITNESS POINTS.

The records listed in Annexure R58/C are Identified Records for the purposes of RMS D&C Q6 Annexure Q/E.

1.2.3  Planning Documents

The PROJECT QUALITY PLAN must include each of the documents and requirements listed in Annexure R58/D and must be implemented.

1.2.4  Testing Procedures

The Inspection and Test Plan must nominate the proposed testing frequency to verify conformity of the item and it must not be less than that specified in Annexure R58/L. Where a minimum frequency is not specified, nominate an appropriate frequency.

1.2.5  Referenced Documents

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 2350). For convenience, the full titles are given in Annexure R58/M.
1.3 **DEFINITIONS**

The terms “you” and “your” mean “the Contractor” and “the Contractor’s” respectively.

The following definitions apply to this Specification:

### 1.3.1 General Definitions

**Abutment**
A structure or wall which extends beyond the bridge to retain the earth and support the ends of the bridge.

**Capping**
The element over the top course of facing elements to complete the RSW to specified finished levels.

**Facing connections**
Any connections, whether mechanical, frictional or other type, between facing elements and the soil reinforcement, designed to transfer loads between the soil reinforcement and facing elements.

**Facing elements**
Elements retaining the reinforced fill material, with provision for connection to the soil reinforcement.

**Foundation**
Portion of ground in contact with the RSW and supporting the loads from it.

**Geosynthetic reinforcement**
Soil reinforcement made of polymeric materials used in geotechnical engineering e.g. linear straps and geogrids.

**Geotechnical Design Manager**
Engineer(s) with qualifications and experience in geotechnical engineering employed by the Contractor under the Project Deed.

**Reinforced fill material**
Granular soil, decomposed rock or crushed rock fill material in a RSW in which the soil reinforcement is embedded.

**Reinforced Soil Wall (RSW)**
A retaining structure, with the face within 20° of vertical, which comprises soil reinforcement embedded in reinforced fill material, together with any facing elements, facing connections and footings.

**RSW System**
A system which has been pre-assessed and accepted by Roads and Maritime Services as suitable for specific RSW applications, and which may be subject to certain conditions for use. For this purpose, a “system” includes the reinforcing elements, wall facings and any associated components such as connections, joint fillers and sealants.

**RSW System Owner**
A company whose RSW System has been accepted by Roads and Maritime Services. The RSW System Owner certifies the design in accordance with RMS D&C R57.


**Soil reinforcement**
Components which are embedded in the reinforced fill material and act through interface friction, bearing or other means to improve the stability and
1.3.2 Design Definitions

Characteristic value: The best estimates of values for material parameters for which the probability of a more adverse value occurring in the field is not greater than 5%.

The material and load factors in this Specification are calibrated using characteristic values. The designer must make safe estimates of the characteristic values for use in design.

Characteristic values must be based on a careful assessment of the range of values which could reasonably be expected to occur in the field. It is emphasised that a statistical analysis of a limited amount of measured data may be useful but will rarely lead directly to characteristic values.

The guaranteed minimum values for yield stress and tensile strength of steel may be used for the characteristic values.

Design value for material: Characteristic value of material multiplied by the appropriate material factor. (See Clause 4.4 of RMS D&C R57.)

Nominal Load: The unfactored loads and load effects acting on the RSW.

1.4 NOTATION

H  Mechanical height of the RSW

2 MATERIALS

2.1 GENERAL

The RSW System used must be in accordance with that specified in the RSW design. The materials used in the Works must be represented by the representative samples of the reinforced fill materials, and granular drainage material where appropriate (refer Clause 2.11).

2.2 SOIL REINFORCEMENT

The soil reinforcement used must be in accordance with that specified in the RSW design.

2.3 REINFORCED FILL MATERIAL

Notify the Project Verifier of the source of reinforced fill material to be used in the Works.

The reinforced fill material must comply with the following requirements:

(a) The reinforced fill material must be composed of inert, hard, durable granular material, without properties that would cause deterioration of the RSW components.
It must be either soil, decomposed rock or crushed rock fill material, free from organic or other deleterious material such as plastic, metal, rubber or other synthetic material, inorganic contaminants, dangerous or toxic material, or material susceptible to combustion.

Material derived from argillaceous rock, such as shales and claystones or other materials which are susceptible to breakdown to a friable material, and steel furnace slag must not be used as reinforced fill material.

(b) The reinforced fill material must meet the physical properties requirements specified in the RSW design, including the angle of friction at constant volume and the design grading envelope, and must be compactable to a stable mass at the required density.

The characteristic value of the weight per unit volume of the reinforced fill material must be within ±5% of the value specified in the RSW design. If these limits are exceeded, consult the designer regarding the implications for the design and any necessary action to be taken. Data for this assessment may be obtained from relative compaction tests carried out on the Works.

(c) Reinforced fill material located within the Selected Material Zone of a road embankment must also meet the requirements for Selected Material as stated in Specification RMS D&C R44.

(d) The reinforced fill material must meet the pH requirements shown in Table R58.1. Where the RSW system has steel components, the reinforced fill material must meet the chemical and electrical properties requirements shown in Table R58.2.

### Table R58.1 – Allowable pH Limits of Reinforced Fill Materials

<table>
<thead>
<tr>
<th>Soil Reinforcement Material Type</th>
<th>Allowable pH Limits in Fill Material&lt;sup&gt;(1)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>5 – 10</td>
</tr>
<tr>
<td>Polyester</td>
<td>4 – 9</td>
</tr>
<tr>
<td>HDPE</td>
<td>3 – 12</td>
</tr>
</tbody>
</table>

**Note:**

<sup>(1)</sup> Determined using Test Method RMS T123 carried out at a temperature of 23 ± 2ºC.

### Table R58.2 - Chemical and Electrical Properties of Reinforced Fill Material for RSW System with Steel Components

<table>
<thead>
<tr>
<th>Chemical and Electrical Property</th>
<th>Test Method</th>
<th>Allowable Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dry Land</td>
<td>Submerged&lt;sup&gt;(1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Chloride ion content&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>RMS T1010</td>
<td>≤ 0.02</td>
</tr>
<tr>
<td>Peroxide sulfur content&lt;sup&gt;(2, 3)&lt;/sup&gt;</td>
<td>AS 4969.12</td>
<td>≤ 0.06</td>
</tr>
<tr>
<td>Resistivity (saturated) (ohm metre)</td>
<td>RMS T185</td>
<td>≥ 10</td>
</tr>
</tbody>
</table>

**Notes:**

<sup>(1)</sup> “Submerged” does not include marine environment, which is a case requiring investigation to determine allowable limits. Use “submerged” values where the structure is permanently or regularly submerged. Use “dry land” values otherwise.

<sup>(2)</sup> % by mass.

<sup>(3)</sup> Prepare samples in accordance with AS 4969.1.
2.4 **Drainage Layer and Filter Fabric**

Where granular material is used as a drainage layer, the granular material must be wrapped inside a nonwoven geotextile.

Granular material in the drainage layer must be inert, hard and durable, meeting the grading requirements stated in Table R58.3. It must not have properties that would cause deterioration of the RSW components, and must be free from organic or other deleterious material. Steel furnace slag must not be used as drainage layer.

**Table R58.3 – Grading Requirements for Granular Drainage Material**

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum particle dimension</td>
<td>53 mm</td>
</tr>
<tr>
<td>Percentage passing 9.5 mm AS sieve</td>
<td>≤ 5%</td>
</tr>
</tbody>
</table>

Nonwoven geotextile of drainage layer must comply with Specification RMS D&C R63 (Strength Class B and Filtration Class 2).

Filter fabric must be nonwoven geotextile and comply with RMS D&C R63 (Strength Class B and Filtration Class 2).

2.5 **Soil Above and Behind Reinforced Soil Block**

The soil above and behind the reinforced soil block within a distance of H/2 from the reinforced soil block, must meet the physical properties requirements specified in the RSW design.

The characteristic value of the weight per unit volume of the soil above, and behind the reinforced soil block within a distance of H/2 from the reinforced soil block, must be within ± 5% of the value specified in the RSW design. If these limits are exceeded, consult the designer regarding the implications for the design and any necessary action to be taken.

The soil above, and behind the reinforced soil block within a distance of H/2 from the reinforced soil block, must meet the pH, physical and chemical properties requirements shown in Table R58.4.
Table R58.4 – Physical and Chemical Properties of Soil Above and Behind Reinforced Soil Block

<table>
<thead>
<tr>
<th>Soil Property</th>
<th>Test Method</th>
<th>Allowable Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>As for reinforced fill material</td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>RMS T108</td>
<td>≤ 30%</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>RMS T109</td>
<td>≤ 12</td>
</tr>
<tr>
<td>Chloride ion content(1)</td>
<td>RMS T1010</td>
<td>≤ 0.03% (3)</td>
</tr>
<tr>
<td>Peroxide sulfur content(1, 2)</td>
<td>AS 4969.12</td>
<td>≤ 0.08% (3)</td>
</tr>
</tbody>
</table>

Notes:

(1) % by weight.

(2) Prepare samples in accordance with AS 4969.1.

(3) Allowable limits applies only RSW system has steel components.

2.6 ADDITIONAL REQUIREMENTS WHEN USING STEEL OR POLYESTER COMPONENTS

2.6.1 Steel or Polyester Components – Use of Recycled Concrete and Stabilised Soil

If any of the soil reinforcement components used in the RSW is made from either galvanized steel or polyester, do not use recycled concrete and cement stabilised soil with cementitious binders as:

(a) reinforced fill material (refer Clause 2.3);
(b) granular drainage layer material (refer Clause 2.4);
(c) fill material in the zone above and behind the reinforced soil block (refer Clause 2.5).

2.6.2 Steel Components Only – Chemical Properties of Water

If any of the soil reinforcement components used in the RSW is made from galvanized steel, water used to increase the moisture content of the reinforced fill material or for any other purposes at the reinforced soil block area must comply with the requirements in Table R58.5.

Table R58.5 – Chemical Properties of Water

<table>
<thead>
<tr>
<th>Chemical Property</th>
<th>Test Method</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>RMS T1002</td>
<td>6.5 – 8.5</td>
</tr>
<tr>
<td>Chloride ion content (mg/L)</td>
<td>RMS T1004</td>
<td>≤ 250</td>
</tr>
<tr>
<td>Sulfate ion content (mg/L)</td>
<td>RMS T1014</td>
<td>≤ 250</td>
</tr>
</tbody>
</table>

2.7 FACING ELEMENTS, CAPPING AND BEARING PADS

The finish of capping and facing elements must be as specified on the Design Documentation drawings.
Concrete and masonry facing elements must attain the minimum strengths specified for the RSW System.

Do not use any facing connections with defective coatings. Do not apply protective coatings in the field, except for minor repairs.

Bearing pads must be:
(a) either HDPE, neoprene or ethylene propylene diene monomer;
(b) durable and inert;
(c) resistant to creep rupture and environmental degradation;
(d) able to accommodate differential movements between adjacent panels, during construction as well as throughout their design life.

2.8 CONCRETE

Concrete, including concrete base footing and concrete facing elements, must meet the requirements specified in Specifications RMS D&C B80 and D&C B115.

2.9 JOINT FILLERS AND SEALANTS

Joint fillers and sealants must be composed of durable inert materials resistant to atmospheric degradation, and must:
(a) protect filter fabric from exposure to sunlight;
(b) maintain the degree of permeability assumed in the design;
(c) retain soil fines.

Sealants must be polysulphide or polyurethane based elastomeric compounds.

2.10 HANDLING AND STORAGE

Transport and store all prefabricated RSW components in accordance with the manufacturer’s instructions to prevent damage and deterioration. Protect geosynthetic reinforcement and geotextile from degradation by ultra-violet radiation until its embedment within the RSW.

2.11 VERIFICATION OF MATERIAL PROPERTIES

Submit a report giving details of the construction materials to be used in the Works.

Include in the report test results of representative samples for each of the specified material properties for reinforced fill materials, granular drainage layer materials where applicable, and the soil material above and behind the reinforced soil block. Obtain at least 4 sample test results for angle of friction at constant volume, and 7 sample test results for other properties.

Obtain also test certificates of representative samples for the soil reinforcement, facing elements, facing connections, and associated components, which must not be more than 12 months old.

The material represented by the samples is considered to be nonconforming if any of the sample test result is less than the lower limit, or more than the upper limit as appropriate, of the characteristic value adopted in the design.
Include in the report a certification that the proposed materials, including all RSW system components supplied, conform to the specified material properties.

### HOLD POINT

**Process Held:** Placement of reinforced fill material.

**Submission Details:** At least 5 working days prior to commencement of placement of reinforced fill material, submit the details specified in Clause 2.11.

**Release of Hold Point:** The Nominated Authority will consider the submitted documents, prior to authorising the release of the Hold Point.

### 3 CONSTRUCTION REQUIREMENTS SPECIFIC TO RSW DESIGN

At least 10 working days prior to the proposed commencement of manufacture of the facing elements, or the preparation of the foundation for the RSW, whichever occurs first, obtain the design output and certification detailed in RMS D&C R57 Clause 4.9.

Submission of this design output and certification constitutes a Hold Point.

### HOLD POINT

**Process Held:** Construction of the RSW.

**Submission Details:** At least 10 working days prior to commencement of manufacture of the facing elements, or the preparation of the foundation for the RSW, whichever occurs first, submit the design output and certification detailed in RMS D&C R57 Clause 4.9.

**Release of Hold Point:** The Nominated Authority will consider the submitted documents, prior to authorising the release of the Hold Point.

### 4 CONSTRUCTION

#### 4.1 GENERAL

Construction of the RSW must comply with Clause 4, the RSW System specification, and any requirements specified in the RSW design.

The method of construction must make due allowance for any existing and planned future services and structures.

#### 4.2 SITE PREPARATION AND EXCAVATION FOR RSW

Carry out site preparation and excavation for the RSW, including removal of any unsuitable material, placing of replacement fill and other site preparation and excavation work for the RSW in accordance with Specifications RMS D&C G40 and RMS D&C R44.
4.3 FOUNDATION PREPARATION

Prior to carrying out any foundation preparation, arrange for the Geotechnical Design Manager to inspect the foundation area, validate and compare the characteristics of the foundation material and profile of the ground water with that assumed in the RSW design, and reassess any foundation treatment specified in the design.

If the Geotechnical Design Manager identifies that the specified foundation treatment is inappropriate; or where no foundation treatment is specified, identifies that material exists in the foundation that is inadequate to meet the design values of foundation soil material parameters, advise the Project Verifier promptly.

Provide the Project Verifier with details of any revised RSW design or revised foundation treatment required.

If you excavate below the designed foundation level without being required to do so by the RMS Representative, you are responsible for replacing the over-excavated material.

Carry out any foundation treatment required.

On completion of the foundation preparation, arrange for the Geotechnical Design Manager to inspect the foundation and obtain a report confirming that the foundation complies with the RSW design.

Submission of this report constitutes a Hold Point.

<table>
<thead>
<tr>
<th>HOLD POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process Held:</strong></td>
</tr>
<tr>
<td><strong>Submission Details:</strong></td>
</tr>
<tr>
<td><strong>Release of Hold Point:</strong></td>
</tr>
</tbody>
</table>

4.4 BASE STRIP FOOTINGS

Comply with the requirements of Specification RMS D&C G71 for Survey Control.

Prepare the base/strip footings supporting the bottom course of facing elements with sufficient accuracy to line and level such that facing elements can be placed within the specified tolerance with due allowance for the movement of footings which may occur due to placing of the fill.

The footing dimensions must comply with the specified tolerances in RMS D&C B80.
4.5  **ERECTION OF FACING ELEMENTS AND PLACEMENT OF REINFORCED FILL MATERIAL**

4.5.1  **Washing of Soil Reinforcement**

Prior to installing soil reinforcement made of steel, wash the soil reinforcement thoroughly with water complying with Table R58.5. Washing of soil reinforcement made of other materials which are not susceptible to corrosion is not necessary, unless specified so by the supplier.

<table>
<thead>
<tr>
<th>WITNESS POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submission Details: At least 24 hours notice prior to the commencement of the activity.</td>
</tr>
</tbody>
</table>

4.5.2  **Erection of Facing Elements**

Adjust the degree of inclination of the facing elements towards the fill, where necessary, as placement and compaction of fill material proceeds, to ensure that the specified tolerances are not exceeded.

<table>
<thead>
<tr>
<th>HOLD POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Held: Erection of second course of facing elements.</td>
</tr>
<tr>
<td>Submission Details: Survey records for the bottom course of facing elements.</td>
</tr>
<tr>
<td>Release of Hold Point: The Nominated Authority will consider the submitted documents prior to authorising the release of the Hold Point.</td>
</tr>
</tbody>
</table>

Immediately check the level and alignment of each course of facing elements after placement of that course and prior to placement of the next course, if any.

Where capping is specified as part of the RSW System, finish the top course of facing elements such that capping is within tolerance of its design alignment.

4.5.3  **Installation of Bearing Pads, Joint Fillers and Sealants**

Place bearing pads between precast concrete panels to prevent them from sitting directly on each other. Bearing pads must be placed within 5 mm of the positions shown on the RSW drawings.

Where filter fabric may be exposed to sunlight through a joint, apply suitable joint fillers or sealants to protect the filter fabric from sunlight. Sealants (including primers) must be applied strictly in accordance with the manufacturer's recommendations.

4.5.4  **Placement of Reinforced Fill Material**

Construct the reinforced soil block as follows:

(a) Unless shown otherwise on the Design Documentation drawings, deposit, spread, level and compact the fill material in layers of thickness appropriate to the compaction methods used, in a direction parallel to facing elements. Each layer of fill material must be horizontal and uniform in thickness over the area to be filled.
At the end of each day’s operations, shape the surface of the fill to permit drainage away from the wall face and the retained embankment.

(b) Lay the soil reinforcement horizontally on the compacted fill at the locations and levels specified on the Design Documentation drawings. Each soil reinforcement must rest fully on top of the compacted fill material without any voided space underneath the soil reinforcement. Connect it securely to the facing elements, in accordance with the requirements of the RSW System.

Pull any geosynthetic reinforcement taut before placing the overlaying fill material. The method of fill placement and compaction must ensure that slack is not introduced into the soil reinforcement as fill is placed.

Record the condition of soil reinforcement and facing connections just before placing the next layer of fill over it.

(c) Where overlapping of soil reinforcement is required e.g. for curved walls, provide a minimum thickness of 75 mm of compacted fill between the overlapping soil reinforcement.

(d) Do not damage or displace soil reinforcement, facing connections and facing elements during placement and compaction. Do not allow tracked machines or vehicles to operate on top of soil reinforcement which are not covered by at least 150 mm of fill material. Rubber tyred equipment may be permitted to pass over soil reinforcement at slow speeds.

Prohibit any sudden braking and sharp turning of machines or vehicles which could displace soil reinforcement from its intended positions, even if there is fill material over the soil reinforcement.

(e) Keep all vehicles and construction equipment with a gross mass more than 1,000 kg at least 1.5 m away from the wall face.

Unless permitted otherwise by the Design Manager, compact the fill material within 1.5 m of the wall face with a vibrating tamper or vibrating plate compactor or a vibrating roller with a mass not exceeding 1,000 kg.

(f) Where filling is required in the zone behind (and outside) the reinforced soil block, place the fill in this zone progressively, keeping the level of fill the same as that within the reinforced soil block.

Where the existing material behind the reinforced soil block is retained by temporary supports such as shoring, remove the shoring progressively as the reinforced fill material is placed and compacted. Remove the shoring in such manner that the stability of the adjacent ground is maintained, the compacted fill material is not disturbed and the formation of voids is prevented.

The maximum layer thickness and required compaction for the 3 Zones within the reinforced soil block must be in accordance with Table R58.6.
Table R58.6 - Maximum Layer Thickness and Required Relative Compaction

<table>
<thead>
<tr>
<th>Zone</th>
<th>Extent of Zone</th>
<th>Maximum Layer Thickness and Required Relative Compaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Beyond 1.5 m from RSW facing elements and up to underside of Selected Material Zone.</td>
<td>As specified for “material placed in formations up to underside of Selected Material Zone” in RMS D&amp;C R44.</td>
</tr>
<tr>
<td>2</td>
<td>Beyond 1.5 m from RSW facing elements and within Selected Material Zone.</td>
<td>As specified for “Selected Material Zone” in RMS D&amp;C R44.</td>
</tr>
<tr>
<td>3</td>
<td>Within 1.5 m from RSW facing elements.</td>
<td>As specified for Zone 1, but with following exceptions:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(a) Maximum compacted layer thickness of 150 mm, unless approved otherwise by the Design Manager.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) Lower limit of relative compaction of 95% <em>(1)</em></td>
</tr>
</tbody>
</table>

Note:

*(1)* When tested in accordance with RMS T166.

### 4.5.5 Provision of Drainage Layer, Filter Fabric and Impermeable Layer

Provide drainage layer as shown on the RSW drawings. Where granular material is used as a drainage material, compact the drainage material and reinforced soil fill with the same compactor and number of passes.

Provide impermeable layer where shown on the RSW drawings.

Place filter fabric to cover all joints to prevent loss of fill through the joints. Filter fabric across a joint must be continuous along any directions and must extend to a minimum of 200 mm to either side of the centre line of the joint.

### 4.5.6 Piling

Piling must be in accordance with the requirements specified in the bridge design, the RSW design, and the relevant piling specifications.

### 4.6 TOLERANCES

#### 4.6.1 General

The dimensions, levels, and position immediately following the completion of the RSW and the application of all dead load surcharges, must be in accordance with the tolerances stated in the following clauses.

Where no tolerance is given, the default tolerance is ±6 mm.

Deviations outwards or away from the block of reinforced fill material are to be shown as positive deviations.
4.6.2 Clearances

Maintain any clearances required for the face at any point.

4.6.3 Soil Reinforcement

Soil reinforcement must be placed within ±100 mm of the design levels and locations specified on the Design Documentation drawings.

4.6.4 Facing Elements

No point on the face of the RSW beneath bridge abutments must deviate from their design position by more than ±50 mm. No point on the face of the structure outside a distance corresponding to the height of the RSW from any bridge abutment must deviate from the design position by +50 mm, −100 mm.

The inclination of the face of the completed wall must not deviate from the specified inclination by more than +0, −5 mm per metre height for panel type walls or by more than +10 mm, −10 mm per metre of wall height for segmental block type walls.

The flatness of the face of the wall must be such that the maximum deviation from a 4.5 m straight edge must not exceed ±20 mm. In the case of walls curved to plan, measure the horizontal deviation from a 4.5 m long reference line curved to the specified curvature measured at panel joints.

4.6.5 Tolerances for Top and Bottom of Wall

The deviation from the design alignment for the top and the bottom of the walls must be:

(a) within ±15 mm for walls beneath bridge abutments;
(b) within ±30 mm for walls beyond the height of the RSW from bridge abutments.

The details at the junction of the wall and capping must be such that the finished capping is within the tolerance of its design alignment and the difference in tolerance for facing elements and capping can be accommodated.

4.6.6 Levels

The level of any point on the wall must not deviate from the specified level by more than 20 mm, except where it is necessary to permit the tops to join neatly to adjacent structures or to result in a visually smooth alignment along the top surface.

4.7 Monitoring

Where monitoring is specified in the RSW design, install targets and probes in the RSW for monitoring of the RSW. The RMS Representative will supply the targets and probes.

Installation must be in accordance with the requirements shown on the Design Documentation drawings.

Verify that the monitoring devices are in working order prior to covering up the devices.
4.8 CONFORMITY TESTING

Carry out sampling and testing of the reinforced fill material, drainage layer materials, and soil above and behind the reinforced soil block used in the Works in accordance with Annexure R58/L. Use statistical techniques in accordance with RMS D&C Q6 as the basis for verifying conformity for each of the material properties in Annexure R58/L against the corresponding characteristic value adopted in the design.

For the purpose of this Clause, a Lot is taken as an area of work that is essentially homogeneous. This occurs when the material origin and properties, general appearance, moisture condition during compaction, compaction technique, response to compactors, and state of underlying materials are substantially alike.

Obtain all conformity test reports on any samples within 3 weeks after sampling.

Reject any Lot that does not conform to all design requirements.

5 CERTIFICATION OF CONSTRUCTION

On completion of construction of the RSW, submit a certificate verifying that the construction materials used and the method of construction conform to the design requirements and this Specification. Submission of this certificate constitutes a Hold Point.

HOLD POINT

Process Held: imposition of surcharge loading above the zone of reinforced fill material.

Submission Details: Submit a certificate verifying that the construction materials used and the method of construction comply with the design requirements and this Specification.

Release of Hold Point: The Nominated Authority will consider the submitted documents, prior to authorising the release of the Hold Point.

6 WORK-AS-EXECUTED DRAWINGS

On completion of construction of the RSW, provide the RMS Representative with a set of the work-as-executed drawings showing:

(a) vertical sections at 7.5 m centres;

(b) the horizontal and vertical positions of the soil reinforcement within the top 1.5 m of the block of reinforced fill material together with any other necessary information such that roadside furniture (e.g. posts) may be installed without causing damage to the RSW;

(c) the locations of all monitoring points referred to in Clause 4.7 of this Specification.
ANNEXURES R58/A TO R58/B – (NOT USED)

ANNEXURE R58/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.2.

C1  SCHEDULE OF HOLD POINTS AND WITNESS POINTS

<table>
<thead>
<tr>
<th>Clause</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.11</td>
<td>Hold</td>
<td>Submission of verification of design requirements</td>
</tr>
<tr>
<td>3</td>
<td>Hold</td>
<td>Construction of the RSW</td>
</tr>
<tr>
<td>4.3</td>
<td>Hold</td>
<td>Validation of foundation</td>
</tr>
<tr>
<td>4.5.1</td>
<td>Witness</td>
<td>Washing of soil reinforcement made of steel</td>
</tr>
<tr>
<td>4.5.2</td>
<td>Hold</td>
<td>Submission of survey record for the bottom course of facing elements</td>
</tr>
<tr>
<td>5</td>
<td>Hold</td>
<td>Submission of construction verification certificate</td>
</tr>
</tbody>
</table>

C2  SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of RMS D&C Q6 Annexure Q/E.

<table>
<thead>
<tr>
<th>Clause</th>
<th>Description of Identified Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3</td>
<td>Source of reinforced fill material</td>
</tr>
<tr>
<td>2.11</td>
<td>Report giving details of all construction materials to be used in the Works together with test results and verifying that specified material properties have been met</td>
</tr>
<tr>
<td>3</td>
<td>Details of RSW design and certification</td>
</tr>
<tr>
<td>4.3</td>
<td>Report verifying that the site and foundations meet the design requirements</td>
</tr>
<tr>
<td>4.5.2</td>
<td>Survey of facing elements</td>
</tr>
<tr>
<td>5</td>
<td>Certificate that construction materials used and method of construction conform to design requirements and the Specification</td>
</tr>
<tr>
<td>6</td>
<td>Set of work-as-executed drawings</td>
</tr>
</tbody>
</table>
ANNEXURE R58/D – PLANNING DOCUMENTS

Refer to Clause 1.2.3.

The information to be supplied by you as part of your PROJECT QUALITY PLAN must include the following:

(a) Details of the construction materials to be used and their conformity with design requirements.

(b) Verification by the RSW System Owner that all components supplied for construction of the RSW meet the RSW System specifications.

(c) Details of the method of construction of RSW in accordance with Clause 4, together with a statement that the method of construction will comply with the design requirements.

(d) Details of the method of preparing the foundation in accordance with Clause 4.3.

(e) Details of the method of installing targets and probes for monitoring of the RSW in accordance with Clause 4.7.

ANNEXURES R58/E TO R58/K – (NOT USED)
### ANNEXURE R58/L – FREQUENCY OF TESTING FOR EACH LOT

<table>
<thead>
<tr>
<th>Clause</th>
<th>Material Property</th>
<th>Test Method</th>
<th>Minimum Frequency⁽¹⁾</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3, 2.5</td>
<td>Angle of friction at constant volume under effective stress conditions</td>
<td>Either: Q181C:Draft 1994⁽²⁾ or: Q181C:2008⁽²⁾</td>
<td>1 test per 400 m³, with a minimum of 5 tests for each type of material; 2 tests per 2,500 m³, with a minimum of 2 tests for each type of material</td>
</tr>
<tr>
<td>2.3, 2.4, 2.5</td>
<td>Grading</td>
<td>AS 1289.3.6.1 (refer also Table R57.10)</td>
<td>1 sample per 200 m³ or part thereof, but not less than 1 sample per layer</td>
</tr>
<tr>
<td>2.3, 2.5</td>
<td>LL and PI</td>
<td>T108 and T109 (refer also Table R57.10)</td>
<td>1 sample per 200 m³ or part thereof, but not less than 1 sample per layer.</td>
</tr>
<tr>
<td>2.3, 2.5</td>
<td>pH, electrical and chemical properties</td>
<td>As shown in Tables R58.1 and R58.2</td>
<td>1 sample per 400 m³ or part thereof but not less than 1 sample per layer.</td>
</tr>
<tr>
<td>4.5.4</td>
<td>Relative compaction:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zones 1 and 2</td>
<td>In accordance with RMS D&amp;C R44</td>
<td>In accordance with RMS D&amp;C R44 and RMS D&amp;C Q6</td>
</tr>
<tr>
<td></td>
<td>Zone 3</td>
<td>In accordance with RMS D&amp;C R44</td>
<td>1 test per 100 m², with minimum of 1 test every two adjacent continuous layers compacted on the same day, provided that the material has uniform treatment and appearance</td>
</tr>
<tr>
<td></td>
<td>Moisture content</td>
<td>In accordance with RMS D&amp;C R44</td>
<td>In accordance with RMS D&amp;C R44</td>
</tr>
</tbody>
</table>

**Notes:**

⁽¹⁾ Take samples at the time of placement of the layer. If you place subsequent layers before obtaining test results of previous layers, you do so at your own risk.

⁽²⁾ Prior to testing, pretreat the material in accordance with Test Method RMS T102 using 3 repeated compaction cycles.
ANNEXURE R58/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.5.

**RMS Specifications**
- RMS D&C G40 Clearing and Grubbing
- RMS D&C G71 Construction Surveys
- RMS D&C Q6 Quality Management System (Type 6)
- RMS D&C B80 Concrete Work for Bridges
- RMS D&C B115 Precast Concrete Members (Not Pretensioned)
- RMS D&C R44 Earthworks
- RMS D&C R57 Design of Reinforced Soil Walls
- RMS D&C R63 Geotextiles (Separation and Filtration)

**RMS Test Methods**
- RMS T102 Pretreatment of Road Construction Materials by Compaction
- RMS T108 Liquid Limit of Road Materials
- RMS T109 Plastic Limit and Plasticity Index of Road Construction Materials
- RMS T123 pH Value of Soil (Electrometric Method)
- RMS T166 Relative Compaction of Road Construction Materials
- RMS T185 Resistivity of Sands and Granular Road Construction Material
- RMS T1002 Determination of the pH Value of Water Using a pH Meter
- RMS T1004 Quantitative Determination of Chloride Ion in Water
- RMS T1010 Quantitative Determination of Chlorides in Soils
- RMS T1014 Quantitative Determination of Sulfate Ion in Water

**Queensland Department of Transport Test Methods**
- Q181C:Draft 1994 Determination of the Effective Angle of Friction at Constant Volume Conditions for Earthworks Materials
- Q181C:2008 Effective Angle of Internal Friction at Constant Volume Conditions for Granular (Coarse Grained) Materials

**Australian Standards**
- AS 1289.3.6.1 Methods of testing soils for engineering purposes – Soil classification tests – Determination of the particle size distribution of a soil – Standard method of analysis by sieving
- AS 4969.1 Analysis of acid sulfate soil – Dried samples – Methods of test – Pre-treatment of samples
AS 4969.12  Analysis of acid sulfate soil – Dried samples – Methods of test – Complete suspension peroxide oxidation combined acidity and sulfur (SPOCAS) method