

# Structures

## Master Specification

### ST-RE-D1 Design of Reinforced Soil Structures

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# ST-RE-D1 Design of Reinforced Soil Structures

## 1 General

- 1.1 This Part specifies the requirements for the design of Reinforced Soil Structures (RSS) which consist of a reinforced, compacted soil block contained by facing panels tied into the fill by reinforcing elements such as strips or grids. It excludes the design of soil nailed structures.

## 2 References

- 2.1 Unless specified otherwise, all design must be undertaken in accordance with the following:
- a) DIT Structures Group Drafting Guidelines for Consultants.
  - b) AS 1100 Technical Drawing.
  - c) AS 3679 Hot Rolled Structural Steel Bars and Section.
  - d) AS 4671 Steel Reinforcing Materials.
  - e) AS 4678 Earth Retaining Structures.
  - f) AS 4680 Hot-dip Galvanized (Zinc) Coatings on Fabricated Ferrous Articles.
  - g) AS 5100 Bridge Design.

## 3 Design requirements

### Design Criteria

- 3.1 The structures must be designed for a minimum life of 100 years.
- 3.2 The design loadings transferred from bridge abutments to the structures must be specified on the drawings. The live loading from the bridge approaches and the vertical and lateral loads from the earthwork must be taken into account in the design.
- 3.3 The structure must satisfy the stability requirements of AS 5100 for earth retaining structures. The reinforced soil block consists of the compact fill and reinforcing elements. Allowable bearing pressures and settlements on the founding material under the reinforced soil block must be determined by the designer from the geotechnical investigations.
- 3.4 Surface and subsoil drainage provisions must be provided where necessary to intercept or divert groundwater and surface water to prevent scour or the development of hydrostatic pressure behind facing panels or saturation of any fill (approach and reinforced soil).
- 3.5 If water or sewer mains are present, provisions to prevent saturation of the backfill in the event of a leaking main must be included. Subsoil drainage must be designed to prevent blockage from silt deposition. The drawings must clearly show all drainage provisions.
- 3.6 If the Works include the extension of an existing Reinforced Soil Structure, the design must include details of the method of preventing erosion and maintaining stability while the existing structure is being modified.
- 3.7 For straight walls the design must provide for a 1 in 40 slope on the vertical wall face.

### Settlement

- 3.8 The wall panel design, including panel jointing, must accommodate design differential movement between adjacent panels during and post construction.
- 3.9 RSS backfill shall be monitored to ensure that at least 80% of the expected settlement has occurred prior to the construction of the road pavements and / or associated structures.

- 3.10 Settlement of reinforced soil structures shall not exceed 10 mm maximum following completion of the structural backfill.

## Foundation Stability

- 3.11 Reinforced soil structures must be designed and constructed in such a manner that at any time, the design geotechnical strength of the foundation exceeds the ultimate applied loading, in accordance with AS 5100.3. The design reports must include calculations for foundation stability.

## Slope Stability

- 3.12 Slope stability of reinforced soil structures must comply with the slope stability requirements set out in RD-EW-D1 "Design of Earthworks for Roads". In assessing the potential instability of slopes above and behind a reinforced soil structure, and of slopes where potential failure surfaces encompass part or all of a reinforced soil structure, such slopes are considered high risk slopes.

## Ground Improvement

- 3.13 If any ground improvement measures, including staged construction of the reinforced soil structure and / or surcharging of the reinforced soil structure are proposed by the Contractor in order to meet the requirements for settlement and stability, then the Contractor must include design calculations and details of the proposed ground improvement measures in the design reports.

## 4 Materials

- 4.1 Materials must comply with requirements of ST-RE-C1 "Reinforced Soil Structures" and any specific requirements of the proprietary systems adopted.

## 5 Monitoring

- 5.1 Monitoring of retaining structures shall be included in the monitoring and surveillance program proposed for the embankments, pavements and bridge structures with time intervals as stipulated in RD-EW-D1 "Design of Earthworks for Roads", Clause 6 "Earthworks performance monitoring".
- 5.2 Monitoring points shall be placed at the top of all RSS facing adjacent to bridges and then spaced at intervals not exceeding 50 metres along its entire length.
- 5.3 A minimum of 2 monitoring points shall be placed on any ramps with spacing between points not to exceed 50 metres. At least one point shall be placed at the highest point of the RSS facing.

## 6 Records

The following records must be prepared:

### Drawings

- 6.1 Construction drawings in hard copy and AutoCAD format. The drawings must be to a level of detail such that no further production of drawings (e.g. shop detail drawings) will be required to assist construction. Any reference to any standard or ancillary drawing on any sheet must include its sheet number.

### Reports

- 6.2 The design report(s) must include:
- a full set of design calculations, incorporating calculations and determinations for all elements, appropriate sketches and details; and
  - evidence of suitability of soil reinforcing products.