

Reinforced Earth

3100

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3101. SCOPE

The work covers the construction of reinforced earth structures, together with the construction of earthwork in layers, assembly and erection of reinforcing elements and placement of facing panels and all associated components.

3102. REINFORCING ELEMENT

3102.1. The reinforcing element shall be of Geotextile, aluminium alloy strip, copper strip, carbon steel strip, mats of metal or synthetic grids, or any other proprietary material which may be approved by the Engineer and indicated on the drawings.

3102.2. Geotextile

The material shall conform to Clause 701.2.6.

3102.3. Aluminium alloy strip shall comply with BS:1470 quality 5454 in the H 24 condition.

3102.4. Copper strip shall comply with BS:2870 quality C 101 or C 102 in the 1/2 H condition and shall have 0.2 per cent proof stress of not less than 180 N/mm².

3102.5. Carbon steel strip which shall be galvanized shall comply with BS:1449 (Part 1), either quality KHR 34/20 P or quality 50/35 P, each having a silicon content of not less than 0.25 per cent and not more than 0.40 per cent. The fabricated element shall be galvanized in accordance with BS:729, and the average zinc coating weight for any individual test area shall not be less than 1000 gm/sq.m.

3102.6. Stainless steel strip shall comply with BS:1449 (Part 2) quality 316 S 31 or 3/6 S 33 except that the material shall be cold rolled to provide a 0.2 per cent proof stress of not less than 400 N/sq. mm and the tensile strength shall not be less than 540 N/sq. m.

3102.7. All metallic components buried in soil shall be of electrolytically compatible materials.

3102.8. Geogrids

The supply of geogrids shall carry a certification of BIS or ISO 9002 for all works. While the reinforcing element for wall or slope portion shall be with mono oriented Geogrid, the reinforcement for the foundation

of a reinforced earth wall or slope shall be with bi-directionally oriented Geogrid. For mono oriented Geogrid, the characteristic design tensile strength at a strain not exceeding 10 per cent in 100 years shall be at least 40 kN/m when measured as per GRI:GG3. The strength for bi-directionally oriented Geogrid in the longitudinal direction shall be at least 40 kN/m at a maximum elongation of 15 per cent. The Geogrid shall be inert to all naturally occurring chemicals, minerals and salts found in soil.

3103. EARTH FILL

The fill material for reinforced earth structures shall have an angle of interface friction between the compacted fill and the reinforcing element of not less than 25°C, measured in accordance with IS : 13326 (Part 1). The soil should be predominantly coarse grained; not more than 10 per cent of the particles shall pass 75 micron sieve. The soil should have properties such that the salts in the soil should not react chemically or electrically with the reinforcing elements in an adverse manner.

3104. FACIA MATERIAL

3104.1. The facing shall comprise of one of following :

- (i) Reinforced concrete (Cast in situ or precast) slabs
- (ii) Plain cement concrete form fill hollow block (Precast)
- (iii) Masonry construction, Rubble facia
- (iv) Other proprietary and patented proven system

The facing shall be sufficiently flexible to withstand any deformation of the fill.

3104.2. Facia unit joint filler should be durable resistant to the effect of air pollution and water/saline water.

3104.3. Bedding material shall consist of either cement mortar or a durable gasket seating such as resin bonded cork strip.

3104.4. Connection between the facia and the reinforcing element shall be by using polyethylene strips/rods, fibre glass dowels or any other material shown in the drawing. Any other material used shall be tested to provide 100 per cent joint strength as of parent element in continuity.

Overlapping in principal reinforcement or in the joint shall ensure load transfer through joints, perpendicular to the direction of laying.

3105. CONSTRUCTION DETAILS

3105.1. The plan area of the reinforced earth structure shall be

excavated to provide a nominally level base which may be stepped at the back as required to receive the horizontal reinforcing element grid.

The depth of the foundation below the finished ground level at the foot of the slope or wall shall not be less than 1000 mm.

Additional strip footing, trough guide made of concrete or anchor key pad shall be provided at founding level to receive the facia or the bottom most reinforcement connection. This shall have adequate soil cover against erosion and scour in particular cases.

3105.2. Orientation

The reinforcing elements shall be placed at right angles to the face of the wall, with greater cross-sectional dimension in the horizontal plane. The placement of the elements including their vertical/horizontal spacing and length shall be as in the drawing.

3105.3. Facing Batter

It may be necessary to set facing unit at an additional batter than as provided in the drawing as there is a tendency for initially positioned units of facia to lean outward as the fill material is placed and compacted. Care and caution shall be taken to rectify this phenomenon.

3105.4. Drainage

Drainage shall be provided as per drawing given in detail. The retained fill shall have a suitably designed drainage bay to allow free draining of the reinforced fill.

3105.5. Laying and Compacting

The reinforcing elements shall be laid free from all kinks, damage and displacement during deposition, spreading, levelling and compaction of the fill. The programme of filling shall be such that no construction plant runs directly on the reinforcement.

All construction plant having a mass exceeding 1000 kg shall be kept at least 1.5 m away from the fact of slope or wall. In this area (upto 1.5 m from the face of slope or wall), following compaction plant shall be used :

- (i) Vibratory roller having a weight per metre width of roll not exceeding 1300 kg with total weight not exceeding 10,000 kg.
- (ii) Vibratory plate compactor of maximum weight 1000 kg.
- (iii) Vibro tamper having a weight not exceeding 75 kg.

Compaction by any other method like using dozer or back blade compaction by dozer or excavator bucket shall be permitted with due approval from the Engineer after ascertaining the level of compaction so achieved.

During construction of reinforced fill, the retained material beyond the reinforcement at the rear or the structure shall be maintained at the same level as reinforced fill.

The compacted layer shall not be more than 200 mm, to achieve compaction of 95 per cent of maximum laboratory density where measured as per IS : 2720 (Part 8). Temporary formwork shall be used to support the construction as per specified details given in the drawing. The forms, scaffolding and props shall be sufficient in numbers to allow taking up of a sectoral construction schedule specified in the design.

3106. MEASUREMENTS FOR PAYMENT

Measurement for reinforcing elements shall be in linear metre for anchor strips or in sq.m. for geogrid/geotextile etc.

The measurement for facia shall be in sq. metres. The measurement for foundation for facia and capping beam shall be in linear metres. Measurement for compacted earthfill shall be in cubic metres for compacted soil.

3107. RATES

Rate shall include cost of labour, plant hire, material storage and handling expenses, for completing the works.

Rate for providing reinforcing elements shall include material cost, all transportation costs and storage of the same as per special provisions. The rate shall also include cost of laying of the reinforcing elements including all overlaps, jointing or stitching, heat bonding or extension.

Rate for facia fixing shall include cost of joints, all necessary temporary formwork, scaffolding and all lifts and leads, if any, as shown in the drawing, unless otherwise specified to be treated separately along with foundation or slope/wall kerb at the top of slope or wall. Rate for bed block and capping beam shall include all items of excavation, concrete, reinforcing steel, formwork, labour and equipment.

Rate for soil fill shall include compaction as desired in requisite layers through mechanical means, cost of hire or labour for plant operations, dressing and levelling slopes, including special measures for edge reinforcements as shown in the drawing.