

## **PART 1 - GENERAL**

### **1.1 DESCRIPTION**

- .1 This section specifies requirements for supplying and placing stone rip-rap, rock scour protection, and/or filter stone for erosion protection at locations and to dimensions indicated on drawings or designated by Departmental Representative.

### **1.2 RELATED SECTIONS**

- .1 Section 31 23 25 - Rock and Gravel Fill.

### **1.3 MEASUREMENT FOR PAYMENT**

- .1 Filter stone: Supply and placement of filter stone, including the cost of all plant, labour, equipment, and materials required to complete the work as specified, will be measured by the cubic meter (CMPM). The volume of material will be determined in place from measurements taken prior to and at completion of the work. Include incidental to this unit price all costs associated with the supply and installation of the geotextile, as detailed on the drawings.
- .2 Rock scour protection: Supply and placement of rock scour protection, including the cost of all plan, labour, equipment, and materials required to complete the work as specified, will be measured by the cubic meter (CMPM). The volume of material will be determined in place from measurements taken prior to and at completion of the work.
- .3 Rip-rap hand laid with sod: No measurement for payment to be made under this section. Include costs in unit price for item in which rip-rap hand laid with sod is required.

## **PART 2 - PRODUCTS**

### **2.1 FILTER STONE**

- .1 Hard, dense with relative density (specific gravity) not less than 2.65, durable quarry stone, free from seams, cracks or other structural defects.
- .2 Stones to be used as filter stone will weigh not less than 75 kg or more than 85 kg.
- .3 Supply rock spalls to fill open joints.
- .4 Field stones of appropriate sizes are acceptable for hand-placed filter stone.

**PART 2 - PRODUCTS**  
**(CONT'D)**

**2.2 ROCK SCOUR PROTECTION**

- .1 Hard, dense with relative density (specific gravity) not less than 2.65, durable quarry stone, free from seams, cracks or other structural defects.
- .2 Stones to be used as rock scour protection will weigh not less than 175 kg or more than 225 kg.
- .3 Field stones of appropriate sizes are acceptable.

**2.3 STONE (For Rip-Rap Hand Laid with Sod)**

- .1 Rip-rap shall consist of clean, hard, durable rock, having a density not less than 2.6 tonnes/m<sup>3</sup>. The rock material, if subjected to the Los Angeles Abrasion Test (ASTM C131), shall have a loss not greater than 35%. When tested for soundness, five cycles of magnesium sulphate (ASTM C88), the rock material shall have a loss of not greater than 15%.
- .2 Stones for use in rip-rap shall consist of clean hard durable rock, free of cracks. Rock subject to marked deterioration by water or weather will not be accepted. Only those stones approved by the Departmental Representative shall be used.

**2.4 SOD**

- .1 Sod shall consist of a dense well rooted growth of permanent and desirable grasses. When sod is lifted it shall be covered with grass recently mowed to a length not more than 75 mm. Sod shall be in widths not less than 300 mm nor more than 450 mm, in thickness not less than the depth of the fibrous roots and in no case less than 25 mm.
- .2 All sod shall be taken from good loamy soil. It shall be well permeated with roots; be uniform in texture and free from weeds; be in good health condition with no sign of decay, and contain sufficient moisture to maintain its vitality during transportation and placing.

**PART 3 - EXECUTION**

**3.1 PLACING**

- .1 Place rip-rap/filter stone/rock scour protection as directed to thickness and details indicated on drawings or as designated by Departmental Representative.

**PART 3 - EXECUTION**  
**(CONT'D)**

**3.1 PLACING**  
**(CONT'D)**

- .2 Where filter stone is to be placed on slopes, ensure that fill is placed to the slopes as indicated on the drawings.
- .3 Fine grade area to be protected to uniform even surface. Fill depressions with suitable material and compact to provide firm bed.
- .4 Place stones in manner approved by Departmental Representative to secure surface and a stable mass. Place larger stones at bottom of slopes.
- .5 Hand Placing:
  - .1 Use larger stones for lower courses and as headers for subsequent courses.
  - .2 Stagger vertical joints and fill voids with rock spalls or cobbles.
  - .3 Finish surface evenly, free of large openings and neat in appearance.
- .6 Filter stones shall be carefully hand-laid to give a thickness perpendicular to slope as indicated on drawings.

**3.2 RIP-RAP HAND LAID WITH SOD**

- .1 The placing of stones and the backfilling and tamping of trenches shall be as required under Section 31 23 10.
- .2 However, as the placing of stones proceeds, sod shall be placed so that sod separates the stones from each other, both horizontally and vertically. The sod shall be placed so that there are no voids between stones.
- .3 Sod shall not be placed upside-down.
- .4 The sodding shall be trimmed so that the exposed edges of sods are flush with the exposed face of the rip-rap.