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2.5 RIPRAP2.5.1 GENERAL2.5.1.1 **Description**

This specification covers the supply and placement of riprap. Riprap is a protective covering consisting of hand-laid or randomly deposited rock, sacked concrete or sacked cement stabilized material which is placed around culvert inlets and outlets and along slopes, embankments and ditches.

2.5.2 MATERIALS2.5.2.1 **General**

All riprap material shall be supplied by the Contractor and shall be resistant to weathering and water action and shall not consist of sandstone or shale. Where sources of rock riprap material exist within the right-of-way limits of the project, or in gravel pits, or other locations under the jurisdiction of the Department, the materials may, with the approval of the Consultant, be provided free of cost to the Contractor.

2.5.2.2 **Random Rock Riprap**

Random rock riprap shall consist of a graded mixture of sound, durable stone or pit-run gravel. The gradation of the mixture shall be such that 50 percent of the riprap consists of material having a least minimum dimension of 250 mm.

2.5.2.3 **Hand-Laid Riprap**2.5.2.3.1 General

The Contractor has the option of supplying Hand-Laid Rock Riprap, Sacked Concrete Riprap or Sacked Cement Stabilized Riprap all of which will be classed as Hand-Laid Riprap.

2.5.2.3.2 Rock Riprap

Hand-laid rock riprap material shall consist of sound, durable stones having a least minimum dimension of 200 mm.

2.5.2.3.3 Sacked Concrete Riprap

Concrete shall be manufactured in accordance with Specification 5.5, Supply of Portland Cement Concrete, for Class "S" Concrete.

Upon approval of the Consultant, clean, well graded pit-run gravel, in lieu of separated sand and gravel, may be used in the manufacture of concrete.

2.5.2.3.4 Sacked Cement Stabilized Riprap

Cement stabilized material shall be manufactured in accordance with Specification 3.9, Cement Stabilized Base Course unless otherwise approved by the Consultant.

2.5.2.3.5 Burlap Sacks

Sacks for sacked riprap shall be 370 mm x 685 mm, 285 g burlap of approximately 0.03 m³ capacity. The bags shall be of sufficient strength to permit them to be lifted by the top corners of the bag when filled with the applicable materials.

2.5.3 CONSTRUCTION2.5.3.1 **Placing Random Rock Riprap**

Random riprap gravel shall be dumped over the area to be treated, until the required depth is attained. Manual handling of the material may be required.

2.5.3.2 **Placing Hand-Laid Riprap**2.5.3.2.1 General

Hand-laid riprap shall be placed at culvert inlets and outlets and at other locations as directed by the Consultant. Riprap aprons as shown on Dwg. No CB6-2.5 M1 will only be required when specified in the special provisions or shown on the plans.

2.5.3.2.2 Placing Rock Riprap

The stones shall be placed with their beds at right angles to the slope, the larger stones being placed first in the bottom courses and graduating to the smaller stones at the top. Stones shall be laid in close contact so as to break joints, and in such manner that the weight is carried by the earth and not by the adjacent stones. The spaces between the larger stones shall be filled with spalls, securely rammed into place. The finished work shall present an even, tight surface as shown on the drawings.

2.5.3.2.3 Preparation of Base for Sacked Concrete or Sacked Cement Stabilized Riprap

The base shall be formed by excavating, filling and shaping to the required depth below and parallel to the finished surface of the riprap. The entire base shall be thoroughly compacted to provide a smooth and firm foundation of uniform density.

2.5.3.2.4 Placing Sacked Concrete or Sacked Cement Stabilized Riprap

Each burlap sack shall be filled to 70 percent of its capacity with concrete or cement stabilized material, securely sewn or stapled to form a straight edge closure, and immediately placed in its final position on the prepared base. The filled sack shall be placed to conform to the prepared base and adjacent sacks already in position, to form a closely moulded, smooth surface of uniform average depth of not less than 125 mm.

All joints between rows shall be staggered to pattern, and all dirt and debris shall be removed from tops of sacks before successive courses are placed.

Not more than five courses of sacks shall be placed in any tier before such time as initial set has taken place in the first course of any such tier.

Following placing, the sacked concrete or sacked cement stabilized riprap shall be kept moist for a period

of twenty-four hours, by sprinkling water, moist earth covering, or other satisfactory means as approved by the Consultant.

2.5.4 MEASUREMENT AND PAYMENT

2.5.4.1 **Random Rock Riprap**

Measurement of random rock riprap will be by the cubic metre of material incorporated into the Work.

Payment will be made at the unit price bid per cubic metre for "Riprap - Random - Supply and Place". This payment shall be full compensation for supplying, processing, hauling and placing the material.

2.5.4.2 **Hand-Laid Riprap**

Payment for the supply and placement of hand-laid riprap including any required riprap aprons will be included in the unit price bid for the various types and sizes of culvert installations and will not be paid for separately.