

## **Part 1 General**

### **1.1 DESCRIPTION**

- .1 This specification is for installation of heavy rock riprap. This work shall include all necessary work required to satisfactorily place the rock riprap, such as:
  - supply and placing of geotextile filter fabric
  - supply and placing of gravel or granular bedding material
  - placement of rock riprap to the extents and intent shown on the design drawings

### **1.2 WASTE MANAGEMENT AND DISPOSAL**

- .1 Divert left over aggregate materials from landfill to local quarry for reuse as approved by Engineer.
- .2 Divert left over geotextiles to local plastic recycling facility for reuse as approved by Engineer.

### **1.3 PERMITS**

- .1 The Contractor shall obtain whatever permits, agreements, and authorizations are necessary, prior to loading the riprap. He shall advise the Engineer of any special provisions required under such permits, and must provide evidence satisfactory to the Engineer that the requirements of the permits have been fully complied with before final payment will be made.

### **1.4 INSPECTION**

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

### **1.5 INDEPENDENT INSPECTION AGENCIES**

- .1 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by the Departmental Representative at no cost to the Departmental Representative.

### **1.6 ACCESS TO WORK**

- .1 Allow inspection/testing agencies access to Work.

**1.7 REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.

**Part 2 Products**

**2.1 STONE**

- .1 The rock supplied shall be clean, hard, durable and angular in shape, resistant to weathering and water action, free from overburden, spoil, shale or shale seams and organic material, and shall meet the gradation requirements for the class specified. In general, no sandstone will be permitted for all classes, however if the proposed material meets or exceeds the minimum requirements, consideration may be given to accepting the material. For these occurrences, further testing shall be done to ensure acceptability. This would include testing of the material in accordance with CSA A23.2-15A "Petrographic Examination of Aggregates". The minimum dimension of any single rock shall be not less than one third of its maximum dimension. The minimum acceptable unit weight of the rock is 2.5 t/m<sup>3</sup>.
- .2 The Contractor shall provide the Engineer with evidence of the acceptability of the riprap material. Reliable performance records of proposed material, other than fieldstone, will be considered evidence of acceptability. Fieldstone shall be considered to have a reliable performance record, and will be accepted if it meets the gradation requirements.
- .3 The acceptance of rock samples from a particular source or quarry site shall not necessarily be construed as constituting acceptance of all material from that location. The material provided for the required Class 2 rock shall have a gradation that conforms to the following:

		CLASS			
		1M	1	2	3
Nominal Mass (kg)		7	40	200	700
Nominal Diameter (mm)		175	300	500	800
None greater than:	kg	40	130	700	1800
	or mm	300	450	800	1100
20% to 50%	kg	10	70	300	1100
	or mm	200	350	600	900
50% to 80%	kg	7	40	200	700
	or mm	175	300	500	800
100% greater than:	kg	3	10	40	200
	or mm	125	200	300	500

Percentages quoted are by mass.

Sizes quoted are equivalent spherical diameters, and are for guidance only.

- .4 Rip Rap shall meet the following minimum requirements for specific gravity, absorption and durability:
  - .1 California Department of Transportation Minimum Specific Gravity = 2.60

- .2 Method of Test for Specific Gravity and Absorption of Coarse Aggregate  
 Maximum Absorption = 2.0 percent (California Test 206)
- .3 California Department of Transportation Minimum Durability Index = 52

*Method of Test for Durability Index Durability Index may be less than 52 if  $DAR^* > 23$  (California Test 229) \* Durability Absorption Ratio (DAR) = Durability Index / (Absorption % + 1%)*

**2.2 GEOTEXTILE FILTER**

- .1 Where geotextile filter fabric is specified, the slope shall be graded to provide a smooth, uniform surface. All stumps, large rock, brush or other debris that could damage the fabric shall be removed. All holes and depressions shall be filled so that the fabric does not bridge them. Loose or unstable soils shall be replaced. Non-woven geotextile filter fabric shall be used under all riprap in accordance with the following table of minimum average roll value properties (MARV's) for each specific Class of riprap:

<b>Non-Woven Geotextile Filter Fabric</b>		
Specifications and Physical Properties		
	Class 1M, 1 and 2	Class 3
Grab Strength	650 N	875 N
Elongation (Failure)	50%	50%
Puncture Strength	275N	550 N
Burst Strength	2.1 MPa	2.7 MPa
Trapezoidal Tear	250 N	350 N
Minimum Fabric Lap to be 300 mm		

The non-woven geotextile filter fabric shall meet the specifications and physical properties as listed above.

- .2 Placement of Fabric

The fabric shall be laid parallel to the slope direction. It shall be placed in a loose fashion, however folds and wrinkles shall be avoided. Adjacent strips of fabric shall be overlapped a minimum of 300 mm, except where placed underwater, the minimum lap width shall be 1 m. Overlaps shall be pinned using 6 mm diameter steel pins fitted with washers and spaced at 1 m intervals along the overlaps.

The top edge of the filter fabric shall be anchored by digging a 300 mm deep trench, inserting the top edge of the fabric and backfilling with compacted soil.

Care shall be taken to prevent puncturing or tearing the geotextile. Any damage shall be repaired by use of patches that extend at least 1 m beyond the perimeter of the tear or puncture. The fabric shall be covered by rock riprap within sufficient time so that ultraviolet damage does not occur; in no case shall this time exceed 7 days for ultraviolet material and 14 days for ultraviolet protected and low ultraviolet susceptible polymer geotextiles. Riprap placement shall commence at the base of the blanket area and proceed up the slope. The height of drop of riprap shall be limited to 1.0 m or less, and the riprap shall not be allowed to roll down the slope. Heavy equipment will not be permitted to operate directly

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### **Part 3            Execution**

#### **3.1                PLACING ROCK**

- .1        Where rip-rap is to be placed on slopes, place larger rock at toe of slope to act as a toe apron as indicated. Use of an excavator with a thumb attachment is preferred.
  
- .2        Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
  
- .3        Place geotextile on prepared surface as indicated.

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- .4 Place rip-rap to thickness and details as indicated. The rock shall be handled, dumped or placed into position to conform to the specified gradation and to the cross section shown on the drawings. The finished surface shall be reasonably uniform, free from bumps or depressions, and with no excessively large cavities below or individual stones projecting above the general surface.
- .5 Place stones in manner approved by Engineer to secure surface and create a stable mass. Place larger stones at bottom of slopes.

#### **Part 4 MEASUREMENT AND PAYMENT**

- .1 The quantity of heavy rock riprap to be paid for will be measured in place. The volume of rock paid for will be calculated from the thickness of the riprap as shown on the drawings, and the actual area covered. Overages in thickness or area beyond the limits shown on the drawings will not be paid for unless these changes were requested by the Engineer.
- .2 Payment will be made at the unit price bid per cubic metre of Rock Riprap acceptably in place, which price shall include full compensation for all necessary materials, royalties, permits, haul of materials, equipment, tools, labour and incidentals necessary to complete the work, including the preparation of the subgrade for the riprap, geotextile filter fabric, bedding material, trimming, excavation, backfill as required, and labour for measurement.

**END OF SECTION**