

This specification outlines the requirements for the placing of rip-rap for erosion protection at locations and to details indicated or directed by the Owner.

## PART 1 REFERENCES

This specification refers to the following standards, specifications, or publications:

ASTM International

C88/C88M Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

C131/C131M Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

C144 Standard Specification for Aggregate for Masonry Mortar

CSA Group (CSA)

A3000 Cementitious Materials Compendium

## PART 2 GENERAL

2.1 NOT APPLICABLE

## PART 3 PRODUCTS

### 3.1 STONE

- .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/C131M), shall have a loss not greater than 35 %. When tested for soundness, five cycles of magnesium sulphate (ASTM C88/C88M), 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 Owner shall be used.
- .3 The largest rocks procurable shall be supplied and in no case shall any fragment measure less than 0.0035 m<sup>3</sup> in volume. In hand laid dry wall rip-rap, spalls shall be supplied to fill open joints. Field stones or boulders or other materials may be used when approved by the Owner.

3.2 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 healthy condition with no sign of decay, and contain sufficient moisture to maintain its vitality during transportation and placing.

3.3 GROUT

- .1 Grout shall consist of a cement mortar composed of one part Portland Cement and three parts fine aggregate.
- .2 Cement to CSA A3000, type 10.
- .3 Sand for mortar to ASTM C144.

3.4 GEOTEXTILE (FILTER FABRIC)

- .1 Geotextile in accordance with Section 02897 – Geotextile (Filter Fabric). Type as indicated in Contract Documents.

PART 4 EXECUTION

4.1 EXCAVATION

- .1 Should the Owner require that excavation be carried out to prepare a foundation for the rip-rap, then the work shall be carried out in accordance with Section 02224 – Roadway Excavation, Embankment & Compaction.
- .2 Rip-rap - Hand Laid Dry Wall; Hand Laid with Sod; Grouted;
  - .1 On slopes to be rip-rapped the slopes shall be fine graded to a uniform even surface. Depressions shall be filled with suitable material and thoroughly compacted to provide a firm bed.
- .3 Rip-rap Random;
  - .1 Where directed by the Owner, excavation for foundation shall be performed to provide a shelf or ledge to retain the rock so dumped.

4.2 PLACING

- .4.1 Rip-rap - Hand Laid Dry Wall;

- .1 Place geotextile on prepared surface in accordance with Section 02897 – Geotextile (Filter Fabric) and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.
- .2 Place rip-rap to thickness and details as indicated.
- .4.3 Unless laid to form a flat apron, the rip-rap shall commence in a trench below the toe of the slope. Stones shall be placed by derrick or by hand. Stones shall be set normal to the slope, and placed so that the largest dimension is perpendicular to the face of the wall, unless such dimensions is greater than specified thickness of the wall.
- .2.4 The largest stones shall be placed in the bottom courses and for use as headers through subsequent course. No shaping of stones will be required; but the Contractor shall build to reasonable semblance of courses with stones laid closely and voids chinked with spalls.
- .3.5 Stones shall be placed in the wall in such a way that the rear of each stone shall be embedded into the slope of the embankment.
- .6 On the completion of laying of rip-rap operations any open foundation trenches bordering the rip-rap shall be backfilled and tamped.
- .4.7 Stagger vertical joints and fill voids with rock spalls or cobbles.
- .5.8 The required thickness of rip rap is dependent on the proposed height and slope of the rip rap and on the expected force of the stream flow.
- .6.9 The Contractor shall construct the rip rap to the thickness stipulated in the contract documents or as directed by the Owner's Representative.
- .5.2 Rip-rap Hand Laid with Sod;
- .1 The placing of stones and the backfilling and tamping of trenches shall in accordance with subsection Rip-rap – Hand Laid Dry Wall 4.2.1 of this specification.
- .2.1 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.
- .3.2 Sod shall not be placed upside-down.
- .4.3 The sodding shall be trimmed so that the exposed edges of sods are flush with the exposed face of the rip-rap.
- .6.3 Rip-rap - Grouted;
- .1 The placing of stones shall be in accordance with subsection Rip-rap – Hand Laid Dry Wall 4.2.1 of this specification.

.2 Use mortar within one hour after water has been added. Do not add additional water after initial mixing.

.3 Before applying mortar the surfaces of the stones shall be amply wetted. The spaces between the stones shall be filled with mortar, starting from the bottom and working to the top except for subdrainage relief holes as indicated.

.4 The mortar shall be worked with suitable tools to completely fill all voids except that the outer faces of the stones shall be exposed. Excess mortar shall be removed with a stiff brush.

.4.5 Grouted rip-rap shall be cured in accordance with the requirements for curing concrete sidewalk.

.2.6 After mortar has set any foundation trenches bordering, the rip-rap shall be backfilled and tamped.

.7.4 Rip-rap - Random;

.1 Rock material may be placed by dumping it into position over the surface to be rip-rapped.

.2 The Owner will indicate whether the larger stones should be placed near the bottom of the slope, or near the top of the treated area to protect against scour. The Contractor shall make a reasonable endeavour to dump the larger stones where required. Placing shall be done in such a manner that the surface of the finished rip-rap shall have a uniform appearance.

## PART 5 PAYMENT

### 5.1 MEASUREMENT FOR PAYMENT

.1 Rip-rap will be measured in cubic metres to measurement specified or directed by the Owner.

.2 Transportation of material to placement site, access to placement site, ~~and excavation for~~ and preparation of foundation base not to be measured for payment but considered incidental to work and included in the MERX Schedule of Quantities and Prices.

.3 Where excavation required for rip-rap overlaps excavation required for other work, then payment for excavation will be made in accordance with the specification for the other work as though no excavation were required for rip-rap.

### 5.2 BASIS OF PAYMENT

.1 All costs associated with the work outlined in this specification shall be deemed to be included in the appropriate unit and lump sum prices quoted

as outlined in the Measurement for Payment subsection of this section and as included in the MERX Schedule of Quantities and Prices.

- .2 Excavation will be paid in accordance with Section 02224 – Roadway Excavation, Embankment & Compaction.
- .3 Geotextile Filter Fabric will be paid in accordance with Section 02897 – Geotextile (Filter Fabric).

Not For Construction

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