

SECTION 220

RIPRAP CONSTRUCTION

220.1 DESCRIPTION:

The construction of riprap shall consist of furnishing and placing stone, with or without grout, ~~or sacked concrete riprap~~. The depth and type of riprap shall be as shown on the plans or specified in the special provisions.

220.2 MATERIALS:

Materials furnished for riprap shall conform to the requirements of Section 703.

220.3 PREPARATION OF GROUND SURFACES:

The bed for the riprap shall be shaped and trimmed to provide even surfaces. A footing trench shall be excavated along the toe of the slope as shown on the plans.

220.4 PLAIN RIPRAP:

~~When the required riprap is less than 20 inches in depth, stone shall be placed by hand. Stone shall be placed to provide a minimum of voids. The larger stone shall be placed in the toe trench, foundation course, and on the outer surface of the riprap. Stones shall be placed with their longitudinal axis normal to the face of the embankment and so arranged that each stone above the foundation course has at least a 3 point bearing on the underlying stones. Bearing on smaller stones used to chink voids will not be acceptable. Interstices between stones shall be chinked with small stones and spalls. The finished surface shall be even and tight and shall not vary from the planned surface by more than 3 inches per foot of depth.~~

~~When the required riprap is 20 inches or more in depth, the stone may be placed by dumping and spread in layers by bulldozers or other suitable equipment.~~

220.5 GROUTED RIPRAP:

Riprap shall be placed as specified and grouted with portland cement mortar. The grout shall consist of 1 part cement and 3 parts by volume or aggregate. The portland cement shall be Type II as specified in Section 725 and the aggregate shall be 2 parts sand and 1 part gravel passing a 3/8 inch square mesh screen. The quality of the sand and gravel shall be as specified in Section 701.

The amount of water shall be such as to permit gravity flow into the interstices with limited spading and brooming. The consistency of the grout shall be as approved by the Engineer.

Except when hand mixing is permitted by the Engineer, grout shall be mixed in an approved machine mixer for not less than 1 1/2 minutes. Should hand mixing be permitted, the cement and aggregate shall be thoroughly mixed in a clean, tight mortar box until the mixture is of uniform color after which clean water shall be added in such quantity as to provide a grout of the specified consistency.

~~220.6 SACKED CONCRETE RIPRAP:~~

~~Slopes on which the sacked concrete riprap is to be placed shall be finished within 0.2 foot of the designated grades. The first course shall be a double row of stretchers laid in a neatly trimmed trench. The second course shall be a single row of headers. The third and remaining courses shall be stretchers or headers as shown on the plans or specified in the special provisions and shall be placed so that joints between courses are staggered. Dirt and debris shall be removed from the tops of sacks before the next course is laid thereon. Headers shall be placed with the folds upward. Not more than 4 vertical courses shall be placed in any tier until the initial set has taken place in the first course of any such tier.~~

~~When, in the opinion of the Engineer, there will not be proper bearing or bond due to delays in placing succeeding layers of the hampering of work by storm, mud or for any cause, a small trench shall be excavated back of the row of sacks already in place and this trench filled with fresh concrete before more sacks are placed. Payment for excavating the trenches shall be considered as included in the payment for the concrete in the trench.~~

~~Sacked concrete riprap shall be cured by sprinkling with a fine spray of water every 2 hours during daylight for not less than 3 days.~~

and underlain with erosion control geosynthetic fabric.

Erosion control geosynthetic fabric shall conform to the requirements of Section 796, Class B in accordance with Table 796-3.

Waste or sacked concrete shall not be permitted for use as riprap

The Contractor, at no additional cost, shall provide mechanical equipment, a sorting site, and labor needed to assist in checking riprap gradation.

Bedding material shall consist of processed natural material conforming to the requirements of Section 702.3, with a material gradation conforming to Select Materials Type A or B, or Aggregate Base as specified in Table 702-1.

220.3 PLACEMENT OF EROSION CONTROL GEOTEXTILE FABRIC:

Fabric shall be placed in a manner and at the locations shown on the project plans. The surface to receive fabric shall be free of obstructions, depressions, and debris. Any defects or soft yielding places which occur in the subgrade for any cause whatsoever shall be corrected and compacted to require density and stability before fabric is placed. These repairs shall be made at the expense of the contractor. The fabric shall be loosely laid (not in a stretched condition), aligned and placed with no wrinkles that lap.

The fabric strips shall be placed to provide a minimum 24-inch of overlap for each joint. On horizontal joints, the uphill strip shall overlap the downhill strip. On vertical joints, the upstream joint shall overlap the downstream joint.

Bedding material shall be placed uniformly on the fabric to the depth specified on the plans and shall be free of mounds, dips, and windrows. Bedding material shall not be compacted.

Use the following description per MCDOT supplemental specification:

Riprap shall be carefully placed on the bedding material and erosion control geosynthetic fabric in such a manner as to not damage the fabric. If the Engineer determines that the placement of stone has damaged or displaced the fabric to the extent that it cannot function as intended, the Contractor, at his expense, shall remove the placed riprap stone and properly correct the damage to, and/or the displacement of, the fabric. Such correction may include the removal and subsequent replacement of the bedding material and fabric, and re-grading the affected area, each as determined by the Engineer.

Riprap shall be placed in a manner which will produce a reasonably well-graded mass without segregation and with a minimum amount of voids, with the larger stone evenly distributed through the riprap mass. The individual placement of larger riprap stones may be required to obtain a uniform distribution of stone size. The riprap placement shall be supplemented by such hand methods as are required to obtain a uniform finished surface. Allowable tolerance from the slope lines and grades shown for the finished riprap surfaces shall not exceed a distance equal to $0.67 \times D_{50}$ above or $0.33 \times D_{50}$ below the design surfaces. Special care shall be exercised in placing riprap within 3 feet of structures to avoid damage to such structures.

Delete. An archaic specification (dates back to the 1950's) that may violate present-day environmental regulations. More typically used today for emergency actions. Can become a long-term maintenance item.

SECTION 220

220.7 MEASUREMENT:

The quantities of riprap construction shall be those of the completed bid item, in place, within the limits of dimensions shown on the plans.

~~The Engineer will compute the quantities of riprap by a method which, in his opinion, is best suited to obtain an accurate determination.~~

Measurement will be in cubic yards rounded to the nearest cubic yard. Measurement shall extend from the erosion control geosynthetic fabric to the top of the riprap. Quantities will be computed by the average end area method.

No separate measurement will be made for erosion control geosynthetic fabric or bedding material.

220.8 PAYMENT:

Payment for riprap will be made for the number of cubic yards of ~~riprap in place~~ ^{construction}, on the basis of unit prices stipulated in the proposal and shall include ~~preparation of ground surfaces and trenching~~, unless an alternate basis for payment is stipulated in the proposal.

complete in-place riprap construction as measured in 220.7

excavation, ground surface preparation, erosion control geosynthetic fabric, bedding material, riprap rock, grout (if used for the project) and backfilling.

The price shall be full compensation for furnishing all material, labor and equipment for riprap construction.

End of Section



SECTION 703

RIPRAP

703.1 STONE:

Stone for plain and grouted riprap shall be sound and durable, free from seams and coatings, and of such characteristics that it will not disintegrate when subjected to the action of water. Loss by abrasion shall not exceed the limits specified in Section 701.4. ← meet the requirements of Section 701.4.

Stone shall be of shapes which will form a stable protection structure of the required depth. Rounded boulders or cobbles shall not be used on slopes steeper than 2 to 1 unless grouted. Angular shapes may be used on any slope. Flat or needle shapes will not be acceptable unless the thickness of the piece is more than 1/3 the length. ^{flatter} If specified, rounded may

~~Waste concrete may be used, if the pieces are sound free from coatings, and meet the size requirements specified for a stone.~~

Delete. Provides no method to determine if durability requirements can be met.

703.2 SIZE OF STONE:

Riprap stone shall be as large as can be conveniently placed in a layer of the required depth. The stones, excepting small stones and spalls used to chink interstices shall weigh not less than 10 pounds and at least 50 percent of the stone shall weigh not less than 100 pounds.

~~703.3 CONCRETE:~~

← Delete. The application is not provided within Section 220 and contradicts grouted riprap per the same section.

~~The portland cement, aggregates and mixing shall be as specified in Section 725 and as herein specified. The aggregate may be pitrun material, at least 80 percent of which shall pass a 1 1/2 inch square mesh screen. Separating aggregates by primary sizes will not be required. Los Angeles rattler tests and soundness tests will not be required.~~

~~The mixed concrete shall contain 376 pounds of portland cement per cubic yard.~~

~~The amount of water shall be such as to produce a mixture with a slump of 3 to 5 inches, when tested in accordance with ASTM-C-143.~~

~~703.4 SACKS:~~

← Delete. An archaic specification (dates back to the 1950's) that may violate present-day environmental regulations. More typically used today for emergency actions. Can become a long-term maintenance item.

~~Sacks shall be made of burlap not lighter than 10 ounce and shall be approximately 19 1/2 inches by 36 inches measured inside the seams when the sack is laid flat. Sound reclaimed sacks may be used. The capacity of each sack shall be 1.25 cubic feet. Each sack shall contain 1 cubic foot of concrete loosely placed so as to leave room for folding the open end, the fold just enough to retain the concrete at the time the filled sacks are placed. Immediately after filling, the sacks shall be placed and lightly trampled to cause them to conform with the ground surface and with adjacent sacks in place.~~

End of Section