MICHIGAN

DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

FOR

**LAKESHORE RIPRAP**

GEO:CDJ 1 of 3 APPR:RWS:DMG:07-29-24

**a. Description.** This work consists of preparing cut or fill grades, shoring the excavation, installing heavy geotextile liner and furnishing and placing stone riprap on the lake bottom and side slopes. Complete all work in accordance with the plans, the standard specifications and as directed by the Engineer.

The following definitions apply when used herein and on the plans:

**Stone Underlayer.** A bedding layer of stone aggregate placed on the excavated ground surface and heavy geotextile liner below the larger Armor Stone layer. The thickness of this layer is shown on the plans.

**Armor Stone.** A layer of well-graded riprap placed above the Stone Underlayer. The thickness of this layer is shown on the plans.

**b. Materials.** Use stone that is quarried aggregate or waste mine rock, free from shale, spoil and organic material, as well as seams, cracks, or other structural defects. The use of recycled crushed concrete is not permitted for any stone riprap. Ensure the stone is hard, angular, durable and resistant to weathering and water and wave action, having 2.5 minimum bulk dry specific gravity and 2.5 percent maximum 24 hour soak absorption in accordance with *ASTM D6473*. The weight loss in 5 cycles by use of sulfate soundness testing must not exceed 10 percent in accordance with *ASTM D5240/D5240M*. The ratio of the greatest (axis A) to least (axis C) dimension must not exceed 3:1 for 98 percent of the Armor Stone and 90 percent of the Stone Underlayer delivered to the project site as depicted in Figure 1 below.



Figure 1: Riprap shape depicting A, B and C axis

Ensure the gradation for Armor Stone and Stone Underlayer meets the requirements specified in Table 1 and Table 2, respectively herein. The basis of acceptance of the stone riprap will be Test Data Certification. However, acceptance of the armor stone riprap gradation will be based on visual inspection by the Engineer using the Wolman Count method (*Federal Lands Highway Test Method 521*). The Contractor and/or the supplier must assist with the Wolman Count as requested by the Engineer.

**Table 1: Individual Stone Gradation Requirements for Armor Stone**

|  |  |  |
| --- | --- | --- |
| Size (inches) (a) | Percent Smaller Than | Particle Weight Limit (pounds) |
| 56 | 100 | 9,600 |
| 48 | 85 | 6,000 |
| 36 | 50 | 2,400 |
| 28 | 15 | 1,340 |
| 18 | 0 | 280 |
| a.Corresponds to the intermediate axis (B) in Figure 1. |

**Table 2: Individual Stone Gradation Requirements for Stone Underlayer**

|  |  |  |
| --- | --- | --- |
| Size (inches) (a) | Percent Smaller Than | Particle Weight Limit (pounds) |
| 26 | 100 | 960 |
| 22 | 85 | 600 |
| 16 | 50 | 240 |
| 13 | 15 | 130 |
| 8 | 0 | 30 |
| a.Corresponds to the intermediate axis (B) in Figure 1. |

Ensure heavy geotextile liner is in accordance with section 910 of the Standard Specifications for Construction. Furnish the Engineer a copy of the Test Data Certification for the heavy geotextile liner before incorporating it into the project.

**c. Construction.** Place riprap in accordance with subsection 813.03.E of the Standard Specifications for Construction, on prepared grades to the elevations, thickness, and lateral limits as shown on the plans. Clear areas to be protected by riprap of brush, trees, stumps, debris, and surplus or unsuitable soil. Shape and compact all grades to the required cross section. Furnish the necessary shoring to maintain a stable excavation when placing heavy geotextile liner and riprap below water. Place heavy geotextile liner on prepared grades in accordance with the *Soil Erosion and Sedimentation Control Manual*. Ensure the riprap installation does not damage the heavy geotextile liner. Ensure heavy geotextile liner is placed in full length strips and in the direction as shown on the plans. Repair or remove and replace damaged heavy geotextile liner as directed by the Engineer at no cost to the contract. Construction equipment and vehicular traffic is not allowed directly on the geotextile.

Once the heavy geotextile liner is placed, construct the Stone Underlayer as shown on the plans. Place Armor Stone to the limits shown on the plans. Careful placement of riprap with a clam bucket or other approved method is required to assure that there is no damage to the heavy geotextile liner. Do not allow sand or other material to be placed with the stone.

On slopes, placement of riprap stone must start at the toe and proceed up the slope, with each stone firmly bedded into the slope and against adjoining stones. Construct the riprap to minimize voids by select placement of optimum stone sizes from the gradation specified. If placed riprap contains large voids, the Engineer will direct the Contractor to place additional stones of the appropriate gradation sizes to fill the voids.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

**Pay Item Pay Unit**

Stone Underlayer Ton

Armor Stone Ton

1. **Stone Underlayer** includes furnishing all labor, equipment and materials to clear and prepare grades, excavating and disposing of surplus or unsuitable materials, shoring, furnishing and placing heavy geotextile liner and placement of the stone riprap as shown on the plans and in accordance with this special provision.

Existing non-armor stone riprap meeting the requirements of this special provision and deemed suitable by the Engineer may be re-used and paid for as **Stone Underlayer**. Existing non-armor stone riprap deemed unsuitable must be removed and disposed of. Payment for this work will be measured by the cubic yard and paid for as **Excavation, Earth** at the contract unit price.

2. **Armor Stone** includes furnishing all labor, equipment, materials and placing the riprap stone as shown on the plans and in accordance with this special provision.

Refer to the special provision for Armor Stone Removal and Salvage for removal, disposal, salvaging and placement of existing armor stone.