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31 37 00	RIPRAP, BOULDERS, AND BEDDING

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Part 1

General

- A. This section includes installation of riprap, boulders and soil riprap as functional and design items for new projects.
- B. Related Sections:
 - 1. 32 91 13 Soil Preparation
 - 2. 32 92 22 Hydroseeding
- C. Submittals and mock-ups: Contractor shall obtain and provide samples of all specified materials to Owner. Sample mockups shall be erected at size specified on drawings, to represent an approximately 10 square foot area, including stone and soil placement, for review and approval of both technical and aesthetic installation results by Owner.

Part 2

Products

- A. Riprap
 - 1. 3”-6” diameter ‘Rock Springs Chocolate’ or ‘Table Mesa Brown’ crushed rock, or limestone in size gradation as specified/provided by Owner (Landscaping & Outdoor Services). Type and total thickness to be as designated on the construction drawings. Maximum stone size shall not be larger than the thickness of the riprap.
 - 2. Visually screen rip-rap areas with high density planting at high visibility areas.
 - 3. Limit use to areas where erosion will occur if rock is not used and stormwater cannot be slowed using other methods.
 - 4. Stones smaller than two to ten percent of the specified size will not be permitted in an amount exceeding 10% of total amount. Size to be determined by mechanical gradation with control by visual inspection.
 - 5. Color to be approved by Owner prior to delivery to project site. Color to be consistent on the entire project.
 - 6. Broken concrete, asphalt pavement pieces, or river rock is not acceptable for use for this work.
- B. Soil Riprap
 - 1. Rock requirements are to comply with riprap specified in Products: Article A.
 - 2. Soil material shall be native or topsoil and mixed to be 65% rip-

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	rap and 35% topsoil by volume, installed 12” thick.
	3. Use uniform mixture of soil and riprap without voids.
	4. To be used in conjunction with NAU shortgrass and tallgrass meadow blends at drainage swales and steep slopes.
C.	Boulders
	1. Boulders to be limestone, approximately 3’ diameter or of ledgestone shape and size, or as specified on the construction drawings.
	2. Color to match existing limestone on campus. Basalt to be used only as approved by Owner. Use of campus limestone stockpiles may be coordinated with Landscaping & Outdoor Services and Campus Landscape Architect. If sourced off-campus, color to be approved by Owner prior to delivery to project site. Color to be consistent on entire project.
	3. Use boulders only in select locations as approved by Owner.

Part 3 – Execution

Preparation

- A. Slopes and channels to be protected with riprap, soil riprap or boulders shall be free of brush, trees, stumps, weeds, and other objectionable material and be graded to a smooth compacted surface.
- B. Contractor shall excavate areas to receive riprap, soil riprap or boulders to the specified depth (bedding material is not required).
- C. Subgrade material shall be stable.
- D. Notify Owner if unsuitable materials are encountered. Unsuitable materials may be required to be removed and suitable materials installed.
- E. Additional compaction not required unless specified. When subgrade is built up with embankment material it shall be compacted per Project Engineer’s direction.

Placement

- A. **Riprap**
 - 1. After the riprap has been placed, the exposed faces of the riprap are to be hand placed with rearranging of individual stones so that there are no large accumulations of either larger or smaller sizes of stone, with faces and shapes arranged to minimize voids, and resulting in smaller material below and between larger materials. Rock underneath can be machine placed in a manner to minimize voids and settlement.
 - 2. Rock to be placed by means to cause interlocking of material with

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smaller rock securely locked between larger stone. Material between larger stones shall not be loose or easily displaced by flow or vandalism.

3. Riprap shall be placed in conjunction with the construction of slope or channel and result in a uniform surface. Surface grade shall not have projections above or depressions under the finished design grade by more than ten percent (10%) of the rock layer thickness.
4. Placement shall commence at the bottom of the slope or other lowest point working upwards.

B. Soil Riprap

1. Requirements are to comply with riprap specified in Placement: Article A.
2. Adjacent stockpiles of riprap and soil shall be created and mixing done at stockpile location, not at location where soil riprap is to be placed. Mix 35% soil by volume with riprap, using procedures to ensure a homogenous mixture, where soil fills the inherent voids in riprap without displacing it. Layering of riprap and soil may be used instead of mixing with prior Owner approval.
3. Wet soil to encourage void filling with soil. Any large voids shall be filled with rock, and small voids filled with soil. Excessively thick zones of soil prone to washing away shall not be created; no soil thicknesses greater than six inches (6").
4. Final surface to be thoroughly wetted for compaction, smoothed and ready to receive seeding.

C. Boulders

1. Boulders to be buried one third (1/3) for natural effect and placed naturalistically to appear as outcroppings.
2. Place boulders on prepared subgrade in manner which will minimize voids.
3. Feature boulders serve an aesthetic function and shall be placed and rotated into final position as directed by Owner in order to achieve desired result.

Rejection

- A. Owner may reject placed riprap, soil riprap and boulders that do not conform to this section, whether delivered to the jobsite or placed. Contractor shall immediately remove and re-lay the materials to conform at the Contractor's expense.

****END OF SECTION****