

## Section 603—Rip Rap

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### 603.1 General Description

This work includes placing protective coverings of sand-cement bag rip rap or stone rip rap.

When required, this work includes placing crushed stone filter material or plastic filter fabric beneath stone rip rap on:

- Fill slopes
- Cut slopes
- End rolls
- Shoulders
- Ditches
- Stream banks
- Channel banks
- Other locations

#### 603.1.01 Definitions

General Provisions 101 through 150.

#### 603.1.02 Related References

##### A. Standard Specifications

[Section 800—Coarse Aggregate](#)

[Section 801—Fine Aggregate](#)

[Section 805—Rip Rap and Curbing Stone](#)

[Section 815—Graded Aggregate](#)

[Section 830—Portland Cement](#)

[Section 832—Curing Agents](#)

[Section 880—Water](#)

[Section 881—Fabrics](#)

##### B. Referenced Documents

AASHTO T 134

[QPL 28](#)

#### 603.1.03 Submittals

General Provisions 101 through 150.

### 603.2 Materials

Ensure that the materials meet the requirements of the following Specifications:

Material	Specification
Portland cement	<a href="#">830.2.01</a>
Rip Rap (Stone)	<a href="#">805.2.01</a>

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Material	Specification
Membrane Curing Compound	<a href="#">832.2.03</a>
Stone Filter Blanket	<a href="#">815.2.01</a> or <a href="#">800.2.01</a> (Size No. 467*)
Fine Aggregate for Sand Cement Rip Rap	<a href="#">801.2.03</a>
Water	<a href="#">880.2.01</a>
Woven Plastic Filter Fabric	<a href="#">881.2.05</a>
*Except that up to 10% is allowed to pass the No. 4 (4.75 mm) sieve.	

### A. Bags for Sand-Cement Bag Rip Rap

Use cotton, burlap, or fiber reinforced paper bags that can contain the sand-cement mixture without leaking during handling and placing. Do not use bags that previously held sugar or other material that will adversely affect the sand-cement mixture.

Ensure that the capacity is at least 0.75 ft<sup>3</sup> (0.02 m<sup>3</sup>) but not greater than 2 ft<sup>3</sup> (0.5 m<sup>3</sup>).

### B. Stone Dumped Rip Rap

Stone dumped rip rap is designated on the Plans as Type 1 or Type 3 as defined in [Subsection 805.2.01](#).

### 603.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

## 603.3 Construction Requirements

### 603.3.01 Personnel

General Provisions 101 through 150.

### 603.3.02 Equipment

General Provisions 101 through 150.

### 603.3.03 Preparation

General Provisions 101 through 150.

### 603.3.04 Fabrication

General Provisions 101 through 150.

### 603.3.05 Construction

Construct this Work according to the following requirements:

#### A. Preparing the Foundations

Prepare the ground surface where the rip rap will be placed to conform with the correct lines and grades before beginning the placement.

1. When filling depressions, compact the new material with hand or mechanical tampers.  
Dispose of excess material by spreading it neatly within the right-of-way as an incidental part of the work.
2. Unless otherwise shown or provided below, begin placing the rip rap in a toe ditch constructed in original ground around the toe of the fill or the cut slope.

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Ensure that the toe ditch is 2 ft (600 mm) deep in original ground and the side next to the fill or cut has the same slope.

3. After placing the rip rap, backfill the toe ditch and spread the excess dirt neatly within the right-of-way as an incidental part of the work.
4. When beginning rip rap in water or below normal water level, substitute an apron of rip rap for the toe ditch. Ensure that the width and thickness of this apron is as shown on the Plans or determined by the Engineer.

### B. Placing Stone Rip Rap

Place rip rap to the limits shown on the Plans or as directed by the Engineer. Place and classify rip rap as follows:

#### 1. Stone Plain Rip Rap

Dump and handle stone plain rip rap into place to form a compact layer to the design thickness.

Ensure that the thickness tolerance for the course is plus 12 in (300 mm) with no under-tolerance. If the Plans do not show a thickness, place stone rip rap to at least 12 in (300 mm) thick, but no greater than 2 ft (600 mm) thick.

#### 2. Stone Dumped Rip Rap

Dump stone dumped rip rap into place to form a uniform surface as thick as specified in the Plans.

- a. Ensure that the thickness tolerance for the course is minus 6 in (150 mm) and plus 12 in (300 mm). If the Plans or Proposal do not specify a thickness, place the course to at least 2 ft (600 mm) thick.
- b. Recycled concrete that meets the requirements of [Subsection 805.2.01](#) may be used instead of stone when shown on the Plans or approved by the Engineer.

Use recycled concrete only when materials do not contain steel after processing.

<b>NOTE: Do not use recycled concrete in aesthetically sensitive areas.</b>
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#### 3. Stone Grouted Rip Rap

Place stone grouted rip rap according to specifications for stone plain rip rap and these guidelines:

- a. Prevent earth from filling the spaces between the stones.
- b. After placing the stone, fill the spaces between them with 1:3 grout composed of Portland cement and sand mixed thoroughly with enough water to make a thick, creamy consistency.
- c. Place the grout beginning at the toe. Finish it by sweeping with a stiff bristle broom.
- d. After grouting, cover the rip rap and keep it wet for 5 days, or cover and keep wet for 24 hours and then coat with white pigmented membrane curing compound.

### C. Placing Filter

Place woven plastic filter fabric under all rip rap. Follow these requirements for placing the filter fabric:

1. Prepare the surface to receive the fabric until it is smooth and free from obstructions, depressions, and debris.
2. Place the fabric with the long dimension running up the slope. Minimize the number of overlaps.
3. Place the strips to provide a width of at least 1 ft (300 mm) of overlap for each joint.
4. Anchor the filter fabric in place with securing pins of the type recommended by the fabric manufacturer. Place the pins on or within 3 in (75 mm) of the centerline of the overlap.
5. Place the fabric so that the upstream strip will overlap the downstream strip.
6. Loosely place the fabric to prevent stretching and tearing during stone placement.  
Do not drop the stones more than 3 ft (1 m) during construction.
7. Always protect the fabric during construction from clogging due to clay, silts, chemicals, or other contaminants.

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8. Remove contaminated fabric or fabric damaged during installation or rip rap placement. Replace with uncontaminated or undamaged fabric at no expense to the Department.

### D. Placing Sand-Cement Bag Rip Rap

Place rip rap to the limits shown on the Plans or as directed by the Engineer.

#### 1. Proportioning Materials

Mix sand and Portland cement at the maximum ratio of 5:1 by weight.

- a. Obtain a minimum compressive strength of 500 psi (3 MPa) in 7 days.
- b. For sand-cement bag rip rap, use enough water to make up the optimum moisture content of the aggregate and cement as determined by AASHTO T 134.
- c. When sand-cement rip rap is to be prebagged, mix the sand cement dry. After placing each course, wet the bags until the bags are wet enough for proper cement hydration.

#### 2. Placement

Before placing sand-cement bag rip rap, fill the bags full, but allow room to tie the bags.

- a. Place the bagged rip rap by hand with the tied ends facing the same direction. Produce close, broken joints.
- b. Place header courses when directed by the Engineer or required by the Plans.
- c. After placing the bags, ram or pack them against one another to produce the required thickness and form a consolidated mass.
- d. Do not allow the top of each bag to vary more than 3 in (75 mm) above or below the required plane.

### E. Placing Stone Blanket Protection

Ensure that the stone blanket protection meets the materials Specifications for stone filter blanket as specified in [Subsection 603.2](#), “Materials,” except stone size No. 357 will be allowed instead of size No. 467.

Place stone blanket protection to the limits shown on the Plans, or as directed by the Engineer.

Uniformly place this material to the thickness shown on the Plans and to a thickness tolerance of 0.5 in ( $\pm 15$  mm).

Do not use stone blanket protection on slopes steeper than two horizontal to one vertical or in areas highly susceptible to erosion. Do not use plastic filter fabrics with stone blanket protection.

### 603.3.06 Quality Acceptance

General Provisions 101 through 150.

### 603.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

## 603.4 Measurement

This work is measured for payment in square yards (meters) of accepted material of the specified thickness. Area measurements are made parallel to the surface on which the material is placed. Plastic filter fabric will be measured as the area of rip rap placed and accepted. No separate measurement will be made for fabric overlap joints, seams, or vertical sections at toe of slopes. No separate measurement is made for grout or cushioning sand.

Plan dimensions are figured by the use of filled bags 12 by 18 by 6 in. (300 by 450 by 150 mm) thick.

When filled bags are less than Plan dimensions or are of varying lengths or width, Plan square yards (meters) will be used to determine pay quantities, if overall dimensions are equal to or greater than those shown on the Plans.

### 603.4.01 Limits

General Provisions 101 through 150.

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### 603.5 Payment

This work will be paid for at the Contract Price per square yard (meter) of material complete in place.

Payment will be made under:

Item No. 603	Stone plain rip rap ____ in (mm) thick	Per square yard (meter)
Item No. 603	Stone dumped rip rap ( <u>type</u> ) ____ in (mm) thick	Per square yard (meter)
Item No. 603	Stone grouted rip rap ( <u>thick</u> )	Per square yard (meter)
Item No. 603	Filter blanket	Per square yard (meter)
Item No. 603	Sand-cement bag rip rap, ____ in (mm) thick	Per square yard (meter)
Item No. 603	Stone blanket protection, ____ in (mm)	Per square yard (meter)
Item No. 603	Plastic filter fabric	Per square yard (meter)

#### 603.5.01 Adjustments

General Provisions 101 through 150.