

## Section 705. — ROCK

**705.01 Gabion and Revet Mattress Rock.** Furnish hard, durable rock that is resistant to weathering and reasonably free of organic and spoil material. Conform to the following:

- (a) Coarse durability index, AASHTO T 210      52 min.
- (b) Unit mass of a filled basket                      1600 kg/m<sup>3</sup> min.
- (c) Gradation:
  - (1) Baskets 0.3 meters or greater in the vertical dimension.
    - (a) Maximum dimension                      200 mm
    - (b) Minimum dimension                      100 mm
  - (2) Baskets less than 0.3 meters in the vertical dimension.
    - (a) Maximum dimension                      150 mm
    - (b) Minimum dimension                      75 mm

**705.02 Riprap Rock.** Furnish hard, durable, angular rock that is resistant to weathering and water action and free of organic or other unsuitable material. Do not use shale, rock with shale seams, or other fissile or fissured rock that may break into smaller pieces in the process of handling and placing. Conform to the following:

- (a) Apparent specific gravity, AASHTO T 85      2.50 min.
- (b) Absorption, AASHTO T 85                      4.2% max.
- (c) Coarse durability index, AASHTO T 210      50 min.
- (d) Gradation for the class specified              Table 705-1

**Table 705-1  
Gradation Requirements for Riprap**

<b>Class</b>	<b>Percent of Rock by Mass</b>	<b>Mass (kg)</b>	<b>Approximate Cubic Dimension<sup>(2)(3)</sup> (mm)</b>
1	20	10 to 15	150 to 200
	30	5 to 10	125 to 150
	40	0.5 to 5	50 to 125
	10 <sup>(1)</sup>	0 to 0.5	0 to 50
2	20	25 to 50	200 to 250
	30	10 to 25	150 to 200
	40	1 to 10	75 to 150
	10 <sup>(1)</sup>	0 to 1	0 to 75
3	20	100 to 150	350 to 400
	30	50 to 100	250 to 350
	40	5 to 50	125 to 250
	10 <sup>(1)</sup>	0 to 5	0 to 125
4	20	250 to 350	450 to 500
	30	100 to 250	350 to 450
	40	10 to 100	150 to 350
	10 <sup>(1)</sup>	0 to 10	0 to 150
5	20	700 to 1000	650 to 700
	30	350 to 700	500 to 650
	40	25 to 350	200 to 500
	10 <sup>(1)</sup>	0 to 25	0 to 200
6	20	850 to 1600	700 to 850
	30	500 to 850	550 to 700
	40	50 to 500	250 to 550
	10 <sup>(1)</sup>	0 to 50	0 to 250

(1) Furnish spalls and rock fragments graded to provide a stable dense mass.

(2) The volume of a rock with these cubic dimensions has a mass approximately equal to the specified rock mass.

(3) Furnish rock with breadth and thickness at least one-third its length.

**705.03 Rock for Masonry Structures.** Furnish sound, durable rock that is native to the vicinity of the work or is similar in texture and color to the native rock and has been proven satisfactory for the intended use.

Furnish dimensioned masonry rock free of reeds, rifts, seams, laminations, and minerals that may cause discoloration or deterioration from weathering.

**(a) Sizes and shapes.** Do not use rock with depressions or projections that might weaken it or prevent it from being properly bedded.

When no dimensions are shown on the plans, furnish the rocks in the sizes and face areas necessary to produce the general characteristics and appearance indicated on the plans.

Unless otherwise specified, furnish rock fragments with the following dimensions:

- (1) Minimum thickness 125 mm
- (2) Minimum width 300 mm or 1½ times the thickness, whichever is greater
- (3) Minimum length 1½ times the width
- (4) Rocks with volume  $\geq 0.03 \text{ m}^3$  50% min.

When headers are required, furnish headers with lengths no less than the width of bed of the widest adjacent stretcher plus 300 millimeters.

**(b) Dressing.** Remove all thin or weak portions. Dress face rock bed and joint lines to a maximum variation from true line as follows:

- (1) Rubble masonry 40 mm
- (2) Class B masonry 20 mm
- (3) Class A masonry 5 mm
- (4) Dimensioned masonry Reasonably true

**(c) Bed surfaces.** Dress face rock bed surfaces normal to the face to a depth of 75 millimeters. Beyond that point, the departure from normal may not exceed 25 millimeters in 300 millimeters for dimensioned masonry or 50 millimeters in 300 millimeters for all other classes.

**(d) Joint surfaces.** For dimensioned masonry, dress face rock joint surfaces normal to the bed surface. For all other classes of masonry, dress face rock joint surfaces to form an angle with the bed surface of not less than 45 degrees.

Dress face rock joint surfaces normal to the face to a depth of 50 millimeters. Beyond that point, the departure from normal may not exceed 25 millimeters in 300 millimeters.

Do not round corners at the meeting of the bed and joint lines in excess of the following radii:

- |                         |             |
|-------------------------|-------------|
| (1) Rubble masonry      | 40 mm       |
| (2) Class B masonry     | 25 mm       |
| (3) Class A masonry     | No rounding |
| (4) Dimensioned masonry | No rounding |

**(e) Arch ring rock joint surfaces.** Dress ring rock joint surfaces radial to the arch or normal to the front face to a depth of 75 millimeters. Beyond that point, the departure from the radial or normal may not exceed 20 millimeters in 300 millimeters.

Dress the back surface adjacent to the arch barrel concrete parallel to the front face and normal to the intrados to a depth of 150 millimeters. When concrete is placed after the masonry is constructed, vary adjacent ring stones at least 150 millimeters in depth.

**(f) Finish for exposed faces.** Remove all drill or quarry marks from exposed faces. Pitch face stones to the line along all beds and joints. Finish the exposed faces as specified in the contract. The following symbols are used to represent the type of surface or dressing specified:

- (1) **Fine pointed (F.P.).** Make point depressions approximately 10 millimeters apart. Limit surface variations to 3 millimeters or less from the pitch line.
- (2) **Medium pointed (M.P.).** Make point depressions approximately 15 millimeters apart. Limit surface variations to 5 millimeters or less from the pitch line.
- (3) **Coarse pointed (C.P.).** Make point depressions approximately 30 millimeters apart. Limit surface variations to 10 millimeters or less from the pitch line.
- (4) **Split or seam face (S.).** Provide a smooth appearance, free from tool marks, with no depressions below the pitch line, and no projection exceeding 20 millimeters beyond the pitch line.
- (5) **Rock faced (R.F.).** Provide an irregular projecting surface without tool marks, concave surfaces below the pitch line, and projections beyond the specified pitch line. For example, the specification "40 R.F." means no projections 40 millimeters beyond the pitch line. Where a "variable rock face" is specified, uniformly distribute stones of the same height of projection.

**705.04 Rock for Special Rock Embankment.**

**(a) Mechanically-placed embankments.** Furnish hard, durable rock that is angular in shape, resistant to weathering, and graded in a well-balanced range conforming to Table 705-2.

**Table 705-2  
Gradation for Mechanically-placed Rock**

<b>Percent of Rock Fragments by Mass</b>	<b>Mass (kg)</b>	<b>Equivalent Cubic Dimension (mm)</b>
50	Greater than 900	Larger than 700
50	40 to 900	250 to 700

**(b) Hand-placed embankments.** Furnish hard, durable rock that is angular in shape, resistant to weathering, and graded in a well-balanced range conforming to Table 705-3.

**Table 705-3  
Gradation for Hand-placed Rock**

<b>Percent of Rock Fragments by Mass</b>	<b>Mass (kg)</b>	<b>Equivalent Cubic Dimension (mm)</b>
75	Greater than 75	Larger than 300
25	40 to 75	250 to 300

**705.05 Rock for Buttresses.**

**(a) General.** Furnish hard, durable, angular rock free of organic and spoil material, resistant to weathering and water action. Furnish rock with breadth and thickness at least one-third its length. Conform to the following:

- (1) Apparent specific gravity, AASHTO T 85                      2.50 min.
- (2) Absorption, AASHTO T 85    4.2% max.
- (3) Coarse durability index, AASHTO T 210                      52 min.

**(b) Mechanically-placed buttresses.** In addition to (a) above, furnish rock graded in a well-balanced range conforming to Table 705-2.

**(c) Hand-placed buttresses.** In addition to (a) above, furnish rock graded in a well-balanced range conforming to Table 705-3.

**705.06 Stone Curbing.**

**(a) Stone curb, type I.** Conform to the size and shape specified and the following:

Furnish quarried limestone, sandstone, or granite from an approved source. Use one type of stone throughout the project. Do not use stone with visible drill marks on the exposed faces.

Saw or point the top surface of all vertical stone curb to an approximate true plane with no depression or projection on that surface of over 6 millimeters. Pitch the front and back arris lines straight and true. Limit projections or depressions on the back surface to not exceed a batter of 25 millimeters horizontal to 75 millimeters vertical.

Saw, point, or smooth quarry split the front exposed face of the vertical stone curb and form to an approximately true plane. Limit projections or depressions on the remaining face distance to 25 millimeters or less from the plane of the exposed face.

Square the ends of vertical stone curb with the top back and face and finish so when the sections are placed end to end, no space more than 13 millimeters shall show in the joint for the full width of the top surface and for the entire exposed front face. The remainder of the end may break back no more than 100 millimeters from the plane of the joint. Cut the joints of circular or curved stone curb on radial lines.

The minimum length of any segment of vertical stone curb is 1.2 meters. However the length may vary where a depressed or modified section of curb is required for driveways, crossings, closures, etc.

**(b) Stone curb, type II.** Slope stone curb shall conform to the requirements for type I stone curb except as follows:

The maximum allowable projection or depression on a horizontal top surface is limited to 13 millimeters. On other exposed faces, the maximum allowable projection or depression is limited to 25 millimeters.

For unexposed surfaces, the maximum allowable projection or depression from a true plane on a 0.5-meter length shall be 75 millimeters.

The maximum allowable space showing on exposed faces between adjacent segments of slope stone curb is 19 millimeters. The minimum length of any segment of slope stone curb is 0.5 meter.