

Construction Specification SR -03	Cross Vane
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1. Description

Cross Vanes are in-stream structures constructed for the purpose of reducing shear stress on streambanks as well as grade control for the streambed. Cross Vanes are constructed as shown in **Standard Drawing SR-03** and as set forth in the Project Drawings and the following specification. Cross Vanes shall consist of both Footer Rocks, placed below the invert of the proposed channel, as well as Vane Rocks.

2. Materials

Cross Vanes shall be constructed of angular, flat or cubed rock. When possible, consideration should be given to obtaining rock that is similar in color and texture to the native stone in the project area. Rock should be of sufficient hardness to resist weathering and shall be free of cracks and other blemishes. Porous rock, such as some limestones, and soft rock, such as shales, are not allowed. In some cases, native rock present on the site may be authorized for use by the Contracting Officer. In no instance will concrete or other “debris” rock be allowed. All rock under this specification shall meet the conditions of material specification **MS-01 Rock**.

3. Rock Size

Rock used for the construction of Rock Vanes will meet the following size requirements. All units are shown in feet (ft) and pounds (lbs). Rock sizes apply to both Footer Rocks and Vane Rocks. Rock size and shape is critical to the construction of proper cross vanes and as such, specifications will be strictly enforced.

3.1 Rock Size

	A-axis	B-axis	C-axis
Minimum Size	4	3	2
Maximum Size	6	4	3

- 3.2 Rock Weight - The dry unit weight of each rock shall be 150 lbs/cuft or greater.
- 3.3 When the Unit Bid Cost method is used for determining payment, the GCSWCD will not pay for those materials which do not meet the rock size specification above. Loose rock rubble shall not exceed five percent (5%) of the total tonnage on each load delivered to the site. In the event the rubble exceeds the allotted percentage, the Contractor shall not be paid for that material.
- 3.4 Any rock material which fails to meet the Contracting Officers approval for size and/or weight, will be returned to the source by the Contractor. The material shall be loaded, scaled at the quarry, and a credit slip provided for the tonnage which was rejected.

4. Source of Materials:

Prior to the execution of the contract, the Contractor will locate potential sources of rock. The Contractor and Contracting Officer will jointly visit the site(s) to determine whether the rock meets the requirements as set forth in these specifications. A site visit may be waived by the Contracting Officer when rock will come from a source that has been approved in the past, or if it is obtained from the current approved supplier used by Greene County or NYSDOT.

5. Construction Methods:

- 5.1 Cross Vanes shall be installed according to the Sequence of Construction, the Plans and Details, the following specifications and as directed by the Contracting Officer.
- 5.2 Cross Vanes shall be constructed as two (2) Rock Vanes on opposite sides of the stream, with a connecting cross channel sill set at the proposed invert of the streambed. **(Standard Drawing SR-03)**. Cross Vanes shall consist of Vane Rock, Sill Rock and Footer Rock.
- 5.3 Cross Vanes shall be constructed so that adjoining rocks taper in an upstream direction, from the bankfull elevation to the stream invert. The upstream (lower) end of the Cross Vanes is set at an angle of 20°-30° tangent to the curve.

- 5.4** The downstream end of the Cross Vane shall be keyed into the streambank at the bankfull elevation. The Cross Vane shall be keyed a minimum of eight feet (8') into the streambank. The upstream end of Cross Vane shall be keyed into the streambed at the invert elevation. The Cross Vane shall be installed with a slope of 4% to 7% from the streambed invert to the bankfull elevation.
- 5.5** The Cross Vanes shall be completed by the placement of a cross channel sill at the design invert of the streambed. Cross channel rocks shall be properly secured behind Footer Rocks, and shall be placed so that the sill rock are level across the channel. Sill rock shall be placed in close rock to rock contact with no space between adjoining rocks. The elevation of the sill shall be as determined on the plan drawings, specifications, construction notes or as determined on-site by the Contracting Officer or Project Engineer.
- 5.6** Footer Rocks shall be installed as shown in the Plans and Details and shall be firmly keyed into the streambed.
- 5.7** Vane Rocks shall be placed in a linear fashion so as to produce the sloping Cross Vane, and shall be placed with tight, continuous surface contact between adjoining rock. Rock shall be placed so as to have no significant gap between adjoining rock.
- 5.8** Vane Rock shall be placed so as to have a final smooth surface along the top plane of the Cross Vane. No Vane Rock shall protrude higher than the other rock in the Rock Vane. A completed Cross Vane has a smooth, continuous finish grade from the bankfull elevation to the streambed.
- 5.9** As the cross vane is constructed, the Contractor shall chink all voids between the footer rocks, and between the footer rocks and vane rocks. Voids shall be chinked with small boulders, cobble or rock fragments. Chinking will be conducted such that no voids greater than four inches (4") in size will be present.
- 5.10** Upon completion of the Cross Vane, the Contractor shall place stabilizing vegetation as shown in the Vegetation Plan and Specifications.
- 5.11** The Contractors shall upon completion of the work reshape the slopes and stream bottom to the specified elevations. All unsuitable and surplus rocks will be removed from the site.

6. Measurement and Method of Payment

Cross Vanes will be measured and paid for based on one of the following methods

Method 1: The Contractor shall be paid based on a per Cross Vane Unit Bid Cost. Upon completion of the Work, the GCSWCD and the Contractor shall jointly count all Cross Vanes installed and payment will be made based on the Unit Bid Cost for each structure.

Method 2. The Contractor shall be paid based on a per ton unit price for construction of the vanes. The per ton unit price shall be based on the cost of the materials, transportation to the project site and placement of the rock in the construction of the Cross Vane. The Cross Vanes will be built using only those rocks that meet the size/weight specifications as set forth above. The Contractor and Contracting Officer shall jointly monitor the rock volumes and weights used on the project, and shall document the rock volumes on a daily basis.

In each case, payment shall be full compensation for the transport of all materials, excavation, installation, and adjustment of the Cross Vanes, and for all materials, labor, equipment, tools and incidentals necessary to complete the work as specified in the Contract Documents.

7. Special Conditions

- 7.1 Prior to the start of work, the Contracting Officer and Project Engineer shall designate representatives authorized to observe the Contractors construction of the Cross Vanes. The Contractor shall construct all Cross Vanes in the presence of an authorized GCSWCD representative.
- 7.2 Placement of Footer Rocks is critical to the success of Cross Vanes. To insure proper placement, the Contractor shall provide a portable pump to de-water excessive ground water from the excavation. All footer rock placement shall be conducted in a dry excavation
- 7.3 The construction of Cross Vanes requires equipment which can place rock in precise locations. An excavator of a suitable size, and containing a thumb is suggested.
- 7.4 The GCSWCD has estimated that each rock vane will require approximately 133 cu yds (200 tons) of rock. Estimated rock volumes found in the ACOE permit section to this document shall not be used for calculating total rock volume requirements.
- 7.5 The presence of clays in the work area will require over excavation of the areas associated with the Cross Vanes. Refer to Specification **SR-07: Stream Channel Excavation** for requirements related to this project.
- 7.5 Payment shall be made using **Method #2: Per Ton Unit Price**. Contractors must develop strict rock supply relationship with the source quarry to insure that rock meets size/shape specifications and to minimize disapprovals of rock materials.