## SPSRW-XX: LOG CROSS VANE

Version Date: 05/22/2015 Revision Date: XX/XX/XXXX by XXX

### Description

The work covered by this section consists of furnishing, stockpiling, placing and maintaining approved stone, logs, and filter fabric to be utilized to construct the log cross vane, as specified in the Contract Document or as directed by the Engineer. Cross vanes are in-stream flow structures primarily used for grade control, reducing near bank shear stresses, and providing habitat.

The quantity of structures to be constructed will be affected by actual conditions that occur during the construction of the project. The type and quantity of this structure may be increased or decreased at the direction of the Engineer. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

### Materials

ENGINEER TO UPDATE IF THEY FEEL THAT THIS SPECIFICATION IS INADEQUATE FOR SITE CONDITIONS.

Logs must be relatively straight, 12 inches or larger in diameter along their entire length and shall meet the material requirements specified in the Contract Documents. All limbs, bark, and branches shall be removed from the log. Sources for logs shall include trees removed due to construction activities as well as off-site timber. All logs shall be relatively solid (hard) and free of visible rot and/or animal damage.

Boulders shall consist of flat-sided, durable field or quarry stone that is sound, hard, dense, angular, and resistant to the action of air and water, and free of seams, cracks, or other structural defects. The Contractor shall use stone pieces with a “shape factor” greater than two (length and width more than twice the thickness). The Contractor cannot use limestone or concrete waste for stone. Stone shall be approved by the Engineer.

The size (length, width and depth (thickness)) of the boulder material shall as specified by the Engineer. Stone shall be approved by the Engineer.

Boulders for in-stream structures shall conform to the specifications for boulders shall conform to their respective specifications as shown on the plans.

Coarse backfill material shall consist of durable field or quarry stone that is sound, hard, dense, slightly rounded, resistant to the action of air and water, and free of seams, cracks, or other structural defects. The Contractor shall use stone pieces with a “shape factor” less than two (length and width less than twice the thickness). The Contractor cannot use limestone or concrete waste for stone. Stone shall be approved by the Engineer.

The type, size and gradation of the Coarse Backfill Material shall be specified by the Engineer to be mobile or non-mobile as the conditions in the channel warrant, and in accordance with the construction documents.

Anchors shall consist of a bolt, cable (minimum length of four feet) and a “duck bill anchor”. Bolt end shall have a nut and washer connection. Submit anchor specifications to the Engineer for approval. Manufactured home tie-down anchors or other soil anchor may be used pending approval of the Engineer.

Coarse backfill material shall meet the material requirements of NCDOT section 1042 Rip Rap Materials.

Filter fabric for sealing structures shall meet the material requirements of NCDOT Section 1056 Geosynthetics.

### Methods

ENGINEER TO UPDATE IF THEY FEEL THAT THIS SPECIFICATION IS INADEQUATE FOR SITE CONDITIONS.

Structure installation and channel grading sequences may vary based on structure function and design. Grade control structures such as log cross vanes shall be installed as grading operations progress downstream.

Prior to construction of the structure, establish elevations at the upstream end of the proposed structure and at the bankfull connection point. The Contractor may install additional survey control, as needed, to complete the work in accordance with the Contract Documents.

Vane Arms and Floodplain Sills:

* 1. Beginning on one-side of the channel, over-excavate/trench the stream bed to a depth equal to the total thickness of the header and footer logs. The excavation slope should be smooth and gradual, typically matching the designed vane arm slope. Bedding for the placement of the footer logs shall be approved by the Engineer prior to placement.
	2. Place footer log in the trench made for the vane arm. At the upstream end, the footer log shall extend into the stream bed. Review, survey (measure), and adjust the alignment and/or height of the vane arm footer log, as needed. The footer log shall extend the entire design length of the vane arm plus the length needed to provide a smooth transition into the streambed and bank/sill. The footer log shall be reviewed by the Engineer prior to proceeding with the work.
	3. Install a sill header boulder at the downstream bank intercept with the footer log. Review, survey (measure), and adjust the alignment and/or height of the sill, as needed. The sill shall be reviewed by the Engineer prior to proceeding with the work.
	4. Install filter fabric per the Contract Documents. Typically the fabric is draped over and nailed to the back of the footer log, down the back face of the footer log and across the area of over-excavation/trenching. Fabric reaching the excavated soil face may be folded and/or trimmed, in accordance with the Contract Documents. The fabric installation shall be reviewed by the Engineer prior to proceeding with the work.
	5. Place the header log on top of and slightly behind the footer log. At the upstream end, the header log shall extend into the stream bed. Review, survey (measure), and adjust the alignment and/or height of the vane arm header log, as needed. The header log shall extend the entire design length of the vane arm plus the length needed to provide a smooth transition into the streambed and bank/sill. The header log shall be reviewed by the Engineer prior to proceeding with the work.
	6. Continuing with the other side of the channel, repeat steps a) through e) until the footers and headers for the structure arms and sills are completed.

Based on the size of the stream and the size (length and diameter) of the log, a single log, meeting all other material requirements, may be used in lieu of separate footer and header logs, with the Engineer’s prior approval. For single log installations combine steps c) and f) in compliance with the Contract Documents.

Invert (Installation):

* 1. Over-excavate the stream bed to a depth equal to the total thickness of the structure invert log. Over excavation of the invert trench shall be in the upstream direction, from the proposed structure face.
	2. Place the invert log and secure with an anchor assembly. The anchor assembly shall be installed in accordance with the manufacturer’s specifications, the Contract Documents and as specified by the Engineer. In lieu of the anchor assembly the Contractor may place flat boulders on the ends of the invert log. The invert log, and restraint method (anchors, boulders, or other) shall be reviewed by the Engineer prior to proceeding with the work.
	3. Install filter fabric per the Contract Documents. Typically the fabric is draped over and nailed to the back of the invert log, down the back face of the log and across the area of over-excavation/trenching. Fabric reaching the excavated soil face may be folded and/or trimmed, in accordance with the Contract Documents. The fabric installation shall be reviewed by the Engineer prior to proceeding with the work.
	4. The Contractor may install a boulder against the invert log at the sill to maintain tight surface contact between the invert log and the header boulder, prior to backfilling. The boulder shall be installed such that the top of the boulder is even with the adjacent header log.
	5. Place Coarse Backfill on top of the filter fabric and between the back of the header /footer logs and the excavated bank soil face and between the back of the invert log and the excavated streambed soil face the Coarse Backfill shall be level with the top surface of the header/invert log. The Coarse Backfill shall be reviewed by the Engineer prior to proceeding with the work.
	6. After installing all of the Coarse Backfill, inspect the structure (arms, floodplain sills and invert log) and trim/cut any loose and/or visible fabric.
	7. Finish grade the adjacent streambed, channel banks, and/or floodplain to provide a smooth even grade transition between project structure components (arms, sills, invert logs, floodplain sills, etc.) and the existing and/or proposed ground surface.

In locations where exposed bedrock and/or other existing feature extends to and/or within the limits of the proposed work, the log cross vane installation shall be field adjusted to incorporate the bedrock/existing feature, into the finished work. The Engineer shall be contacted as soon as the presence of bedrock and/or other existing feature is field identified, to determine the appropriate method of incorporation. Site conditions may require slight deviation from the plan and shall be approved by the Engineer.

### Measurement

The quantity of log cross vane to be paid for shall be the actual number of linear feet of “Log Cross Vane” completed and accepted into the final work, as measured along the centerline surface of the structure (sill, vane, and invert). The payment will be considered as full compensation for all work covered in this special provision, including, but not limited to grading, installation, excavating, placing backfill, maintaining the feature through acceptance, and for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the work as specified in the Contract Documents, or as directed by the Engineer.

No separate measurement of materials shall be made under this item for footer logs, coarse backfill, fabric, anchors and/or other incidental items.

### Payment

The work covered by this section shall be paid for at the contract per linear foot price for “Log Cross Vane”. Payment will be full compensation for all work covered in this special provision, including, but not limited to grading, installation, adjusting, excavating, placing backfill, maintaining the feature through acceptance, and for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the work as specified in the Contract Documents, or as directed by the Engineer.

There shall be no separate payment for furnishing trees meeting the requirements of this specification.

Payment shall be made under:

LOG CROSS VANE LF