## SPSRW-XX, LOG J-HOOK VANE

Version Date: 10/31/2022 Revision Date: XX/XX/XXXX by XXX

### **DESCRIPTION**

The work covered by this section consists of furnishing, stockpiling, placing, and maintaining approved stone, boulders, earth, wood material, logs, mulch, and filter fabric to be utilized to construct the log j-hook vane, as specified in the Contract Document or as directed by the Engineer. The j-hook vane is used for bank protection by directing flow towards the center of the channel.

The quantity of structures may be adjusted during construction due to site conditions and at the direction of the Engineer. 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.

Backfill Material shall consist of a well-mixed gradation of, stone aggregate, rip rap, and earth.. Earth material shall be sourced on site from stockpiled materials resulting from bank and/or channel bed excavations from channel construction activities. Earth material from channel bed excavation is preferable for well-mixed gradation placed in the channel and bank(s).

Stone aggregate and rip rap backfill material shall meet the material requirements of NCDOT section 1005 General Requirements for Aggregate and NCDOT section 1042 Rip Rap Materials.

Stone 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 cannot use limestone or concrete waste for stone.**

Logs must be from a hardwood species, relatively straight, 8 to 12 inches in diameter along their entire length and shall meet the material requirements specified in the Contract Documents. All limbs 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 boulders**. Boulders shall be approved by the Engineer.

The size (length, width, and depth (thickness)) of the boulders shall be as specified by the Engineer in accordance with the construction documents.

Filter fabric for sealing structures shall meet the Type 2 material requirements of NCDOT Section 1056 Geosynthetics.

Galvanized steel roofing nails of durable quality with an umbrella head shall be used to fasten filter fabric to the header/footer logs.

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### **METHODS**

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Structure installation and channel grading sequences may vary based on structure function and design. Log j-hook vanes are intended to re-direct flows and should be installed after channel grading operations, so that flow vectors and channel alignment can be used to adjust the installation.

Vane and Sill

* 1. Establish elevations of the proposed structure. The Contractor may install additional survey control, as needed, to complete the work in accordance with the Contract Documents.
	2. Over-excavate/trench the stream bed to a depth equal to the total thickness of the log, footer log (if needed), and brush layer plus backfill material. The excavation slope should be smooth and gradual, typically matching the designed vane slope. Bedding for the placement of the footer log shall be approved by the Engineer prior to placement.
	3. Install the footer boulder as part of the cut off sill.
	4. Place the brush layer in the trench and compact. The brush shall be placed perpendicular to the log vane.
	5. Place the log on the brush layer. At the upstream end, the log shall extend into and below the elevation of the stream bed. Place a header boulder near the upstream end of the log to provide ballast at the location of the proposed boulder hook Review, survey (measure), and adjust the alignment and/or height of the log vane as needed. The log shall extend the entire design length of the vane plus the length needed to provide a smooth transition into the streambed and bank/sill. The log shall be reviewed by the Engineer prior to proceeding with the work.
	6. Install header boulder and footer boulder (if needed) against the log at the intersection of the bank on the downstream ends prior to backfilling. The boulder shall be installed such that the face of the streambank is smooth.
	7. Install filter fabric per the Contract Documents. Nail filter fabric to the upstream side of the log. Nails shall be below finished grade and spaced at one-foot (1-ft) intervals horizontally. Drape filter fabric over the upstream side of the header log (and footer logs, if applicable) and brush layer, down the upstream face of the cut off sill and across the area of over-excavation. Fabric reaching the excavated soil face may be folded and/or trimmed, in accordance with the Contract Documents. There shall be no visible, loose ends or unsecured filter fabric on the completed work.
	8. Place Backfill Material on top of the filter fabric and between the upstream side of the header log and the excavated bank soil face and between the upstream side of the log and the excavated streambed soil face. Backfill Material shall be level with the top surface of the log. Place Backfill Material downstream of the Log Sill for scour protection as shown in the Construction documents. The Backfill Material shall be reviewed by the Engineer prior to proceeding with the work.
	9. Finish grade the adjacent streambed, channel banks, and/or floodplain to provide a smooth even grade transition between project structure components (arms, sills, inverts, floodplain sills, etc.) and the existing and/or proposed ground surface. Drops over log vanes must not exceed 0.1’ without prior approval from the Engineer.

Boulder Hook

* 1. Over-excavate the stream bed to a depth equal to the total thickness of the hook boulders.
	2. Place hook boulders in the over-excavated locations. Minimize gaps between adjacent hook boulders.
	3. Repeat steps 1) and 2) until the boulder hook installation is in compliance with the Contract Documents.
	4. Install filter fabric per the Contract Documents. Drape filter fabric over the upstream side of the hook boulders. 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 Backfill Material on top of the filter fabric and between the upstream side of the hook boulders and the excavated bank soil face. Backfill Material shall be level with the top surface of the hook boulders. Place Backfill Material downstream of the Boulder Hook for scour protection as shown in the Construction documents. The Backfill Material shall be reviewed by the Engineer prior to proceeding with the work.
	6. Finish grade the adjacent streambed, channel banks, and/or floodplain to provide a smooth even grade transition between project structure components (arms, sills, inverts, floodplain sills, etc.) and the existing and/or proposed ground surface.

Based on the size of the stream and the size (length and diameter) of the log(s), a header/footer log combination meeting all other material requirements may be used in lieu of a single log with the Engineer’s prior approval. For header/footer log combination installations, place the header log on top of and slightly behind the footer log. Connect/pin the header and footer log together using #3 rebar or approved equivalent. The header log shall extend the entire design length of the vane plus the length needed to provided anchoring into the stream bank. The footer and header logs shall be reviewed by the Engineer prior to proceeding with the work.

In locations where exposed bedrock and/or other existing feature extends to and/or within the limits of the proposed work, the log j-hook 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 features are 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 j-hook vane to be paid for shall be the actual number of linear feet of “Log J-Hook Vane” completed and accepted into the final work. The length shall be measured along the centerline surface of the structure including the embedded length into bank and log j-hook vane length.

No separate measurement of materials shall be made under this item for logs, boulders, backfill material, fabric, 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 J-hook Vane”. Payment will be full compensation for all work covered in this special provision, including, but not limited to grading, installation of materials, adjusting, excavating, excavated design pool, 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 payment shall be made for subsidiary items.

Payment shall be made under:

**J-HOOK VANE, LOG LF**