

STANDARD AND SPECIFICATIONS FOR LIVE STAKES



Definition

A stake or pole fashioned from live woody material.

Purpose

To create a living root mat that stabilizes the soil by reinforcing and binding soil particles together and by contributing to the reduction of excess soil moisture.

Conditions Where Practice Applies

Live stakes are an appropriate technique for repair of small earth slips and slumps that are frequently wet and for stabilizing raw streambanks. This technique is for relatively uncomplicated site conditions when construction time is limited and an inexpensive vegetative method for stabilization is derived. It is not intended where structural integrity is required nor to resist large, lateral earth pressures.

Design Criteria

1. Live stakes shall be 1 - 2 inches in diameter and 2-6 feet long, depending on site application.
2. No leaf buds shall have initiated growth beyond 1/4" and the cambium layer shall be moist, green and healthy.
3. All material shall be maintained in a continuously cool, covered, and moist state prior to use and be in good condition when installed.

4. Materials harvested on site shall be installed the same day they are prepared. Nursery grown material shall be maintained in a moist condition until installed.
5. Installation Details
 - a. The lengths of live cuttings/live stakes depends upon the application. If through riprap, the length shall extend through the surface of the stone fill. At least half the length shall be inserted into the soil, below the stone fill.
 - b. Minimum 2 to 4 inches and two live buds of the live stake shall be exposed above the stone filling.
 - c. Live stakes shall be cut to a point on the basal end for insertion in the ground.
 - d. Use a dead blow hammer to drive stakes into the ground. The hammer head should be filled with shot or sand. A dibble, iron bar, or similar tool shall be used to make a pilot hole to prevent damaging the material during installation.
 - e. Live cuttings shall be inserted by hand into pilot holes.
 - f. When possible, tamp soil around live stakes.
 - g. Care shall be taken not to damage the live stakes during installation. Those damaged at the top during installation shall be trimmed back to undamaged condition.

Maintenance

Due to the susceptibility of plant materials to the physical constraints of the site, climate conditions, and animal populations, it is necessary to inspect installations frequently. This is especially important during the first year or two of establishment. Plant materials missing or damaged should be replaced as soon as possible. Sloughs or breaks in drainage pattern should be reestablished for the site as quickly as possible to maintain stability.

**Figure 4.4
Live Stake**

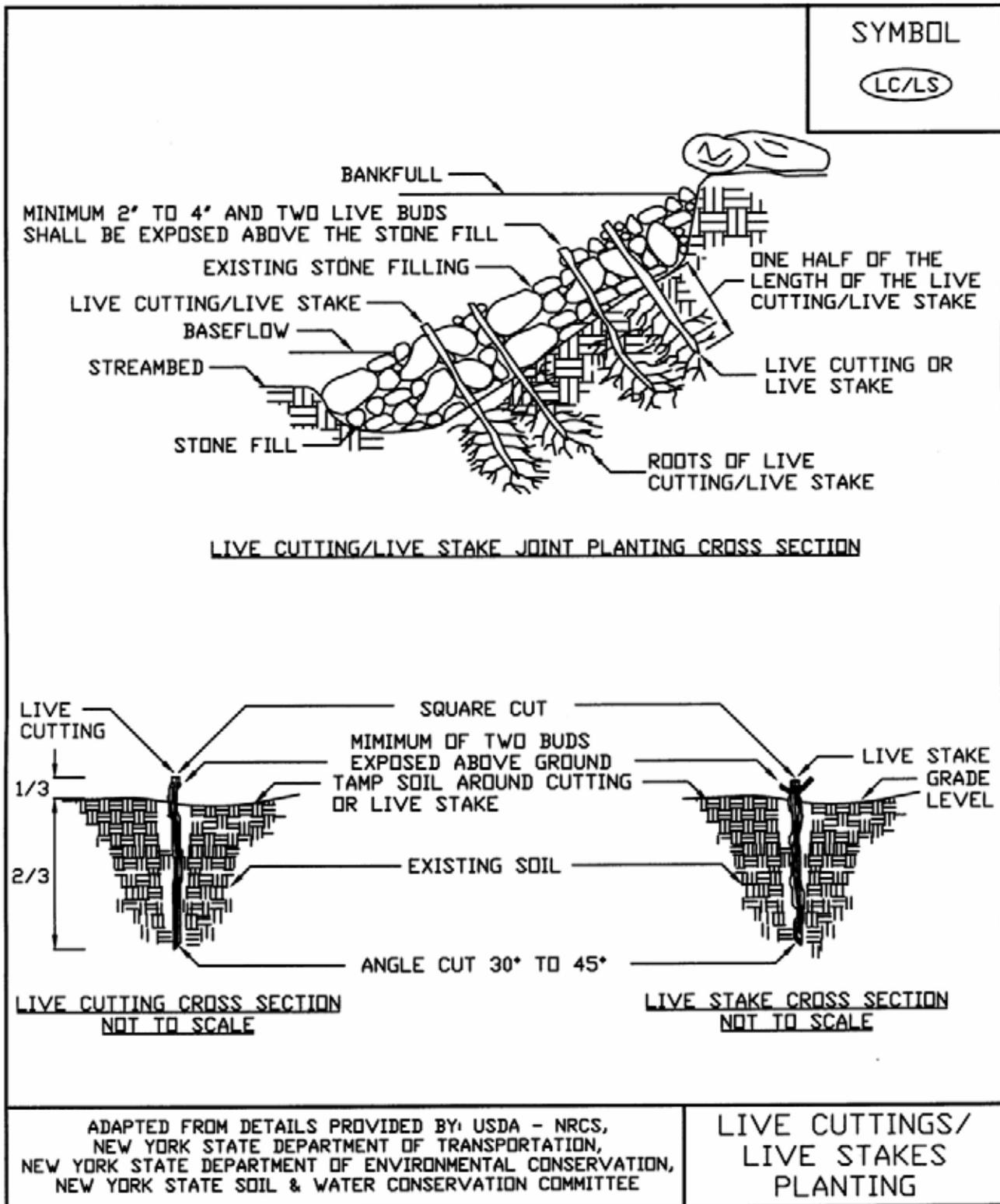


Figure 4.4A Live Stake Construction Specifications

| | |
|---|---|
| | <p>SYMBOL</p>  |
| <p><u>CONSTRUCTION SPECIFICATIONS</u></p> | |
| <ol style="list-style-type: none"> 1. CARE SHALL BE TAKEN NOT TO DAMAGE THE LIVE CUTTINGS/LIVE STAKES DURING INSTALLATION. THOSE DAMAGED SHALL BE LEFT IN PLACE AND SUPPLEMENTED WITH AN INTACT LIVE CUTTING/LIVE STAKE. 2. THE LENGTHS OF LIVE CUTTINGS/LIVE STAKES DEPENDS UON THE APPLICATION. THE LENGTH SHALL EXTEND THROUGH THE SURFACE OF THE STONE FILL. AT LEAST HALF THE LENGTH SHALL BE INSERTED INTO THE SOIL, BELOW THE STONE FILL. 3. A PILOT HOLE IS REQUIRED TO ENSURE THAT THE LIVE CUTTING/LIVE STAKE IS NOT DAMAGED WHEN DRIVEN THROUGH THE STONE FILLING. ACCESS SHALL BE MADE THROUGH THE USE OF A DIBBLE BAR, OR SIMILAR TOOL TO WORK AN OPENING THROUGH THE ROCK LAYER. 4. MINIMUM 2" TO 4" AND TWO LIVE BUDS OF THE LIVE CUTTING/LIVE STAKE SHALL BE EXPOSED ABOVE THE STONE FILLING. 5. LIVE CUTTINGS SHALL RANGE FROM 1/2" TO 1" IN DIAMETER AND BE FROM 1' TO 4' IN LENGTH. 6. LIVE STAKES SHALL RANGE FROM 1" TO 4" IN DIAMETER AND BE FROM 5' TO 6' IN LENGTH. 7. SEE CONTRACT DOCUMENTS FOR SPECIES, SIZE, SPACING, LOCATION, AND FINAL DETERMINATION ON USE OF CUTTINGS OR STAKES. 8. LIVE CUTTINGS/LIVE STAKES SHALL BE CUT TO A POINT ON THE BASAL END FOR INSERTION IN THE GROUND. 9. USE A DEAD BLOW HAMMER TO DRIVE STAKES INTO THE GROUND. THE HAMMER HEAD SHOULD BE FILLED WITH SHOT OR SAND. A DIBBLE, IRON BAR, OR SIMILAR TOOL SHALL BE USED TO MAKE A PILOT HOLE TO PREVENT DAMAGING THE MATERIAL DURING INSTALLATION. 10. LIVE CUTTINGS SHALL BE INSERTED BY HAND INTO PILOT HOLES. 11. WHEN POSSIBLE, TAMP SOIL AROUND LIVE CUTTINGS/LIVE STAKES. 12. ANY LIVE CUTTING/LIVE STAKE THAT IS DAMAGED SHALL BE LEFT IN PLACE AND SUPPLEMENTED WITH AN INTACT LIVE CUTTING/LIVE STAKE. | |
| <p>ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE</p> | <p>LIVE CUTTINGS/ LIVE STAKES PLANTING SPECS</p> |

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STANDARD AND SPECIFICATIONS FOR BRUSH LAYER



Brush layer cuttings shall be 1/2 to 2 inches in diameter and be from dormant plants. No leaf buds shall have initiated growth beyond 1/4" and the cambium layer shall be moist, green, and healthy. The cuttings shall be long enough to contact the back of the bench with the growing tips protruding out of the slope face.

Care shall be taken not to severely damage the live branch cuttings during installation. Damaged cuttings will be replaced prior to backfilling.

Starting at the toe of the slope, excavate benches along the contour of the slope. The benches shall range from 2 to 3 feet wide and the surface of the bench shall be angled so the front edge is higher than the back of the bench (See Figure 4.5). The benches shall be spaced according to the previous table, Slope Distance Between Layers (ft).

Live branch cuttings shall be placed on the bench in a crisscross or overlapping configuration in layers 3 - 4 inches thick. Backfill shall be placed on top of the live branch cuttings and tamped in 6 inch lifts. Small plate compactors may be used to settle the soil. Areas between the rows of brush layers shall be stabilized by seeding or other appropriate erosion control method.

Definition

A brush layer is a horizontal row of live branch cuttings placed in soil with other similar rows, spaced a specific vertical distance apart.

Purpose

To stabilize cut and fill slope areas by reinforcing the soil with unrooted branch stems, trap debris on slope, dry excessively wet sites, and redirect adverse slope seepage by acting as horizontal drains.

Conditions Where Practice Applies

Generally applicable to stabilize slope areas above the flow line of streambanks as well as cut and fill slopes. Brush layers can be used on slopes up to 2:1 in steepness and 20 feet in height.

Design Criteria

The spacing requirements for brush layer rows is dependent on the slope steepness and moisture content. Spacing shall conform with the following table.

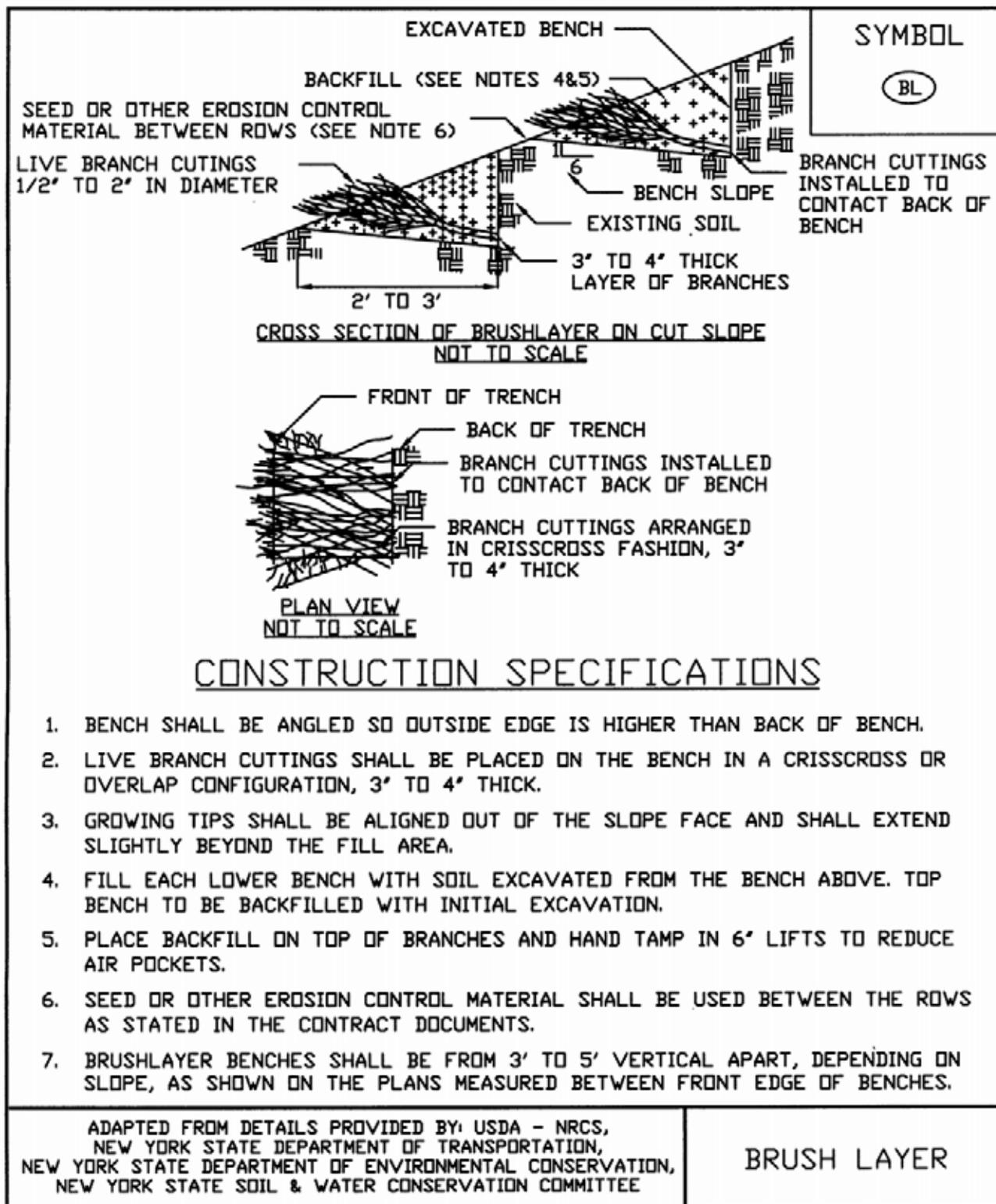
Slope Distance Between Layers (feet)

| Slope H : V | Wet Slope | Dry Slope | Max Slope Length |
|----------------|--------------|--------------|---------------------|
| 2 to 2.5:1 | 3' | 3' | 15' |
| 2.5 to 3.5:1 | 3' | 4' | 15' |
| 3.5 to 4.0:1 | 4' | 5' | 25' |

Maintenance

Due to the susceptibility of plant materials to the physical constraints of the site, climate conditions, and animal populations, it is necessary to inspect installations frequently. This is especially important during the first year or two of establishment. Plant materials missing or damaged should be replaced as soon as possible. Sloughs or breaks in drainage pattern should be reestablished for the site as quickly as possible to maintain stability.

**Figure 4.5
Brush Layer**



STANDARD AND SPECIFICATIONS FOR LIVE CRIBWALL



Definition

A hollow box-like structure made with an interlocking arrangement of untreated logs or timber members spiked together and anchored into the slope. The structure is filled with suitable earthfill materials and layers of live branch cuttings which root inside the structure and extend into the slope.

Purpose

To protect exposed or eroded streambanks from the erosive forces of flowing water and stabilize the toe of slope to reduce steepness.

Conditions Where Practice Applies

Generally applicable where flows are less than 6 feet per second and no degradation of the streambed occurs. Can reduce steepness and provide stability where space is limited and a vertical structure is needed. It is not intended to be used where the integrity of a road or structure is dependant on the cribwall since it is not designed to resist large lateral earth pressures.

Design Criteria

1. The vegetated cribwall structure shall be designed to a height for its intended purpose.
2. Live branch cuttings should be 1/2 to 2 inches in diameter and long enough to reach from the front of the structure to the undisturbed soil.
3. The structure will be built with a batter of 1 to 12. Large spikes or rebar are required to secure the logs or timbers together (10 inches minimum).

4. Only untreated logs or timber shall be used in the cribwall.
5. Installation begins with excavating to a stable foundation 2' - 3' below the ground elevation at the toe of slope with the back of the excavation (to the slope) slightly deeper than the front.
6. The first course of logs is placed along the front and back of the excavated foundation approximately 4-5 feet apart and parallel to the slope contour.
7. The next course is placed at right angles on top of the previous course to overhang the front and back of the previous logs by 3-6 inches.
8. Each course is placed in the same manner and fastened to the preceding course to the desired grade.
9. Stone fill is placed in the bottom of the structure up to the ground level and up to the base flow in a stream channel.
10. Once the cribwall structure reaches the existing ground elevation, live branch cuttings are placed on the stone fill parallel with the slope contour.
11. The cuttings are then covered with select clean fill with a maximum size of 3 inches and not more than 20 percent passing a 200 sieve size.
12. The live branch cuttings shall be placed at each course followed by the select fill to the top of the structure with the growing tips slightly protruding from the cribwall face.
13. The plant materials shall be kept in a healthy growing condition by watering. Also see maintenance below.

Maintenance

Due to the susceptibility of plant materials to the physical constraints of the site, climate conditions, and animal populations, it is necessary to inspect installations frequently. This is especially important during the first year or two of establishment. Plant materials missing or damaged should be replaced as soon as possible. Sloughs or breaks in drainage pattern should be reestablished for the site as quickly as possible to maintain stability.

Figure 4.6
Live Cribwall

