

Targeted Constituents

● Significant Benefit		◐ Partial Benefit		○ Low or Unknown Benefit	
● Sediment	○ Heavy Metals	◐ Floatable Materials	○ Oxygen Demanding Substances		
○ Nutrients	○ Toxic Materials	○ Oil & Grease	○ Bacteria & Viruses	○ Construction Wastes	

Description

A straw bale barrier consists of straw bales placed end to end along a level contour in a shallow trench and then staked to hold them in place. The straw bale barrier detains and filters stormwater runoff, creating a small pond behind the barrier where sedimentation occurs. Straw bales, along with silt fence, are erosion control devices that can be used in many ways. This practice will significantly reduce sediment.

Suitable Applications

- Along the perimeter of the site.
- Along streams and channels, or to protect sensitive areas.
- Around temporary spoil areas and other small cleared areas.
- At the bottom of exposed and significant erodible slopes.
- Within a swale or ditch that has gentle slopes and drainage area less than 1 acre.

Approach

Straw bale barriers are a well-known and common temporary means for trapping sediment at or near the potential source of erosion, and can also reduce the potential for overland sheet flow to concentrate into rills and gullies. Straw bale barriers can be installed below slopes, along paved areas, along stream banks and many other locations without requiring vehicle access or heavy equipment.

Straw bale barriers can be installed by hand or by using a small piece of trenching equipment. Proper installation is necessary to ensure good erosion control. Improperly installed straw bale barriers can actually worsen erosion by concentrating stormwater runoff instead of slowing and detaining.

Straw bale barriers are often used interchangeably with silt fence. However, silt fence has a much higher efficiency in reducing sediment, will last longer, and may be more cost-effective. A straw bale barrier typically has a maximum life of 3 months prior to excessive deterioration and rot. Straw bale barriers are often used in two rows of bales, or with a layer of geotextile fabric across the front, or in conjunction with other erosion control devices, in order to improve the sediment removal capabilities of straw bales. A single row of straw bale barrier may remove approximately 60% of the sediment if carefully installed and maintained. Efficiency is maintained primarily by replacing straw bales which have deteriorated in a timely manner.

Straw bale barriers should not be used in live or continuously-flowing streams. Straw bales should not be used in ditches or swales which drain areas greater than 1 acre. Do

not use straw bales in steep ditches or swales where the design flow is greater than 2 feet per second.

Straw bale barriers are effective for smaller quantities of water, such as overland sheet or rill flow. Like silt fences, straw bale barriers must be sufficiently anchored and follow the contours. Since straw bales are not as effective as silt fence fabric, straw bale barriers are likely to be used in conjunction with other erosion source controls.

Materials

Straw bale barriers should be made from clean straw or hay, baled, with no foreign substances or materials other than some type of string or wire. Each bale shall contain at least 5 cubic feet of straw or hay material, typically weighing in the neighborhood of 50 pounds. A typical straw bale is 30 to 36 inches long.

Bales should be bound with either metal wire, nylon string or polypropylene string that will adequately resist weathering and rot throughout the service life of the straw bale. Metal wire should be at least 16-gauge size baling wire. String shall be durable and have at least 80 pounds of breaking strength. Do not use cotton or jute bindings, which will quickly deteriorate and fail.

Anchoring stakes are typically 36 to 42 inches long, with 18 inches driven into the ground to secure the straw bales. Stakes may be either wood posts, such as 2" x 2" size oak or other hard woods, or iron rebar such as #4 diameter. A larger size wood post may be needed for pine or other soft woods. See Figure ES-15-1 for typical trenching and stake details.

Installation Guidelines

- Silt fence is generally preferred over straw bale barriers for ditches and for critical slopes that are long or steep. Straw bale barriers are used primarily in areas where overland sheet flow occurs.
- The drainage area for a straw bale barrier shall not exceed 10,000 square feet for every 100 feet of straw bale barrier. For a rectangular area, this means a maximum average slope length of 100 feet, which is only permissible for slopes flatter than 2 percent.

Maximum Slope Lengths for Straw Bale Barriers	
Land Slope	Maximum Slope Length
Less than 2 %	100 feet
From 2 to 5 %	75 feet
From 5 to 10 %	50 feet
From 10 to 20 %	25 feet
More than 20 %	15 feet

- Locate straw bale barriers at least 5 to 7 feet beyond the base of steep or long slopes. In locations at the bottom of a slope, turn the ends of the straw bale barrier upslope so that a depth of stormwater equal to the straw bale height is retained in front of the straw bales. The impoundment is similar to the silt fence installation in Figure ES-14-2, except that an emergency overflow is not needed.
- A double row of straw bale barriers is commonly specified to increase sediment removal. Rows should be staggered to prevent washouts. Silt fence fabric can also be entrenched into ground between two rows of straw bales for special situations.

Common problems with straw bale barriers are:

- Not adequately entrenched into the ground.
- Straw bales are not adequately bound with sufficient wire or string.

- Not installed on a level contour.
- Installed in a location with too much stormwater flow.

Installation Procedures

Step 1: Prepare the grade and alignment for the straw bale installation. Clear brush and reshape ground profile as necessary. Verify that the straw bale barrier is installed along a level contour and that maximum slope lengths are not exceeded.

Step 2: Excavate a trench approximately 4 inches deep and slightly wider than the straw bale. Keep excavated soil nearby for use in filling the trench. Clay soil, if available, is preferred to make a watertight seal.

Step 3: Place the straw bales into the trench one at a time. Each straw bale should be oriented so that the bindings are horizontal to prevent them from decomposing. Anchor each straw bale by driving the first stake at an angle to ensure a tight fit with the previous straw bale. Drive the second stake at a corresponding opposite angle to prevent the straw bale from floating or tearing apart (as shown in Figure ES-15-1). Tightly fill or chink all gaps with loose straw from the upstream end.

Step 4: Firmly compact the excavated soil against the uphill and downhill edges of the straw bale barrier. The use of clay soil will reduce piping and undercutting. Place excess soil against straw bale to a height of 4 inches on the uphill edge.

Maintenance

- Inspect straw bales after each rainfall event and also weekly for damaged or loosened material or bindings, excessive sediment buildup, undercutting flows or flows around end of straw bale barrier. Repair or replace as necessary.
- Remove accumulated sediment whenever it reaches one-third of the straw bale height. Shovel by hand to prevent damage to the straw bales. Dispose accumulated sediment onsite to prevent movement of sediment.
- The expected life of a straw bale barrier is usually 3 months. Inspect straw bales more often as the materials start to deteriorate. Install new straw bales as needed to ensure proper erosion control.
- Remove straw bales when no longer needed. Used straw bales can often be used as mulch for seeding or to stabilize ground cover elsewhere on site.

Limitations

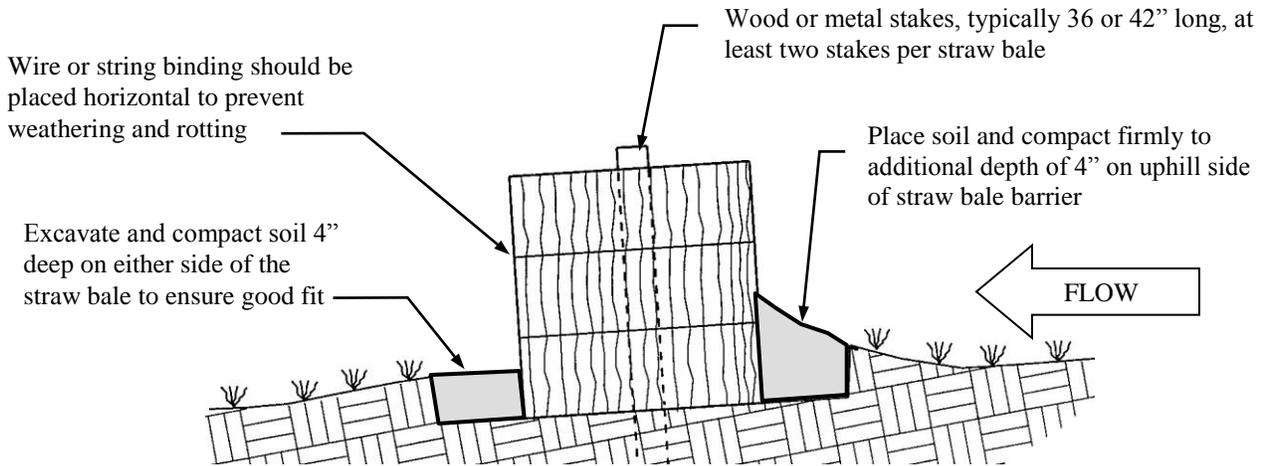
- Straw bales shall not be used in live or continuously-flowing streams. Straw bales can generally not be used in channels which drain areas larger than 1 acre.
- Straw bales are subjected to flotation or to damage from animals. Do not install in locations subject to large forces from stormwater runoff.
- Straw bale barriers should not be used for extended periods of time. The expected life of a straw bale is 3 months, and may be further shortened by rainy weather and extreme temperatures.

References

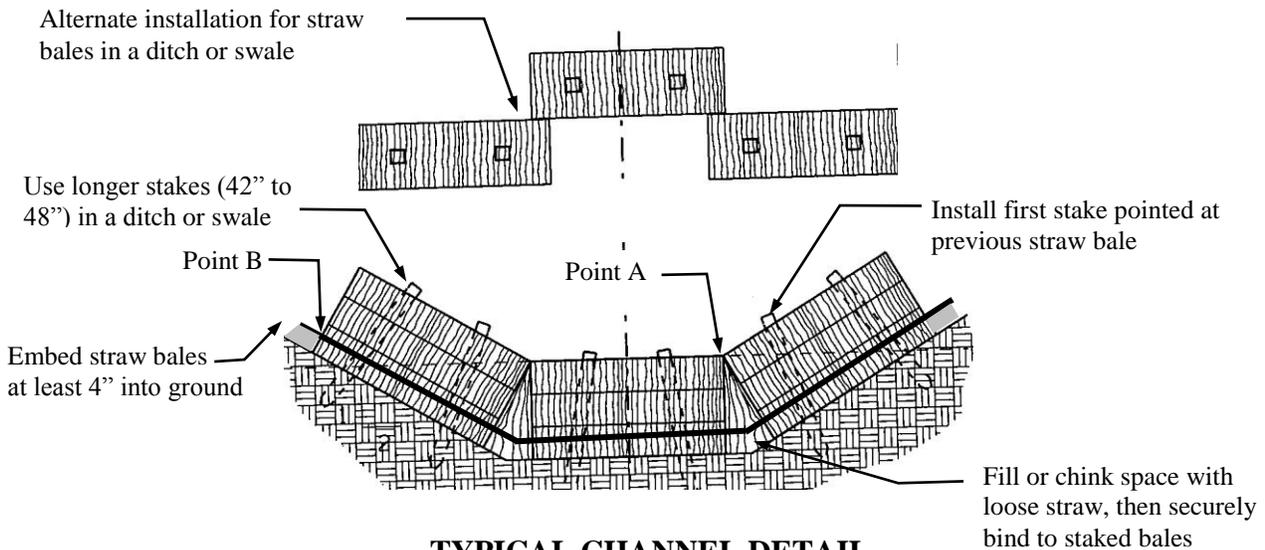
30, 31, 32, 33, 34, 35, 141, 162, 167, 172, 179 (see BMP Manual Chapter 10 for list)

Notes:

1. Install at least two metal or wood stakes for each straw bale. The first stake should be angled down toward the previous straw bale, in order to ensure close contact.
2. Place straw bale barrier at least 5 to 7 feet away from any steep or long slopes to impound stormwater runoff, similar to the silt fence detail on Figure ES-14-3.
3. Point B (at the outside of barrier) must be higher than point A (at ditch centerline).



TYPICAL CROSS SECTION



TYPICAL CHANNEL DETAIL

NOT TO SCALE

**Figure ES-15-1
Straw Bale Barrier**