4.4.10 Silt Fence and Associated Variants

* SF * SF * SF * SILT FENCE
* ESF * ESF * ESF * ENHANCED SILT FENCE
* SFB * SFB * SFB * SILT FENCE WITH WIRE BACKING

Source: TNWRRC

Definition and Purpose

Silt fences are temporary sediment control devices commonly used on construction sites to retain soil on disturbed land and prevent sediment-laden runoff from entering storm drains or nearby water bodies. They consist of a porous geotextile fabric supported by wood or metal posts and are typically installed to intercept sheet flow, reduce runoff velocity, and promote sediment deposition through settling. Variants such as silt fence with wire backing include added support using a wire-reinforced geotextile, making them more durable and suitable for areas adjacent to streams, wetlands, or steep slopes. Super silt fences are reinforced systems (typically chain link fencing and galvanized poles) designed for use where standard or wire-backed silt fences cannot meet slope length requirements or where space limits the installation of sediment basins or traps (VDEQ, 2024). Enhanced silt fences, featuring high-strength woven monofilament geotextile fabric and metal reinforcement, may be more ideal when the site has various sensitive areas such as sinkholes, ETWs, etc. These systems offer superior tensile, puncture, and hydraulic performance compared to standard silt fences, allowing for greater filtration capacity and durability under high-flow conditions (TDOT).

Appropriate Applications

Silt fence, silt fence with wire backing, and super silt fence are only to be used in areas of sheet flow and installed on contour (NCDEQ, 2013). Common examples include at the toe of a slope, along the perimeter of a construction site, along the banks of ditches or swales, and around the perimeter of a stockpile.

Enhanced silt fence can be used in areas of sheet flow and is the only variant of silt fence applicable in areas of concentrated flow. It can be used as a check dam alternative in small open channels, swales, and ditches; however, they are not to be used in streams (TDOT). In sheet flow applications, this variant is particularly useful in areas draining unstable watersheds, where sediment loads are expected to be elevated, where runoff enters ETWs, or during vegetation establishment. For check dam alternatives, refer to the specifications in the standard drawing. Herein, the enhanced silt fence will be discussed in its sheet flow applications only.

Limitations and Maintenance

Silt fence, silt fence with wire backing, and super silt fence do not provide enough durability for use in areas of concentrated flow. The forces associated with concentrated flows will lead to blowouts, undermining, and bypass. Further, maintenance of silt fence is imperative to prevent blowouts, overtopping, and structural failure. Once sediment has accumulated to a height of half the silt fence, it is to be removed and disposed of properly. Disposal may include keeping the sediment onsite and stabilizing it. Regular inspection is essential: fences should be inspected regularly to identify sagging, damage from construction equipment, or signs of undermining along the toe.


Source: KTC (2015)

Maintenance challenges are often compounded by site conditions. Saturated soils behind the fence can make it difficult to remove sediment with machinery, particularly on linear construction sites with limited space for reinstallation. In such cases, an alternative approach is to leave the sediment in place if it is stable and install an additional silt fence to continue capturing runoff (USEPA, 2021). However, if a fence consistently fails, this typically indicates improper installation or poor placement. In these situations, installing different EPSC measures may be more beneficial than reinstalling the compromised fence. Ultimately, silt fences must remain in place until disturbed areas are permanently stabilized, and final removal should include restoration of the site through grading and seeding of remaining sediment deposits.


Source: USEPA (2021)

Fabric degradation is another limitation; the geotextile material may wear or clog with fine sediment over time, which significantly reduces its permeability and effectiveness. In such cases, the fabric must be replaced, or in some instances, an entirely new silt fence should be installed either upslope or downslope of the original location. While support posts and reinforcing wires can often be recycled or reused, traditional silt fences are one-time-use plastics that contribute microplastics to the environment as they degrade (Whitman et al., 2025). In addition to environmental concerns, silt fences block the passage of small animals and amphibians, posing wildlife concerns.

Planning and Design Considerations

Silt fence and its variants are systems to retain sediment on the construction site by temporarily ponding sheet flow and promoting deposition. Its primary form of sediment treatment is by settling sediments through ponding, though some geotextile materials may provide secondary benefits of filtering sediments. They are applicable under differing scenarios (Table 4.4.10-A), and therefore fabric and reinforcement requirements of the variants also vary (Table 4.4.10-B). Use 14-gauge wire backing and a maximum mesh spacing of six inches for wire-backed silt fence. For super silt fence, use chain link is galvanized No. 11.5 Ga. steel wire with 2.25-inch opening, No. 11 Ga. aluminum coated steel wire in accordance with ASTM A 491, or galvanized No. 9 Ga. steel wire top and bottom with galvanized No. 11 Ga. steel intermediate wires (VDEQ, 2024). One fabric requirement differentiation is the flow through the material due to ponding. The designer should anticipate ponding and provide sufficient storage areas and overflow outlets to prevent flows from overtopping the fence. Silt fence should be installed on contour and curled uphill on each end of the fence in a “J-hook” pattern to prevent end flow and scouring out. This J-hook pattern may also be adopted when site conditions prevent the placement of silt fence on contour. Another option, when using multiple rows of silt fence, is to connect the rows with a longitudinal strip of silt fence to prevent sediment-laden runoff from migrating around the rows of silt fence. Provide stabilized outlets to protect the fence system and release storm flows that exceed the design storm.


Source: TDEC


Source: TNWRRC

Table 4.4.10-A: Maximum slope length (feet) upgradient from silt fence. Sources: PADEP (2012) and VDEQ (2024).

Slope	Silt Fence	Silt Fence with Wire Backing	Super Silt Fence
≤ 2	100	500	1000
5	100	250	550
10	50	150	325
15	35	100	215
20	25	70	175
25	20	55	135
30	15	45	100
35	15	40	85
40	15	35	75
45	10	30	60
50	10	25	50

Note: Guidance on enhanced silt fence is not provided. It can be assumed to have similar allowable slope lengths as a super silt fence.

Table 4.4.10-B: Physical property requirements of silt fence fabrics. Source: TDOT.

Physical Property	Test	Silt Fence	Silt Fence with Wire Backing / Super Silt Fence	Enhanced Silt Fence
Grab Str. Tensile (lbs) - Wrap Direction	ASTM D 4632	≥ 120	≥ 310	≥ 370
Grab Str. Tensile (lbs) - Fill Direction	ASTM D 4632	≥ 100	≥ 200	≥ 230
Elongation at Failure (%)	ASTM D 4632	≤ 20	-	-
Burst Str. (PSI)	ASTM D 3786	≥ 250	≥ 400	≥ 470
Puncture Str. (lbs)	ASTM D 4833	≥ 60	≥ 105	≥ 110
Trap. Tear Str. (lbs) - Wrap Direction	ASTM D 4533	≥ 50	≥ 100	≥ 115
Trap. Tear Str. (lbs) - Fill Direction	ASTM D 4533	≥ 40	≥ 60	≥ 75
Apparent Opening Size (U.S. Sieve)	ASTM D 4751	#30 to #70	#70 to #100	#30 to #80
Flow Through Rate (gal/min/sq.ft)	ASTM D 4491	≥ 4	≥ 18	≥ 110
Min Ultraviolet Residual (%)	ASTM D 4355	≥ 70	≥ 90	≥ 90

Silt fence, regardless of type, can be installed in one of two ways: static slicing or trenched, both of which require staking the fence into the ground and affixing the fence to such stakes (Table 4.4.10-C). The static slicing method, often preferred for its superior soil sealing and strength, uses specialized slicing machines equipped with a narrow vertical blade. As the

blade is pulled through the soil, it creates a slit (approximately 12 inches deep) and simultaneously inserts the silt fence fabric directly into the ground behind it [in which the depth of buried fabric depends on the type of silt fence (Table 4.4.10-C)]. The slicing blade slightly lifts the soil to minimize horizontal disturbance while allowing for efficient vertical compaction. After insertion, a tractor or machine-mounted roller can be used to compact both sides of the fence line by driving over the disturbed soil multiple times, creating a tight seal. This vertical compaction minimizes air gaps and potential seepage paths, resulting in a more stable and longer-lasting installation. Once the fabric is in place, posts and the fabric are securely attached using wire ties, staples, or lath, depending on post type (Table 4.4.10-C; TDOT; USEPA, 2021). In the trenching method, installation begins by excavating a shallow trench, typically four to six inches deep and wide. The bottom edge of the filter fabric is placed into this trench, allowing at least six inches of fabric to be buried, depending on silt fence type (Table 4.4.10-C). After placing the fabric, the trench is backfilled with excavated soil and compacted firmly, either manually or with mechanical equipment, to create a seal that prevents water from flowing underneath the barrier. Posts are then driven into the ground on the downstream side of the fabric, where post material, length, and depth driven into the ground depend on the variant of silt fence (Table 4.4.10-C). If the post material is metal, a post cap is required. The fabric is then attached to the posts using wire ties, staples, or wood lath, ensuring it is tight and upright (TDOT; USEPA, 2021; VDEQ, 2024). While trenching is a widely used and cost-effective method, proper compaction of backfill soil is critical: inadequate sealing can lead to undercutting and system failure, especially in saturated or high-flow conditions. Compared to static slicing, trenching may offer more flexibility in maneuvering around obstacles, but requires greater attention to soil sealing and reinforcement and time (USEPA, 2021).

Photo courtesy of J. R. Buchanan

Table 4.4.10-C: General installation guidelines for silt fence and silt fence variants. Sources: [a]TDOT and [b]VDEQ (2024).

Feature	Silt Fence[a]	Silt Fence with Wire Backing[a]	Super Silt Fence[b]	Enhanced Silt Fence[a]
Primary Use	Sheet flow, sediment-laden runoff	Higher stress, steep-sloped areas	Higher stress, space-constrained areas	Higher stress, steep slopes, Concentrated flow*
Support Structure	Fabric only, on posts	Wire mesh backing plus fabric on posts	Chain link fence plus high-strength fabric	Wire mesh backing plus high-strength fabric
Post Material	Steel or wood	Steel	Galvanized or aluminum	Metal-studded tee
Post Spacing	Max 6 feet	Max 4 feet	Max 10 feet	Max 2 feet
Post Depth into Ground	Min 20 inches	Min 36 inches	Min 24 inches	Min 42 inches
Post Length	Min 48 inches	Min 64 inches	Min 57 inches	Min 84 inches
Post Dimensions (nominal)/Weight	2.25 x 2.25 inches	1.25 lbs/ft	2.5-inch diameter	1.25 lbs/ft
Fabric Height Above Ground	Min 26 inches	Min 26 inches	Min 32 inches	Min 40 inches
Fabric Height Below Ground	Min 6 inches	Min 6 inches	Min 8 inches	Min 8 inches
Silt Fabric Width	36 inches	Min 32 inches	Min 40 inches	Min 48 inches
Fabric Attachments	Tied/stapled to posts	Tied	Tied or clipped to a chain link fence	Tied
Installation Method(s)	Static slicing or trenching	Static slicing or trenching	Trenching	Trenching
Trench Depth	4-6 inches	4-6 inches	8 inches	Max 14 inches
Trench Width	4-6 inches	4-6 inches	6 inches	Max 18 inches
Trench Backfill	Required, compacted	Required, compacted	Required, compacted	Required, compacted
Removability	Easy	Easy to moderate	Moderate to difficult	Moderate to difficult

*When using enhanced silt fence in areas of concentrated flow, refer to the proper standard drawings. Herein, specifications of the enhanced silt fence is for sheet flow.

For maximum effectiveness, silt fences should be installed along the contour of the land. Placement near ridges or drainage divides, where water movement is minimal, provides little benefit and may even introduce unnecessary erosion or sedimentation problems. Further, installation on upgradient property boundaries likely has a negative impact as it will only impound water running onto the site. Installation must ensure the bottom of the fence sits on a nearly level grade (0%, ± 0.5%) and follows the natural ground contour as closely as possible. At the base of slopes, fences should be installed five to seven feet away from the toe to provide space for water ponding and sediment accumulation. Silt fences can be installed with or without backing. For fences without backing, the drainage area should not exceed one-quarter acre per 100 feet of fence, where the drainage area initiates at the lowest elevation of silt fence (i.e., not at the end of a roll of silt fence). When using backing, the allowable drainage area increases to one acre per 150 feet of fence. Given the typical lifespan of plastic fencing is six to 12 months, projects lasting longer than a year should plan for full replacement, budgeting for material replacement approximately every nine months.

Summary points and general good installation techniques include:

- Ensure that the height of the sediment fence extends roughly 26 inches above the ground surface. Fences exceeding this height may impound sufficient volumes of water resulting in failure of the structure;
- Construct the filter fabric from a continuous roll cut to the length of the barrier to avoid joints. When joints are necessary, securely fasten the filter cloth only at a support post with a minimum of four feet overlap to the next post, or roll the fabric together and fasten to one post to create a stronger joint. Where joints are necessary, plan the roll layout so as not to have joints at low points;
- Do not attach filter fabric to trees;
- When silt fence is installed adjacent to streams, wetlands, or other natural resources, a wired-backed silt fence is recommended;
- Install posts at the specified depths and spacings on the downstream side of the silt fence, and as close as possible to the fabric, enabling posts to support the fabric from upstream water pressure;
- Securely attach the silt fence fabric to the posts on the upstream side of the posts. For steel posts, attach fabric to the posts using wire or plastic zip ties with a minimum 50-pound tensile strength, at least five to a post. Three ties should be installed in the upper eight inches for top strength. Ties should be installed on the diagonal, as opposed to on the horizontal, to anchor more strands of fabric to the post. For hardwood posts, attach fabric with 17-gauge wire staples (3/4" wide x 1/2" long), at least five to a post. Three staples should be installed in the upper eight inches for top strength; and
- Install J-hooks where the silt fence cannot be completely installed on the contour.

Traditional, synthetic silt fence typically removes 80 to 90 percent of sediments (Faucette et al., 2008; Perez et al., 2024). However, agencies across the nation indicate plastic silt fence is one of the most, if not the most, problematic practices for contributing plastics (micro and macro) to the environment, and the need for a plastic-free alternative to silt fence. Though the natural silt fence counterpart may not yet be readily available, it is in testing (see associated picture). Wattles absent of plastic nettings and proper installation techniques (Section 4.4.9) as well as slash mulch berms (Section 4.4.2) are viable, environmentally- and wildlife-friendly alternatives. These alternatives have demonstrated similar sediment removal performance (up to 98%) as synthetic silt fence (Donald et al., 2013; Schussler et al., 2021; Perez et al., 2024).

Example Application

No formal design or quantities are required for this measure and therefore are not presented here.

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