U-Shaped Sediment Traps

SEDIMENT CONTROL TECHNIQUE

Type 1 System		Sheet Flow		Sandy Soils	✓
Type 2 System		Concentrated Flow	✓	Clayey Soils	[1]
Type 3 System	✓	Supplementary Trap		Dispersive Soils	

[1] Generally only limited control over clay and silt-sized particles.

Symbol

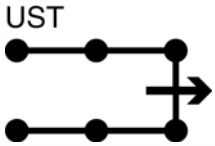


Photo 1 – **Photo 2 –**

Key Prin

1. Primarily u to collect the rse les a is h the fence.
2. Functions by tem ily ond rticles o settle.
3. Critical design param ers are which determines the length and/or width of the sediment trap.
4. It is critical that the ends of each wing (see Figures 5 and 10).
5. When located within a table drain, the allowable width of the sediment trap maybe governed by bank can be used to direct flow into a narrow U-shaped sediment trap (refer to Figure 5).
6. Critical operational issues include:
   (i) ensuring the to allow easy maintenance (clean-out) by a backhoe; and
   (ii) ensuring all flow is directed into the sediment trap, thus avoiding flow bypass.

Design Information

The maximum support post (Figure 9).

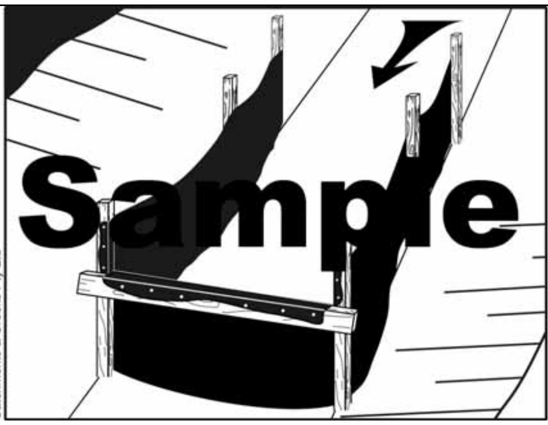
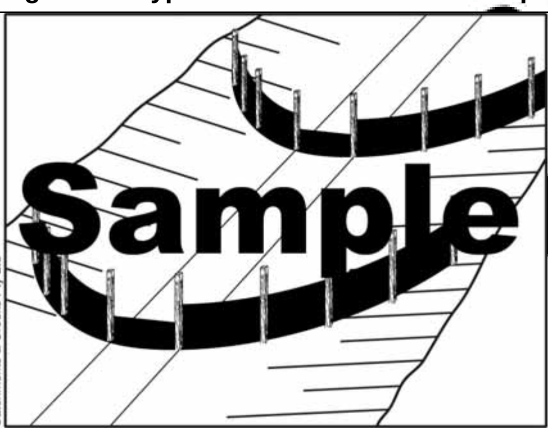
Wherever practical, the fabric should be anchored trench (Figure 8).

Unless placed on a very steep slope, a spill-through weir (Figure 3) must be installed at the low point in the above the ground surface.

Design procedure:

1. Select the preferred type of U-shaped sediment trap from Table 1.

Table 1 – Selection of sediment trap layout

 **Figure 1 – Type AU 'narrow' sediment trap**	**Preferred usage:** • • ons whe e it ho rb cent e pur nstalling • y drai good at nly be ga tending t p the ert t ele ds o spill-t r cres.
 **Figure 2 – Type BU 'w de' sediment trap**	**Pref rred u** • W a elevatio

2. Determine the design discharge, Q (m^3/s).
3. Calculate the required width of the spill-through weir (refer to Table 2). The minimum width of will be used to de-silt the trap.
4. Nominate the height of the spill-through weir. Usually set (refer to Table 3).
5. Determine the required ground elevation at height of the spill-through weir.
6. Knowing the required ground elevation at the ends of each wing wall, determine the overall traps, Table 3 can be used to estimate the required length (L) of the sediment trap.

Design of spill-through weir:

Where appropriate, spill-through weirs should be installed into the end of the sediment trap to prevent flows bypassing around the structure, and reduce the risk of hydraulic failure.

The required width

is provided below as Equation 1, as well as being tabulated in Table 2.

(Eqn 1)

where: Q = Design flow rate (usually 0.5 times the 1 in 1 year ARI peak discharge) [m^3/s]
W = Weir width [m]
H = Hydraulic head = height of upstream water level above weir crest [m]

Table 2 – Flow rates passing over a spill-through weir (m^3/s)

Hydraulic head, H (m)	Spill-through weir width, W (m)								
	0.3	0.5	1.0	1.5	2.0	2.5	3.0	4.0	4.5
0.10									
0.15									
0.20									
0.25									
0.30									
0.35									
0.40									

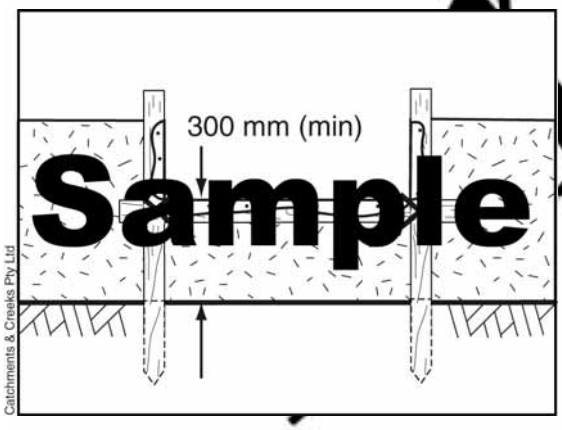


Figure 3 – Spill-through weir profile

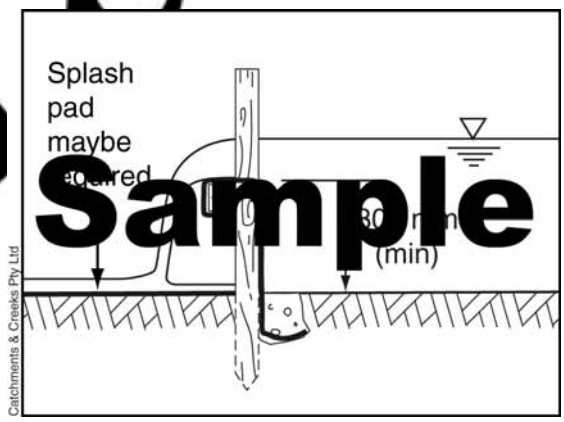


Figure 4 – Side profile of a spill-through weir

If the sediment trap is to be installed within a table drain (i.e. a side drain of a road adjacent to the shoulder to bury the fabric, or even drive support posts into the road shoulder. Reasons for such restrictions include:

- disturbance of the heavily compacted road shoulder can allow water to enter the road foundations causing early failure of the road;
- safety risks associated with support posts and other structures placed too close to a roadway.

In order to construct a suitable sediment trap within such a drain it is usually necessary for the sediment weir. The minimum required length of the sediment trap is provided in Table 3 for various drain gradients.

Table 3 – Required length of a Type AU sediment trap

Drain grade (%)	Required length, L (m) [1]	Height of spill-through weir, Z (m)
< 6%	Use a Sandbag Check Dam Sediment Trap	
6%		
8%		
10%		
14%		
20%		
25%		
> 35%		

[1] Length assumes minimal bank slope. The required length may be reduced if the wing walls can be extended up the bank slope.

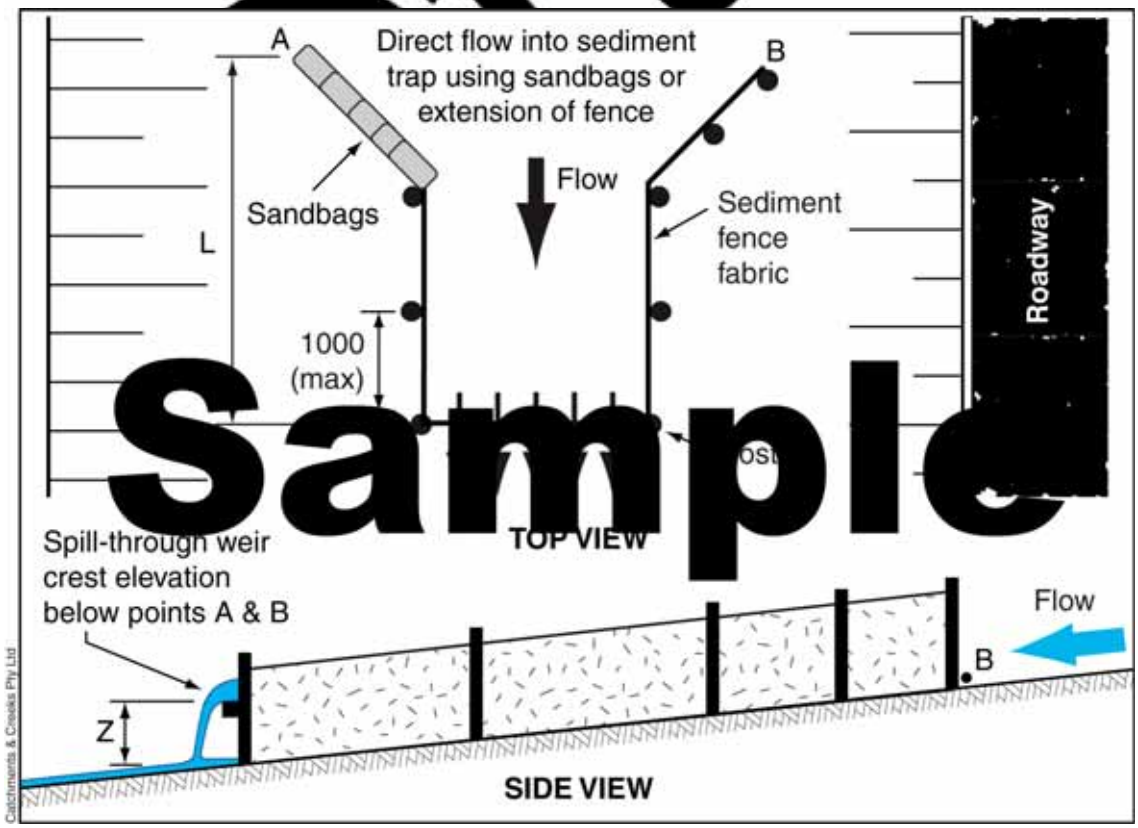


Figure 5 – Profile of a Type AU 'narrow' sediment trap

Type AU (narrow) sediment traps (Figure 6) use the fall in the drain's invert to elevate the ends of each wing wall above the height of the spill-through weir crest.

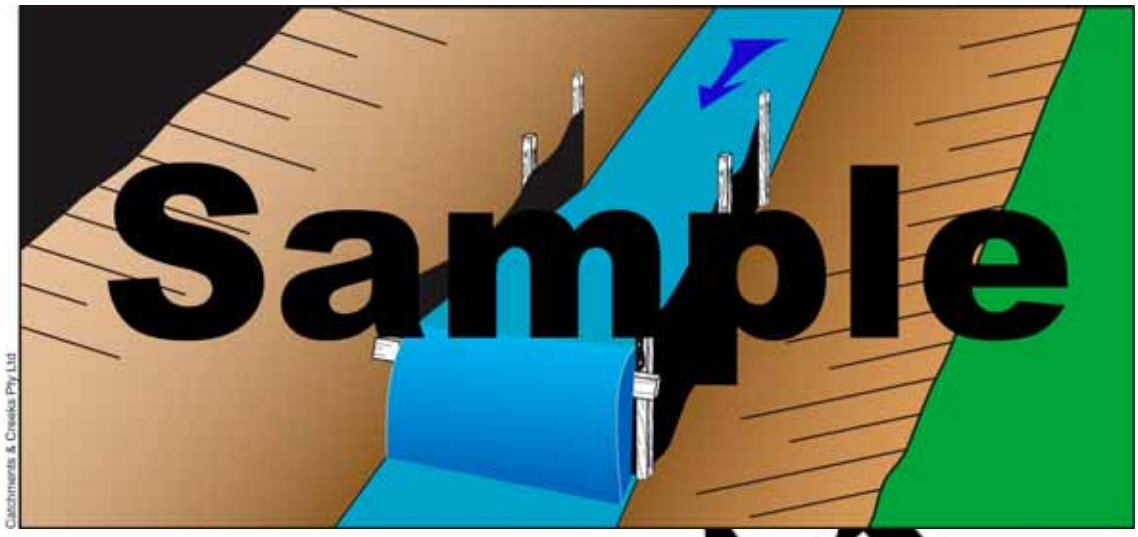


Figure 6 – Type AU sediment trap

Type BU (wide) sediment traps (Figure 7) use the gradient of the drain's bank to elevate the ends of each wing wall above the height of the spill-through weir crest.

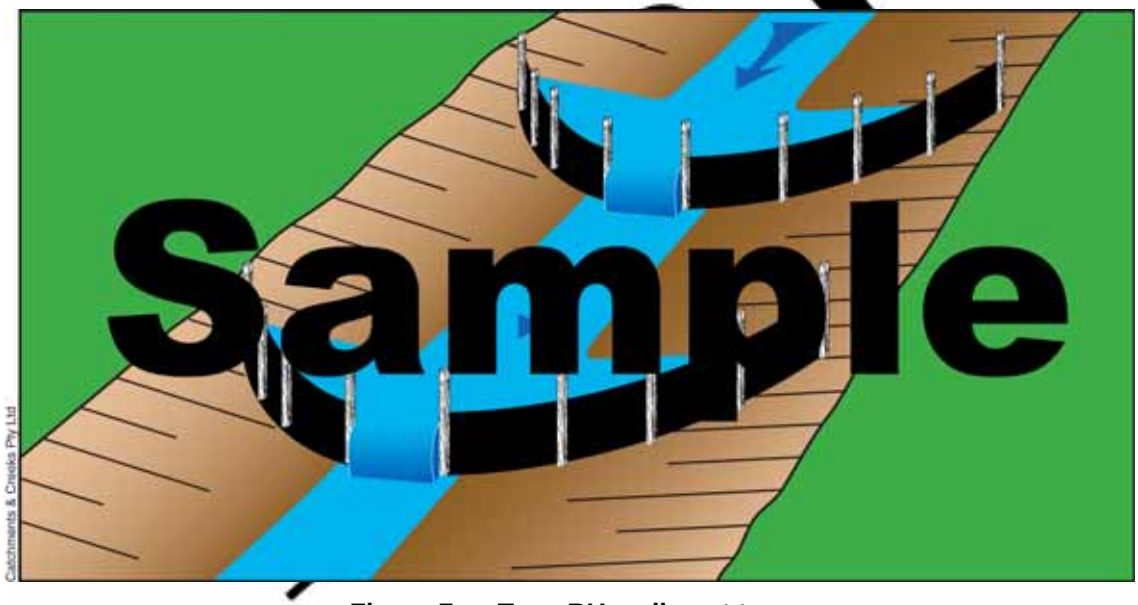


Figure 7 – Type BU sediment trap

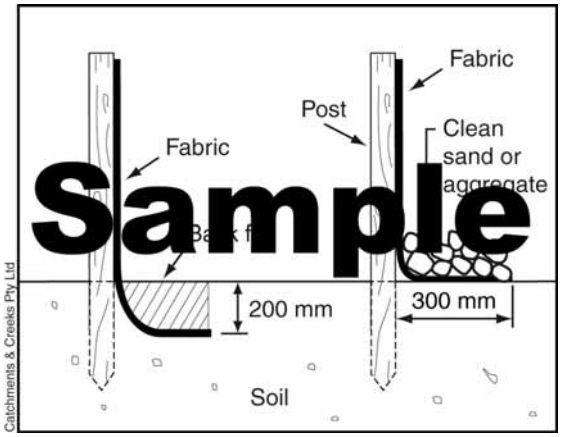


Figure 8 – Trenching fabric

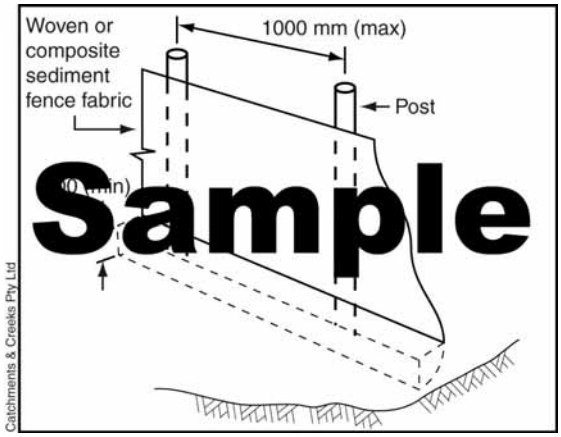


Figure 9 – Spacing of support posts

Care must be applied when placing any form of sediment trap within an area of concentrated flow such as a drainage swale. Issues for consideration include:

- Potential increase in flood waters, possible causing water to bypass into adjacent properties, or cause the flooding of adjacent roadways.
- Undesirable flow bypassing around the sediment trap.
- Damage to the sediment trap caused by the deep and/or high velocity floodwaters.
- Potential flood and/or erosion damage caused by flows in excess of the nominated design discharge.

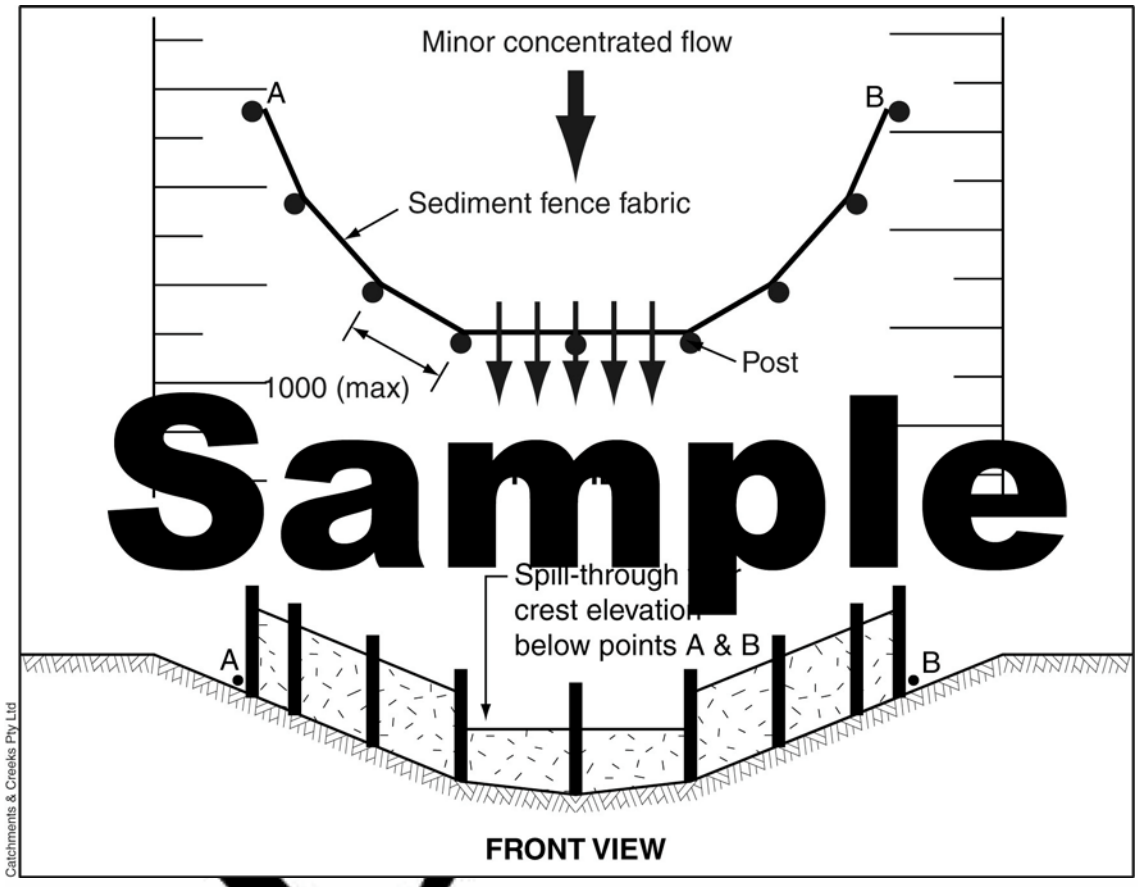


Figure 10 – Profile of a Type BU 'wide' sediment trap

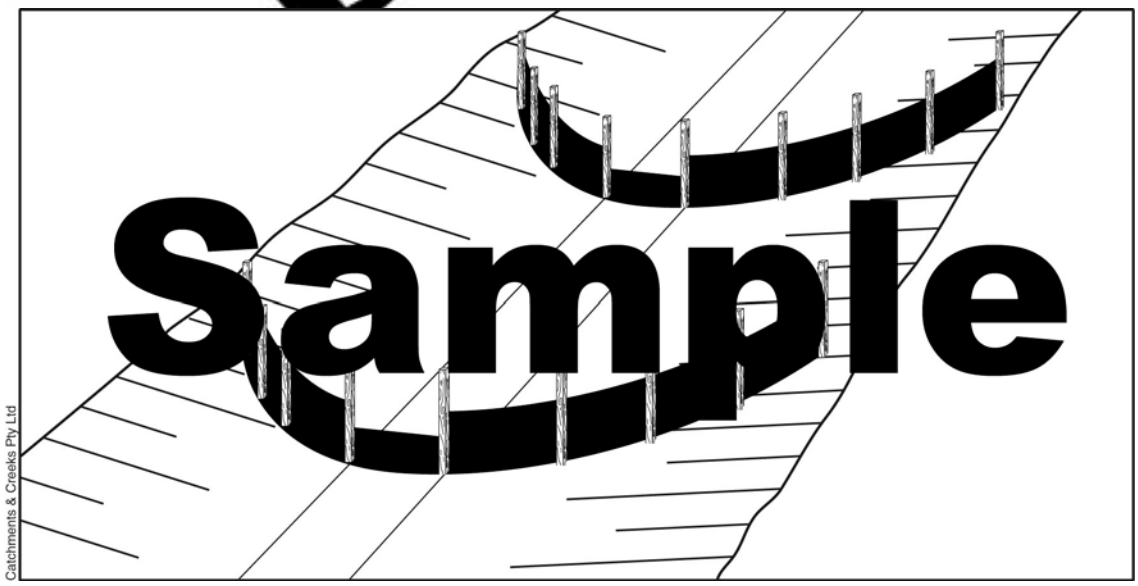


Figure 11 – Type BU sediment trap

Design examples

The nominated design discharge should not bypass around the ends of the sediment trap as shown in Figures 12 and 13.

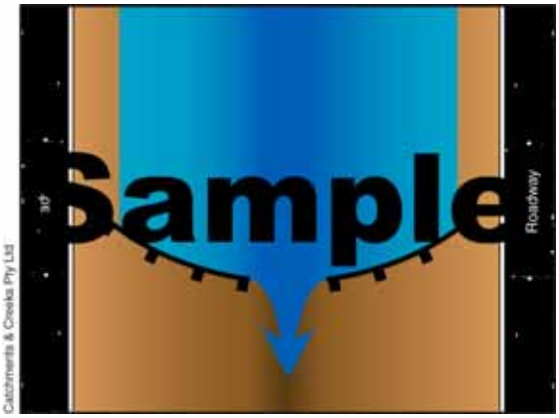


Figure 12 –

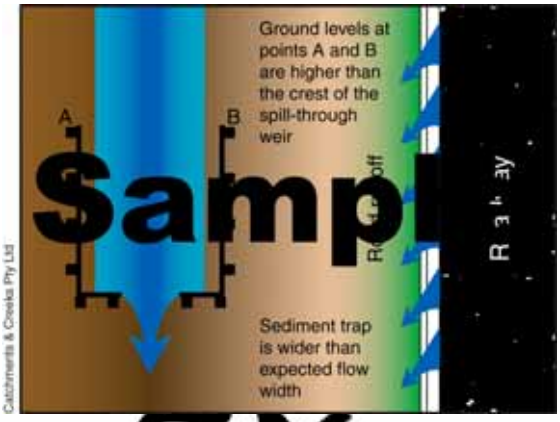


Figure 13 –

Photo 3 –

Photo 4 –

Photo 5 –

Photo 6 –

What not to do!

U-shaped sediment traps have often been inappropriately designed and/or installed. The following figures and photos discuss common design and installation problems.

Figure 14 –

Photo 7

Figure 15 –

Photo 8 –

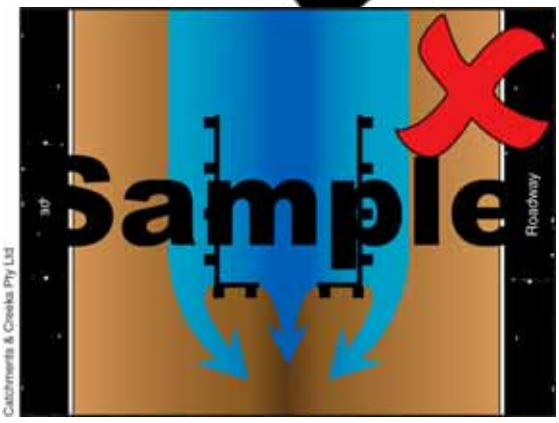


Figure 16 –

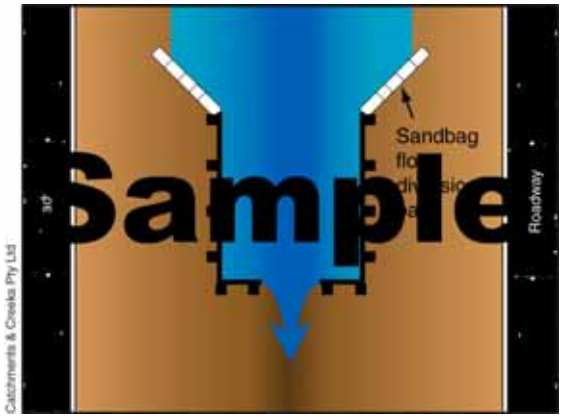


Figure 17 –

Description

A sediment trap formed from typical sediment fence materials, but heavily curved in a U-shape.

The sediment trap is designed such that the essential 'ponding' is confined between the two wing walls of the sediment trap.

Purpose

Used as a coarse trap sediment within minor drainage swales and roadside table drains.

Limitations

Application is generally limited to steep drains with a gradient exceeding 5%.

The design flow rate is limited by the available width of the spill-through weir.

Potential service life of around 6 months.

Advantages

Reasonably easy to install.

Controls sediment runoff close to the source of the erosion.

A highly visible sediment control measure.

Generally more effective, durable and cheaper than straw bale sediment tra

Disadvantages

The spill-th ugh weir is often i rectly installed

Can be diffic appropriately b the bottom of the fa within the sho er of the road.

Common Problems

Often incorrectly installe in a 'straight' alignment instead of a U-shape.

Ends of the fence not turned up the slope to prevent flow bypassing.

The spill-through weir is set too low (< 300mm) or not placed within the low point of the fence.

Excessive spacing of support posts.

Fabric not adequately attached to the support posts.

Special Requirements

The crest of the spill-through weir must be at least 300mm high and must be below the ground level at the ends of the wing walls.

Location

Normally located as a series of sediment traps along the drain.

Site Inspection

Check for excessive sediment deposition.

Investigate the source of any excessive sediment.

Ensure the appropriate selection of fabric (i.e. woven or non-woven composite).

Ensure the fabric is adequately buried.

Check the spacing of support posts.

Check if flow will bypass the wing walls.

Materials

- Fabric: polypropylene, polyamide, nylon, polyester, or polyethylene woven or non-woven fabric, at least 700mm in width and a minimum unit weight of 140g/m. All fabrics to contain ultraviolet inhibitors and stabilisers to provide a minimum of 6 months of useable construction life (ultraviolet stability exceeding 70%).
- Fabric reinforcement: wire or steel mesh minimum 14-gauge with a maximum mesh spacing of 200mm.
- Support posts/stakes: 1500mm^2 (min) hardwood, 2500mm^2 (min) softwood, or 1.5kg/m (min) steel star pickets suitable for attaching fabric.

Installation

1. Refer to approved plans for location, extent, and required type of fabric (if specified). If there are questions or problems with the location, extent, fabric type, or method of installation contact the engineer or responsible on-site officer for assistance.
2. Install the fabric in a U-shape extending the wing walls either up the side slopes and/or up the channel bank (as directed) to a point where the ground level is at least 300mm higher than the crest of the spill-through weir.
3. Ensure that the expected channel flow will enter the sediment trap, either by extending the wing walls up the bank slope, or constructing sandbag flow diversion banks.
4. Unless directed by the site supervisor, excavate a 200mm wide by 200mm deep trench along the alignment of the spill-through weir and wing walls.
5. Along the lower side of the trench, appropriately secure the stakes into the ground spaced no greater than 1m.
6. Construct the sediment trap from a continuous roll of fabric.
7. Securely attach the fabric to the support posts using 25mm staples or tie wire at maximum 150mm spacing with the fabric extended at least 200mm into the trench.
8. Install a spill-though weir at the lowest point in the fence. The weir must be at least 300mm above adjacent ground level, and below the lowest ground level at the ends of the wing walls.
9. Securely tie a horizontal cross member (weir) to the adjacent support posts. Cut the fabric down the side of the posts and fold the fabric over the cross member and appropriately secure the fabric.
10. If directed, install a suitable splash pad immediately down-slope of the spill-through weir to control soil erosion downstream of the sediment trap.
11. Backfill the trench and tamp the fill to firmly anchor the bottom of the fabric and mesh to prevent water from flowing under the fence.

Maintenance

1. Inspect the sediment trap at least weekly and after any significant rain. Make necessary repairs immediately.
2. Repair any torn sections with a continuous piece of fabric from post to post.
3. When making repairs, always restore the system to its original configuration unless an amended layout is required or specified.
4. If the fabric is sagging between stakes, install additional support posts.
5. Remove accumulated sediment if the sediment deposit exceeds a depth of 150mm.
6. Dispose of sediment in a suitable manner that will not cause an erosion or pollution hazard.
7. Replace the fabric if the service life of the existing fabric exceeds six months.

Removal

1. When disturbed areas up-slope of the sediment trap are sufficiently stabilised to restrain erosion, the fence must be removed.
2. Remove materials and collected sediment and dispose of in a suitable manner that will not cause an erosion or pollution hazard.
3. Rehabilitate/revegetate the disturbed ground as necessary to minimise the erosion hazard.