Excavated Drop Inlet Protection

SEDIMENT CONTROL TECHNIQUE

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

[1] In its simplest form (Photos 1 & 2) these systems would at best be considered as 'supplementary' sediment traps.

Symbol

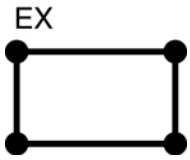

Photo 1 – Excavated drop inlet protection at top water level

Photo 2 – Excavated drop inlet protection (poor example)

Key Principles

1. Sediment trapping is primarily achieved through gravity-induced sedimentation within the settling pond that forms around the stormwater inlet.
2. The critical design parameter is the surface area of the formed settling pond.
3. The primary purpose of the aggregate-lined weep holes is to allow the sediment trap to freely drain, thus reducing safety risks and allowing the sediment trap to be de-silted after major storms.
4. If insufficient pond surface area is provided around the inlet, then the sediment trapping efficiency will be significantly reduced.

Design Information

Maximum catchment area 0.4ha on sites with low sediment runoff, or 0.1ha on sites with expected high sediment runoff yields.

Minimum depth of excavated settlement pool of 300mm, and a maximum depth of 600mm measured from the crest of the drop inlet.

Maximum gradient of excavated slopes to be no steeper than 2:1(H:V).

Recommended excavated volume around the field inlet is 100m^3/ha. Minimum recommended volume is 67m^3/ha.

Seepage holes (protected with aggregate and wire mesh) should be installed in the inlet structure to allow drainage of the settlement pool.

Table 1 provides the minimum surface area per unit flow rate of settling ponds for various treatment standards. Achieving a Type 2 sediment control standard is very rare for this type of sediment trap.

Table 1 – Minimum settling pond surface area per unit inflow rate ($m^2/m^3/s$)

Sediment trapping standard	Critical particle size (mm)	Pond water temperature [2]		
		10° C	15° C	20° C
Type 3	0.20	45	39	35
	0.15	80	70	61
Type 2	0.10	180	160	140
	0.05	720	630	555

[1] Minimum pond area is based on the theoretical (Stokes' Law) minimum pond size plus a 20% safety factor to account for inflow jetting and other variables.

[2] Pond temperature may be assumed to be the same as the typical rainwater temperature during the time of year when the pond is likely to be in operation; otherwise, assume 15 degrees.

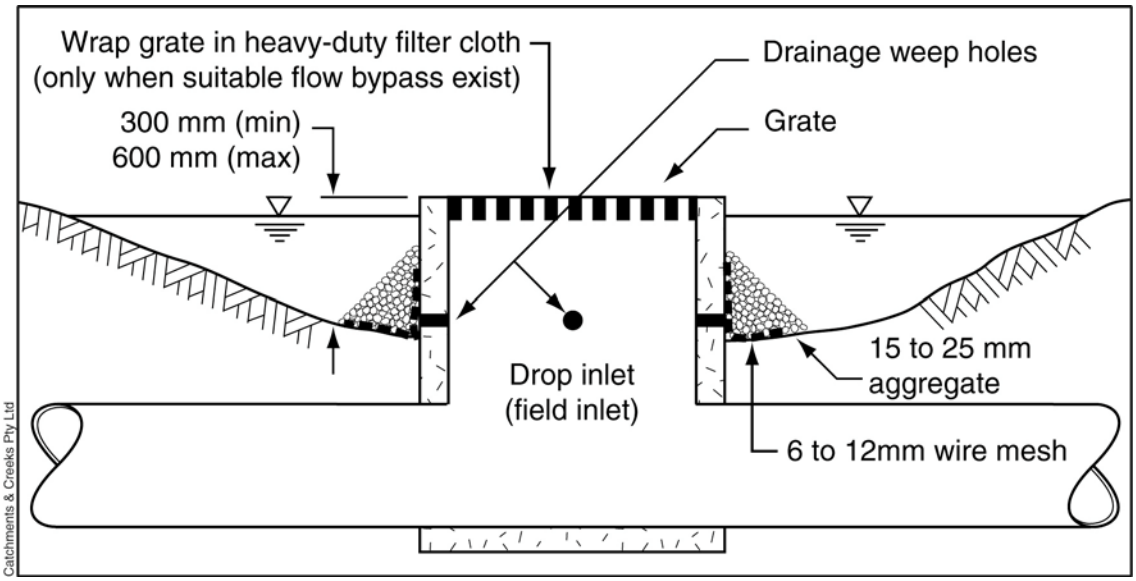

Figure 1 – Cross-section of excavated drop inlet protection

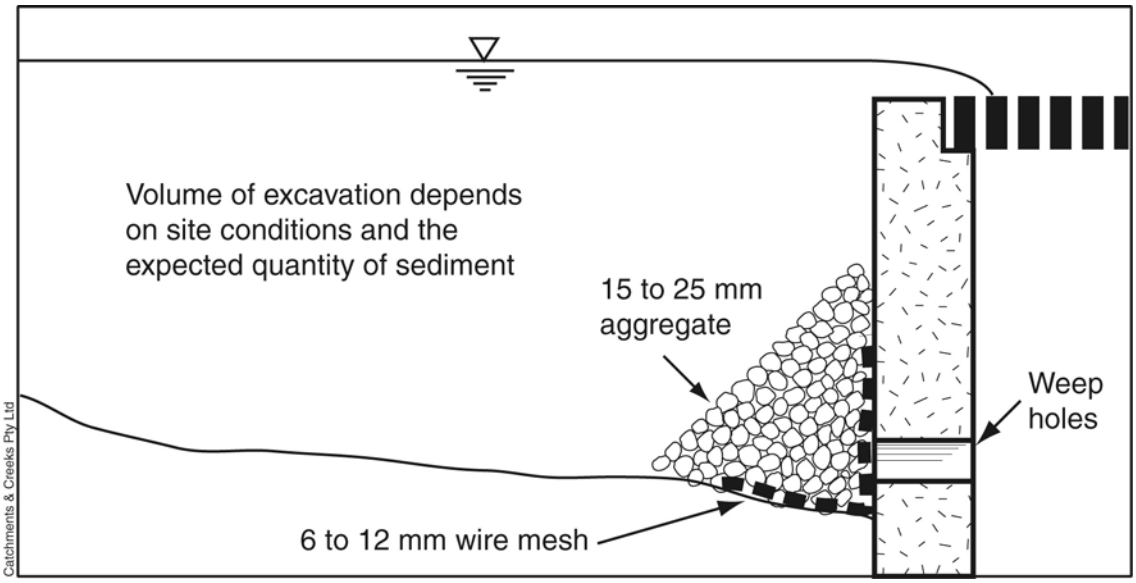

Figure 2 – Details of weep hole with aggregate filter

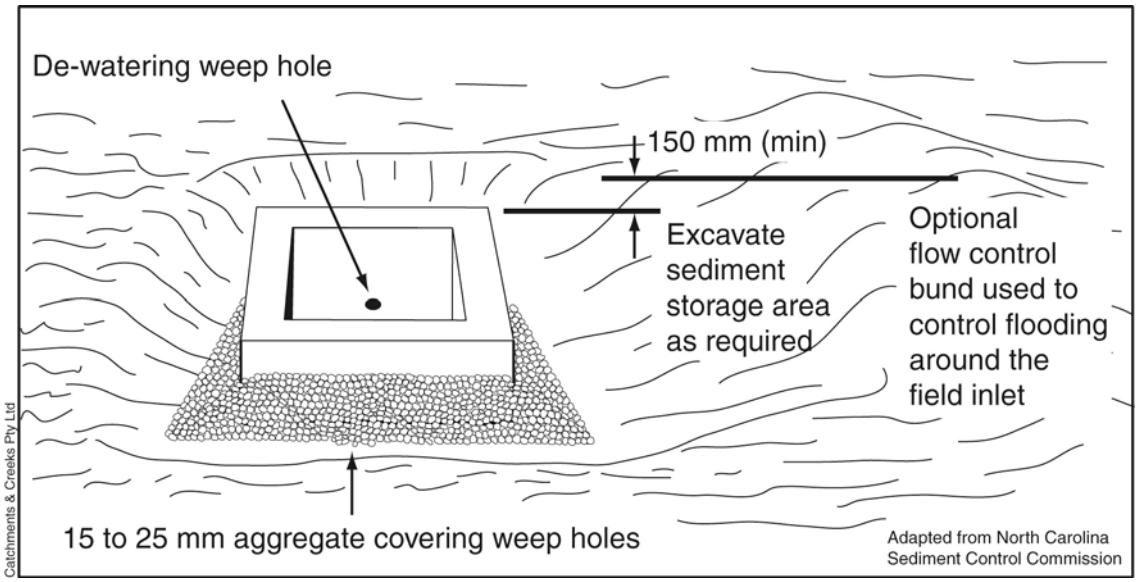

Figure 3 – Excavated drop inlet protection shown with flow control bund

Description

Excavated drop inlet protection systems consist of an excavated pit formed around a stormwater field (drop) inlet with temporary de-watering holes drilled into the drop inlet to allow the pit to freely drain.

Typically the crest of the drop inlet controls the depth of ponding around the structure.

Purpose

Used to remove and retain sediment from stormwater runoff before it is allowed to enter an underground drainage system.

Best used when it is either unsafe or impractical to allow the temporary ponding of sediment-laden stormwater above natural ground level.

Limitations

These types of sediment traps provide limited turbidity control.

In most circumstances these traps should be supplementary to a more substantial downstream sediment trap.

Catchment area limited to around 0.4ha.

Not suitable for inaccessible areas where regular maintenance cannot be performed on the sediment trap.

Advantages

Quick and simple to construct.

Can assist in reducing sediment build-up in stormwater drains and culverts, thus reducing the cost of post storm clean-up.

Disadvantages

Requires regular maintenance due to the relatively small sediment storage area.

Drainage problems can occur if poorly designed or poorly maintained.

May represent a traffic safety hazard.

Common Problems

The aggregate filter can quickly block with sediment limiting drainage of the settling pond.

Special Requirements

When used on public roads, the sediment trap must not cause a traffic safety problem.

The maximum depth of ponding around the structure must be controlled to manage safety risks.

Consideration should always be given to the flow path of potential bypass flows.

Where necessary, the sediment trap should be partially surround by a flow control bund (Figure 3) to control the passage of bypass flows.

Location

Placed around stormwater inlets in locations where it is undesirable for water to pond above the natural ground level.

Site Inspection

Look for potential flooding or traffic safety problems.

Take note of where bypass water will flow.

Ensure that any water that bypasses the inlet will not cause flooding problems.

Check the maximum allowable pond depth.

Check the height and stability of any flow control bunds.

Materials

- Aggregate: 15 to 25mm crushed rock.
- Mesh: wire mesh with 6 to 12mm open grid.

Installation

1. Refer to approved plans for location and dimensional details. If there are questions or problems with the location, dimensions or method of installation contact the engineer or responsible on-site officer for assistance.
2. Ensure that the installation of the sediment trap will not cause undesirable safety or flooding issues.
3. Clear the area of all debris that might hinder excavation and disposal of spoil.
4. Excavate the settlement pool around the storm inlet to obtain the required settling volume/area as specified on the approved plans.
5. Ensure the maximum depth is 600mm measured to the crest of the inlet structure, and batter slopes are no steeper than 2:1(H:V).
6. Grade the approach to the stormwater inlet uniformly to minimise scour cause by inflow water.
7. Drill or otherwise establish drainage holes at various levels in the inlet structure to allow free draining of the excavated pool. Cover the drainage holes with weir mesh then cover the mesh with a stable batter of filter aggregate.
8. Where directed, establish a flow control bund to control the passage of bypass flows.
9. Take all necessary measure to minimise the safety risk caused by the structure and to prevent unsafe entry into the stormwater inlet.

Maintenance

1. Inspect the sediment trap after each runoff producing rainfall event and make repairs as needed to the structure.
2. Stabilise flow entry points as required.
3. Remove sediment if over 1/3 of the storage volume has been lost, or as necessary to provide adequate storage volume for subsequent storms.
4. Dispose of sediment in a suitable manner that will not cause an erosion or pollution hazard.
5. Replace the filter aggregate when water fails to adequately drain from the sediment pool or when silt is observed passing through the drainage holes.

Removal

1. When the up-slope drainage area has been stabilised, seal the drainage holes, fill the basin with stable soil to the specified grade and elevation, then compact and stabilise/revegetate as required.