Rock & Aggregate Drop Inlet Protection

SEDIMENT CONTROL TECHNIQUE

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

[1]   A Type 2 sediment containment system may be formed if the sediment trap is designed in accordance with the guidelines for *Rock Filter Dams.*
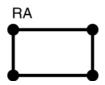
Symbol

Photo 1 – Rock and aggregate drop inlet protection located with dual carriageway

Photo 2 – Rock and aggregate drop inlet protection

Key Principles

1.   The critical design parameter is the surface area of the settling pond that surrounds the stormwater inlet.

2.   The purpose of the aggregate is to control the rate of flow entering the stormwater inlet (thus allowing the formation of a settling pond around the inlet), and to provide limited filtration of flows passing through the aggregate.

3.   During low flows, the trapping of coarse sediment is achieved through gravitational settlement within the settling pond, while the finer sediments are filtered by the aggregate filter.

4.   During high flows, sediment trapping is achieved primarily through gravitational settlement within the settling pond that forms around the drop inlet.

5.   If insufficient pond surface area is provided around the inlet, then the sediment trapping efficiency will be reduced and settled sediment will quickly block the aggregate filter.

Design Information

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

Recommended maximum height of 600mm and minimum height of 300mm.

Recommended minimum top width of the main support embankment of 300mm excluding the thickness of the aggregate filter layer.

Temporary flow control bunds may be required to control the depth and extent of ponding and to prevent water bypassing the inlet (Figure 5). The crest of these banks should be at least 150mm above the weir crest of the main support rock.

Photo supplied by Catchments & Creeks Pty Ltd

Photo 3 – Placement of main support rock

Photo supplied by Catchments & Creeks Pty Ltd

Photo 4 – Rock and aggregate drop inlet protection located with dual carriageway

Where necessary, formation of the settling pond may require excavation of material from around the inlet.
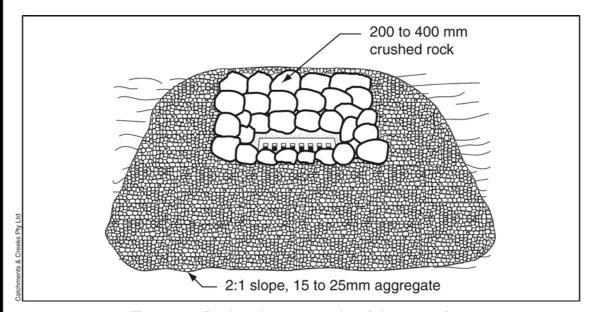

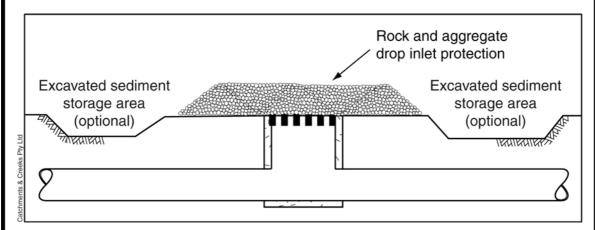**Figure 1 – Rock and aggregate drop inlet protection**

Figure 2 – Rock and aggregate drop inlet protection shown with optional sediment collection trench
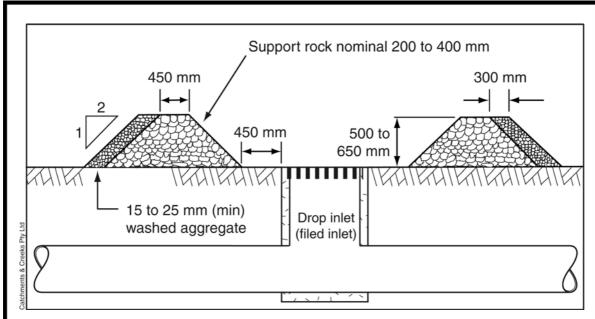
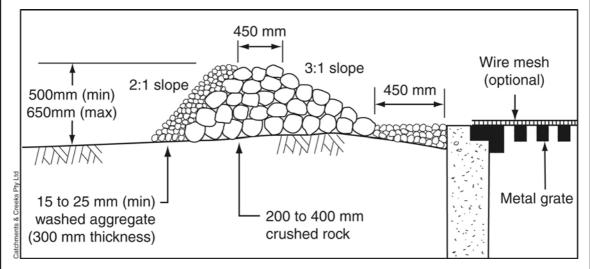**Figure 3 – Typical cross-section of rock and aggregate drop inlet protection**

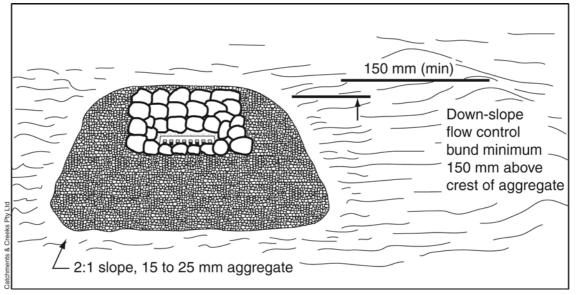**Figure 4 – Placement of aggregate**

Figure 5 – Rock and aggregate drop inlet protection shown with flow control bund to limit the extent and depth of ponding

Description

Rock and aggregate drop inlet protection systems consist of a ring of larger support rock placed around the stormwater inlet, with an outer layer of aggregate used as a filter medium.

The crest of the structure acts as a spillway to regulate the height of ponding, and to prevent water from bypassing to undesirable locations, or from causing flooding problems.

Purpose

Used to remove and retain sediment from stormwater runoff before it enters the underground drainage network.

Most commonly used around drop (field) inlets, but can also be used on culvert inlets and pipe inlets.

Rock and aggregate drop inlet sediment traps perform two main functions:

- during minor storms, the partially sediment-blocked aggregate filters sediment from dirty water;
- during high intensity storms, the aggregate embankment causes storm runoff to pond around the inlet allow the settlement of coarse sediments.

Limitations

These types of sediment traps provide limited turbidity control.

Limited to catchment areas around 0.4ha.

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

The trap can become an undesirable traffic safety hazard.

Advantages

Large rock and aggregate drop inlet protection systems can be extremely rugged and thus difficult to damage or vandalise.

Relatively inexpensive and usually requires little site disturbance.

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

Disadvantages

Drainage problems can occur if poorly designed or poorly maintained.

High sediment concentrations in the stormwater runoff can quickly block the aggregate filter layer.

Common Problems

Drainage problems can occur if the aggregate fully blocks with sediment.

Filtration of sediment by the aggregate filter may not be effective until partial sediment blockage of the aggregate occurs.

Special Requirements

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

Allowance should always be made for potential bypass flows.

The maximum depth of ponding around the structure must be controlled to prevent water from bypassing to undesirable locations, or from causing flooding problems.

Where necessary, the sediment trap may need to be partially surround by a flow control bund to control the depth and extent of ponding (Figure 5).

Location

Placed around drop (field) inlets where the catchment area is relatively large.

Typically used within the median of dual carriageways.

Site Inspection

Check the flow path of potential bypass flows.

Look for potential flooding or traffic safety problems.

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 the flow control bund.

Materials

- Primary core (support) rock: well graded, hard, erosion resistant rock, minimum size as specified in the approved plan, but not less than 200mm.

- Filter medium: 15 to 25mm clean aggregate.

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. Using minimum 200mm rock, construct an embankment around the stormwater drain, minimum height 300mm with a minimum top width of 300mm. Internal batter slopes shall be no steeper than 3:1(H:V) and the toe of the batter no closer than 300mm from the edge of the stormwater inlet. The outer batter shall be no steeper than 2:1(H:V).

4. The top of the rock embankment should operate as a spillway to control the maximum pond height. Ensure the maximum pond height will not cause a safety hazard, including undesirable flooding of an adjacent property or roadway.

5. Place a minimum 300mm thick layer of filter aggregate over the outer slope of the rock embankment.

6. Where necessary, establish a flow control bund(s) to appropriately manage the settling pond depth and movement of bypass flows.

7. 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 sediment trap and associated flow control bunds.

2. Remove collected sediment and dispose of in a suitable manner that will not cause an erosion or pollution hazard.

3. If flow through the sediment trap is reduced to an unacceptable level, the aggregate filter should be replaced. If a greater degree of water treatment (filtration) is required, geotextile filter fabric may be placed over the aggregate.

4. Remove sediment and restore original sediment storage volume when collected sediment exceeds one-third of the specified storage volume.

5. Sediment deposits should be removed immediately from any area where it is likely to cause a safety risk.

Removal

1. When the up-slope drainage area has been stabilised, remove all materials included deposited sediment and dispose of in a suitable manner that will not cause an erosion or pollution hazard.

2. Bring the disturbed area to a proper grade, then smooth, compact and stabilise and/or revegetate as required.