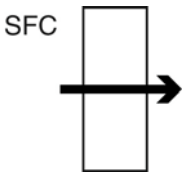
Sediment Filter Cage

INSTREAM PRACTICES

Flow Control		No Channel Flow	✓	Dry Channels	✓
Erosion Control		Low Channel Flows	✓	Shallow Water	✓
Sediment Control	✓	High Channel Flows		Deep Water	



Symbol

Photo 1 – Prefabricated filter cage

Photo 2 – Sediment cage in operation

Key Principles

1. Sediment trapping is achieved by both particle settlement within the settling pond formed by the cage, and by the filtration of water passing through the filter media.
2. The critical design parameter for optimising particle settlement is the 'surface area' of the settling pond.
3. The critical design parameters for the filtration process are the design flow rate for water passing through the structure.
4. Geotextile filters are considered to provide superior filtration to straw bales.

Design Information

The cages are normally manufactured in standard lengths of 3m, 4m and 6m.

The stage-discharge characteristics of a filter cage can be analysed as per *Sediment Weirs*.

Hydraulic design procedures as per instream *Sediment Weir* (refer to separate fact sheet).

Width of cage is normally set as the standard width of a straw bale.

The cage includes a 150mm mild steel blade welded to the base of the cage (Photo 1) to allow the cage to anchor into the sand channel bed.

The downstream internal face of the cage is lined with non-woven filter cloth, minimum 'bidim' A34, or the equivalent.

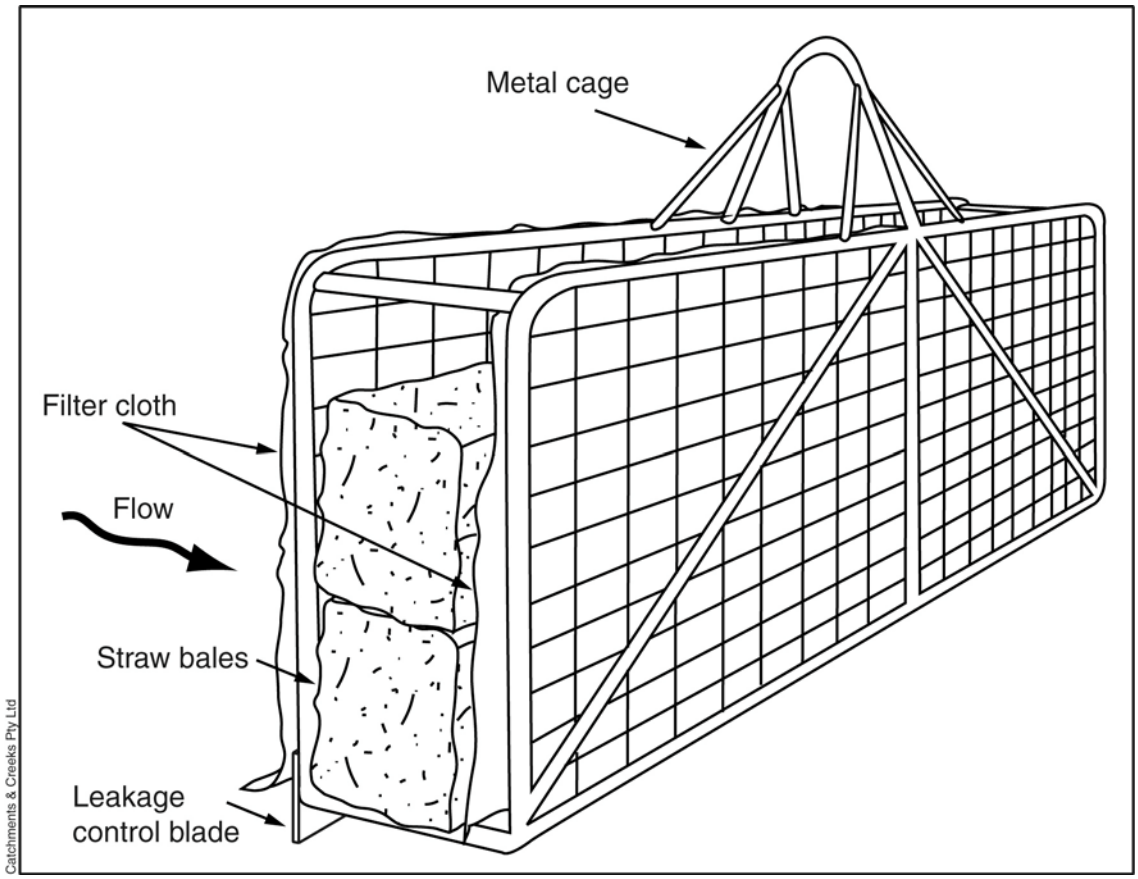


Figure 1 – Sediment filter cage

The upstream external face of the filter cage can be lined with non-woven filter cloth (high flow option), or woven sediment fence fabric (low flow option). Woven fabric is used only when the design discharge is sufficiently low to prevent overtopping of the cage.

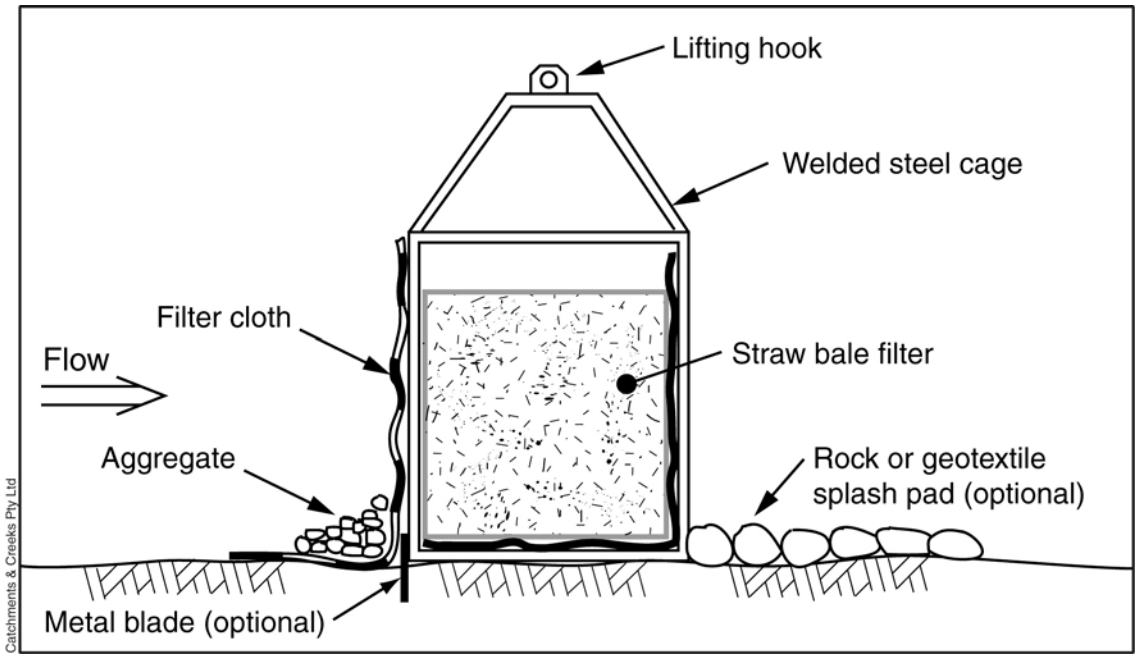


Figure 2 – Typical installation of sediment filter cage

Description

A prefabricated steel frame and wire mesh cage anchored to the bed of a channel and filled with a filter media such as straw bales.

The cages are normally prefabricated in different lengths.

An earth bank or sandbags may need to be formed on each side of the cage to prevent flow bypassing the filter.

Filtration is provided by non-woven filter cloth and straw bales.

Purpose

Used to filter instream sediment flows while working in low-flow, flat-bed channels.

Limitations

A specialist instream sediment control system only suitable for certain types of channels.

Very limited control over turbidity.

Advantages

Quick and easy to install.

Cages are prefabricated, reusable and easy to transport.

Disadvantages

Installation requires heavy lifting machinery.

May cause disturbance to the bed and banks of the watercourse during installation and removal.

Damage to the channel may occur in formation of the earth abutments.

Leakages around the cages are common.

Special Requirements

Installation and removal requires heavy machinery access.

Location

Best used on flat-bed sandy channels.

Materials

- Filter cage: Two galvanised welded mesh gates reinforced with diagonal braces (25mm steel pipe) held together, at a distance of a bale width, and with a flat metal anchor plate welded to the upstream bottom edge.
- Internal filter media: straw bales or 25 to 75mm clean aggregate.
- Filter cloth: non-woven, heavy-duty geotextile fabric equivalent to 'bidim' A34 or stronger, or non-woven geotextile reinforced with a UV-stabilised, polypropylene mesh.

Installation

1. Prior to commencing any works, obtain all necessary approvals and permits required to conduct the necessary works including permits for the disturbance of riparian and aquatic vegetation, and the construction of all permanent or temporary instream barriers and instream sediment control measures.
2. Refer to approved plans for location and installation 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.
3. Fully assemble the sediment filter cage including internal filter medium prior to installation.
4. Line the internal floor and rear panel with a continuous sheet of filter fabric. The fabric should extend outside of the cage at least 1m each side to help control leakages.
5. Tightly pack straw bales within the cage and secure with wire.
6. Ensure clearing and excavation of access paths and the watercourse are limited to the minimum practical.
7. Install the cage using equipment operating from the channel bank.
8. Ensure the cage rests firmly on the channel bed and the anchor plate seals well into the channel bed. Where necessary, profile the channel's bed and banks to allow a good seal.
9. Securely brace the cage with tie-ropes, star pickets, and/or other appropriate measures.
10. Appropriately seal around the ends of the cage to control the movement of water. Straw bales may be used to plug leaks around cage.

Formation of temporary earth abutments

1. If there is flow within the watercourse or drainage channel at the time of construction of the embankment, then install appropriate instream sediment control devices and/or flow diversion systems prior to construction.
2. To the maximum degree practical, construction activities and equipment must not operate within open flowing waters.
3. Clear the location for the embankment; clearing only what is needed to provide access and to install the embankment.
4. Remove any cleared organic matter and debris from the channel and dispose of it properly. Do not use organic matter or debris to build the embankment.
5. To assist in the eventual removal of all materials used in the construction of the embankment, a protective layer of geotextile filter cloth (preferably in the form of a single sheet) should be placed over the channel prior to installation of the embankment. If more than one sheet of fabric is required, overlap the fabric by at least 600mm. The filter cloth should extend upstream a sufficient distant to allow this material to eventually be wrapped over the finished embankment, thus fully enclosing the embankment.
6. Construct the embankment out of the material specified within the approved plans or as directed. Earth embankments shall be suitably compacted during their placement.
7. Ensure the sides of the embankment are no steeper than a 2:1 (H:V).
8. After completion of the embankment, stretch the upstream section of the filter cloth over the crest of the embankment and secure (pin) to form a spillway.
9. Where necessary, place rock over the filter cloth to provide additional protection to protect the embankment from overtopping flood flows.

Maintenance

1. Inspect the filter cage and associated earth embankments at least four times a day.
2. Plug leaks, remove debris from front of cage and broom off sediment from front of geotextile fabric to allow continued flow.
3. Inspect for leaks around the ends of the cage.
4. Replace filter fabric if it blocks with sediment or the flow rate decreases below an acceptable level.
5. A temporary sediment barrier may need to be installed downstream of the sediment filter cage while maintenance is occurring.

Removal

1. The sediment filter cage and any associated embankment should be removed as soon as possible after it is no longer needed.
2. If excessive sediment or debris has collected upstream of the sediment filter cage remove it before the embankment and cage are removed and dispose of such material properly.
3. If there is flow within the watercourse or drainage channel at the time of removal of the structure, then install appropriate instream sediment control devices and/or flow diversion systems prior to its removal. Such measures should only be installed if considered appropriate for the local conditions, and only if their installation is judged to provide a net overall environmental benefit.
4. Remove all materials used to form the sediment filter cage and associated embankments and dispose of in a manner that will not create an erosion or pollution hazard.
5. Restore the watercourse channel to its original cross-section, and smooth and appropriately stabilise and/or revegetate all disturbed areas.