


# Hard Armouring

## DRAINAGE CONTROL TECHNIQUE

Low Gradient	✓	Velocity Control		Short Term	✓
Steep Gradient	✓	Channel Lining	✓	Medium-Long Term	✓
Outlet Control	✓	Soil Treatment		Permanent	[1]

[1] The use of hard linings within the design of permanent drainage structures is not addressed within this fact sheet.

Symbol 



**Photo 1 – Batter chute formed from corrugated sheet iron**

### Description

A variety of products exist including `stone pitching, concrete, bitumen and interlocking concrete armour units.

Products such as rock mattresses can rely heavily on vegetation for long-term stability when used in drainage channels.

### Purpose

Used for scour protection on high velocity chutes and spillways.

### Limitations

Usually requires a near uniform channel cross-section with few irregularities.

### Advantages

Designs usually have a lower risk of failure compared to vegetated channel liners.

Usually have close to 100% strength immediately after placement.

Some products allow the integration of vegetation to soften their appearance.



**Photo 2 – Concrete lined catch drain**

### Disadvantages

Can be expensive.

Usually less aesthetically pleasing than traditional vegetated channels.

### Common Problems

Erosion along the outer edges of the channel lining caused by lateral inflows being deflected by the raised edge of the channel lining.

Tunnel erosion under concrete linings if the concrete is placed directly on a dispersive soil.

### Special Requirements

Some interlocking or modular units require special installation procedures.

### Site Inspection

Check that lateral inflows can freely enter the channel without causing erosion along the upper edge of the armouring.

Check for water passing under the surface material.