Construction Exits – Vibration grids

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] Reduced efficiency should be expected for clayey soils, especially during wet weather.

Symbol

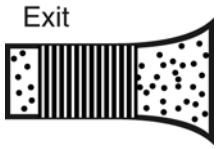

Photo 1 – Vibration grid and rock pad

Photo 2 – Vibration grid

Key Principles

1. The critical design parameter is the length of the vibration grid.
2. Vibration grids operate best during dry weather, thus the adjoining rock ramps are essential for sediment control during wet weather.
3. The sediment trapping ability of the adjoining rock ramps is directly related to the 'volume' of open voids between the rocks, which is related to the uniformity of the rock size, and the length and depth of rock.

Design Information

Vibration grids are most commonly formed from metal angle (e.g. 100x100x10mm) at approximately 270mm spacing. The metal grid must not be placed directly on the ground, but elevated above a suitable sediment collection chamber (e.g. an inverted box culvert).

Recommended minimum length of the vibration grid is 4m, but the overall minimum length of the stabilised construction exit (i.e. grid plus rock ramps) is 15m.

Minimum width of 3m or 2.5m per lane.

An adequate sediment storage collection chamber is required under the vibration grid.

An access track between the vibration grid and the sealed roadway must be stabilised with rock as per the requirements for *Rock Pads*.

The rock pad/ramp is to be made safe for foot traffic if it crosses an open footpath.

Rock must placed on filter cloth (minimum 'bidim' A24 or equivalent) if located on clayey or unstable soils.

Figures 1 and 2 show the typical layout of a vibration grid within an extended rock pad. The rock pad normally needs to be formed above natural ground level to accommodate the sediment collection chamber beneath the vibration grid.

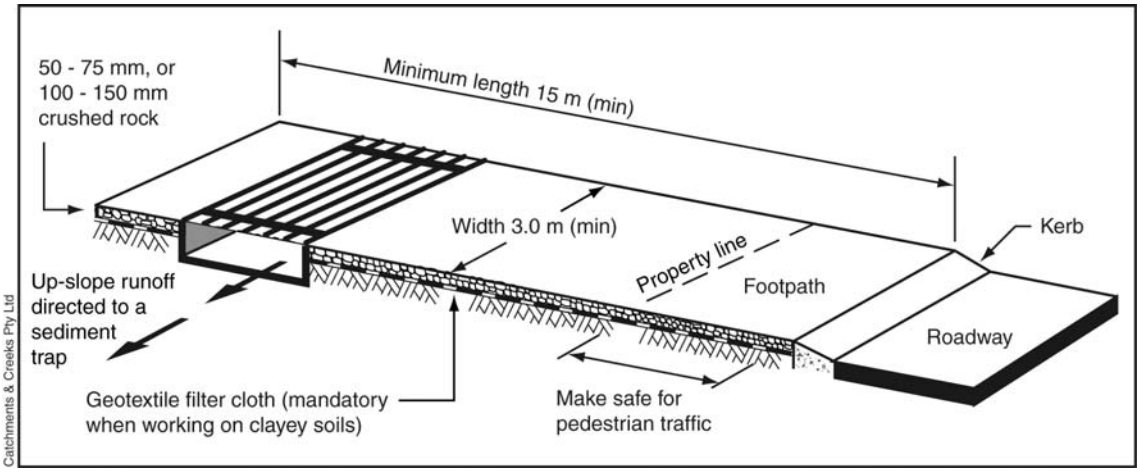

Figure 1 – Typical layout of vibration grid with rock ramps

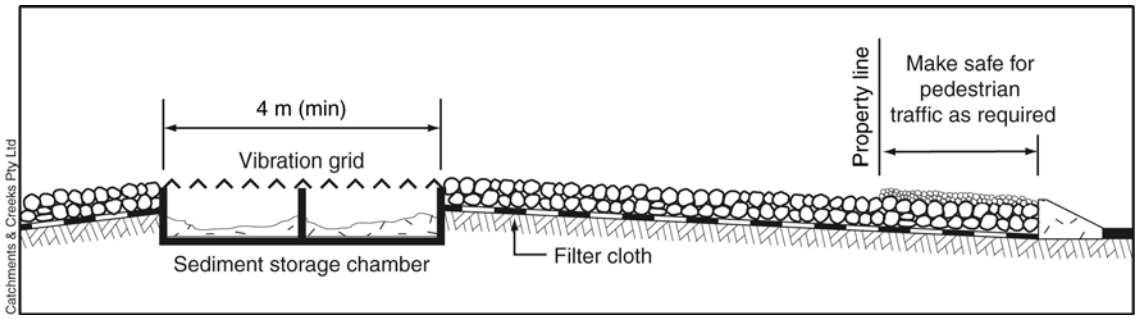

Figure 2 – Typical layout of vibration grid with rock ramps

There are many variations in the design of vibration grids as can be seen in Photos 2, 3 and 4. Figure 3 shows the typical dimensions of a vibration grid formed from metal angles.

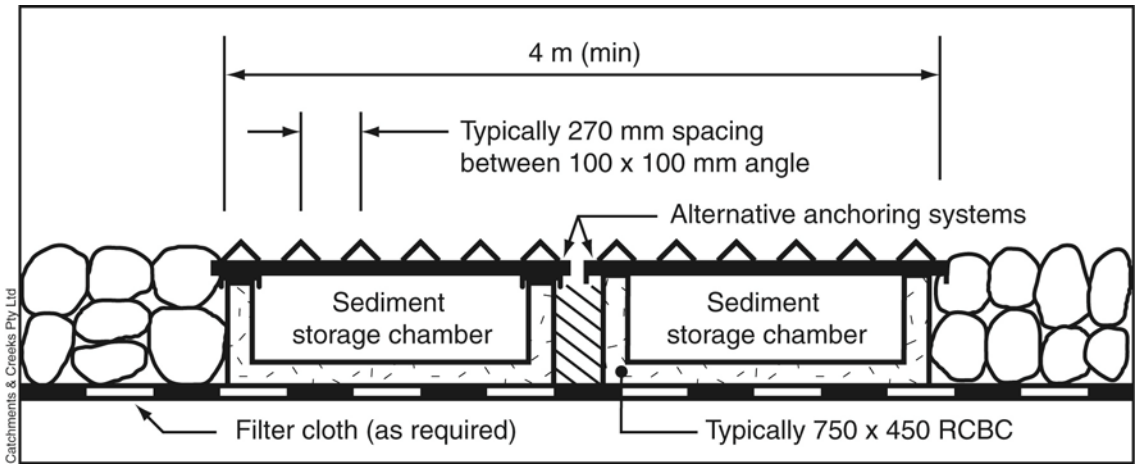

Figure 3 – Typical arrangement of vibration grid and sediment collection chamber

Photo 3 – Vibration grid

Photo 4 – Vibration grid

One of the regular problems associated with the use of vibration grids is the reluctance of owner-drivers to use the grids due to possible truck damage. An alternative design concept, which is in the early stages of development, is the use of a coarse rock layer on top of the grid (Figure 4) to reduce damage to trucks while maintaining the unit's full sediment trapping ability. Alternatively, heavy duty decking mesh (Figure 5) can be used. Both these systems more closely simulate the sediment trapping actions of traditional rock pads.

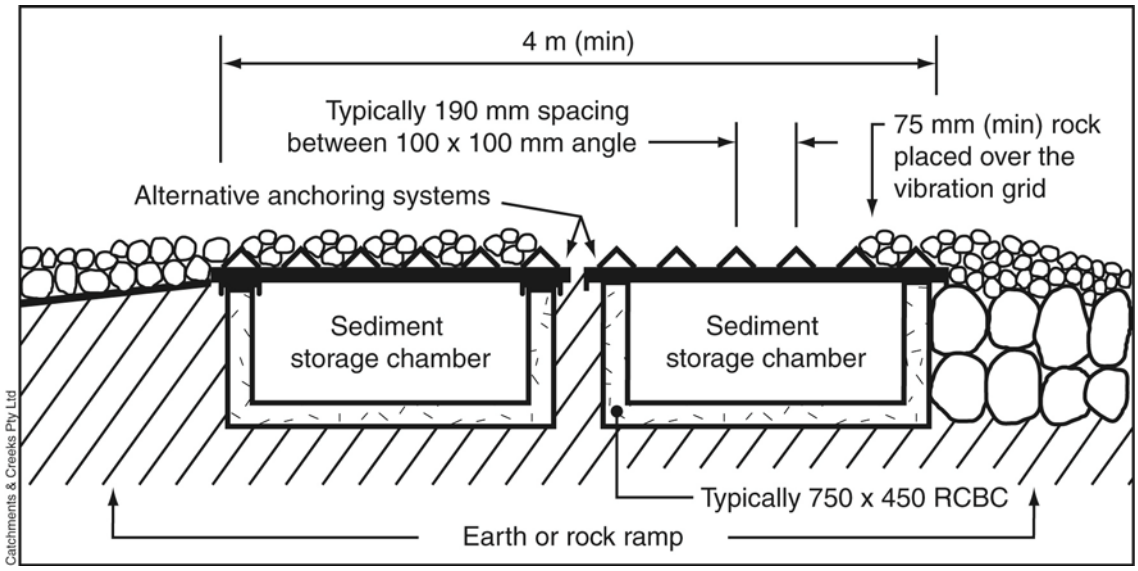

Figure 4 – Alternative conceptual design using rock upper course

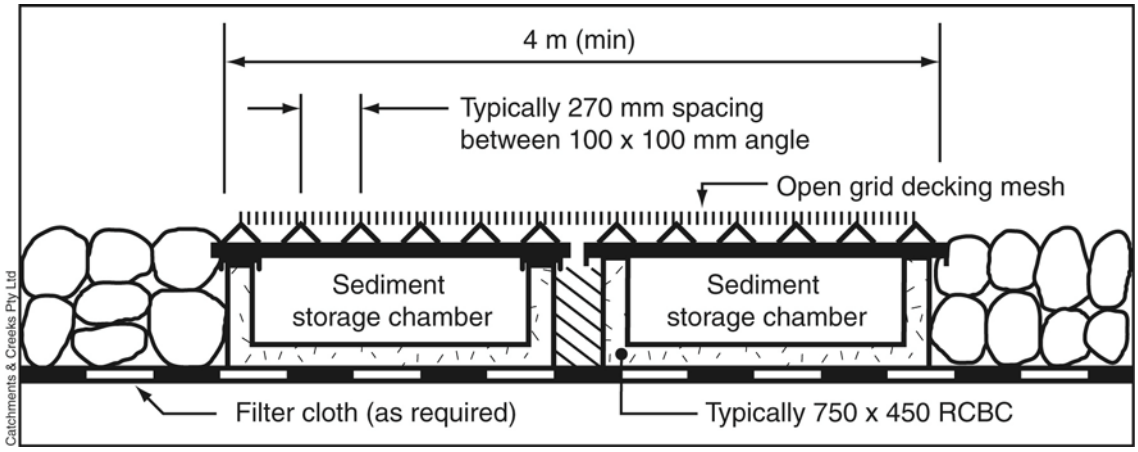

Figure 5 – Alternative conceptual design using upper mesh layer

Description

'Construction exit' is a general term referring to *rock pads, vibration grids* and *wash bays*.

Vibration grids typically consist of prefabricated metal grids (Photos 2, 3 & 4) placed on concrete sediment collection chambers.

Purpose

The basic aim of a vibration grid is to help prevent sediment being released onto public roads via the entry or exit road.

Principally used to vibrate dry, sandy soil from vehicle tyres.

Stabilised construction exits are one of the few sediment control measures that are required during both wet and dry weather.

Limitations

Vibration grids are 'supplementary' sediment traps typically of low sediment trapping efficiency.

Sediment trapping efficiency is generally related to the soil type and weather conditions.

The vibration grid is most effective during dry weather conditions. The associated rock ramps are most effective during wet weather conditions.

Generally not used on building sites.

Vibration grids (in isolation from a rock pad) are not effective in removing cohesive (sticky) soil from vehicle tyres.

Advantages

The prefabricated units can be hired.

Welded steel grids can be constructed then reused for several years.

A combined vibration grid and rock pad is generally more effective than a rock pad in isolation.

Disadvantages

Requires regular maintenance including de-silting the sediment collection chamber and adding/replacing rock.

Location

Located at site entry points, or where vehicles pass from unsealed roads onto sealed roads.

It is important to locate the construction exit such that vehicles cannot bypass the vibration grid when exiting the site.

The construction site entry/exit point may not necessarily be located at the permanent site entry/exit point.

Vibration grids should be set back from the public roadway to allow maximum deposition of sediment.

Common Problems

Inadequate maintenance.

Inadequate sediment storage volume below the grid.

Sediment not regularly removed from the rock ramps or collection chambers.

Drainage not adequately controlled at the entry/exit point, allowing sediment-laden stormwater runoff to wash onto public roads.

Special Requirements

The vibration grid must be set inside either a rock pad or sealed roadway.

Surface water flowing over the construction exit sediment trap must be directed to a sediment trap.

The vibration grid must not become a source of sediment runoff onto the adjacent road.

A square-edged shovel and large stiff-bristled broom must be available on-site for maintenance.

Rock must be placed on filter cloth (minimum 'bidim' A24 or equivalent) if placed on clayey or unstable soils.

Site Inspection

Check for excessive sedimentation on the associated rock ramps/pad.

Check for sediment tacked onto the road.

Check if an additional layer of rock is required on the rock ramps.

Ensure surface runoff is directed to a suitable sediment trap.

Materials

- Rock: well graded, hard, angular, erosion resistant rock, nominal diameter of 50mm to 75mm (small disturbances) or 100 to 150mm (large disturbances). All reasonable measures must be taken to obtain rock of near uniform size.
- Footpath stabilising aggregate: 25 to 50mm gravel or aggregate.
- Geotextile fabric: heavy-duty, needle-punched, non-woven filter cloth ('bidim' A24 or equivalent).

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. Clear the location of the vibration grid, removing stumps, roots and other vegetation to provide a firm foundation so that the rock is not pressed into soft ground. Clear sufficient width to allow passage of large vehicles, but clear only that necessary for the exit. Do not clear adjacent areas until the required erosion and sediment control devices are in place.
3. Grade the location of the vibration grid so that runoff from the unit will not flow into the street, but will flow towards an appropriate sediment-trapping device.
4. Ensure that the installation of the vibration grid includes adequate sediment storage volume under the grid. Where necessary, install suitable precast sediment collection chambers.
5. Place a rock pad/ramp forming a minimum 200mm thick layer of clean, open-void rock over the roadway between the vibration grid and the sealed street to prevent tyres from picking up more soil after they have been cleaned.
6. The total length of the vibration grip and rock ramps should be at least 15m where practicable, and as wide as the full width of the entry or exit and at least 3m. The rock ramp should commence at the edge of the off-site sealed road or pavement.
7. Flare the end of the rock pad where it meets the pavement so that the wheels of turning vehicles do not travel over unprotected soil.
8. If the footpath is open to pedestrian movement, then cover the coarse rock with fine aggregate or gravel, or otherwise take whatever measures are needed to make the area safe

Maintenance

1. Inspect vibration grid prior to forecast rain, daily during extended periods of rainfall, after significant runoff-producing rainfall, or otherwise at fortnightly intervals.
2. If sand, soil, sediment or mud is tracked or washed onto the adjacent sealed roadway, then such material must be physically removed, first using a square-edged shovel, and then a stiff-bristled broom, and then by a mechanical vacuum unit, if available.
3. If necessary for safety reasons, the roadway shall only be washed clean after all reasonable efforts have been taken to shovel and sweep the material from the roadway.
4. When the voids between the rock becomes filled with material and the effectiveness of the rock ramps are reduced to a point where sediment is being tracked off the site, a new 100mm layer of rock must be added and/or the rock pad must be extended.
5. Ensure any associated drainage control measures are maintained in accordance with their desired operational condition.
6. Dispose of sediment and debris in a manner that will not create an erosion or pollution hazard.

Removal

1. The vibration grid should be removed only after it is no longer needed as a sediment control device.
2. Remove materials and collected sediment and dispose of in a suitable manner that will not cause an erosion or pollution hazard.
3. Re-grade and stabilise the disturbed ground as necessary to minimise the erosion hazard.