Gravelling

EROSION CONTROL TECHNIQUE

Revegetation		Temperate Climates	✓	Short-Term	[2]
Non Vegetation	✓	Wet Tropics	✓	Long-Term	✓
Weed Control	[1]	Semi-Arid Zones	✓	Permanent	✓

[1] Refer to *Rock Mulching* fact sheet for weed control application.

[2] May be used for short-term erosion control around the construction office area and car park.

Symbol

Photo 1 – Gravelling of construction access road

Photo 2 – Gravelling of construction car park

Key Principles

1. Primarily used to control raindrop impact and mud generation, therefore depth of cover, and percentage of fines (particles finer than 1mm) are critical.
2. Operational performance is governed by the control of raindrop impact erosion, dust and surface mud on traffic areas.
3. Gravel is **not** a suitable material for the stabilisation of construction site entry/exit points; however it may be suitable for the formation of rock entry pads on some small building sites (e.g. those building sites with little or no soil/earth import or removal).

Design Information

Minimum 100% coverage of the soil surface.

Nominal aggregate (rock) size of 20 to 75mm.

Apply at a minimum thickness of 50mm, or at least twice the nominal aggregate size.

Allowable flow velocities for rock with a specific gravity of 2.6 are presented in Table 1.

The equivalent allowable shear stress, based on a critical Shield's parameter of 0.07 and a safety factor of 1.5, is provided in Table 2.

The assumed Manning's roughness for the gravel (used to determine the allowable flow velocity from the allowable shear stress) is presented in Table 3. This Manning's roughness is based on a d_{50}/d_{90} = 0.8 (i.e. a relatively uniform rock size). Note; d_{50} is the nominal rock size of which 50% of the rocks are smaller.

Hydraulic design of gravelled surface is only required if the surface is likely to be subjected to significant overland flow that could displace the gravel or otherwise cause erosion.

Table 1 – Allowable flow velocity (m/s) for various rock sizes [1,2]

Hydraulic radius (mm)	Nominal mean (d_{50}) rock size (mm)					
	20	30	40	50	60	75
50						
75						
100						
150						
200						
300						
500						

[1] Based on a relative density of 2.6 (i.e. rock mass of 2.6 tonne/m^3)

[2] Applicable to slopes less than 5%. Caution if applied to slopes [illegible]

Table 2 – Allowable shear stress (N/m^2) for [illegible] rock [illegible] [1]

Hydraulic radius (mm)	Nominal mean (d_{50}) rock [illegible] (mm)					
	20	30	40	50	60	75
N/A						

[1] Based on a critical Shield's parameter of 0.07 and a safety factor of 1.5.

Table 3 – Assumed Manning's roughness (n) of gravel [1]

Hydraulic radius (mm)	Nominal mean (d_{50}) rock size (mm)					
	20			50	60	75
50						
75						
100						
150						
200						
300						
500						

[1] Based on a rock size distribution of d_{50}/d_{90} = 0.8 (refer to Equation A19 in Appendix A – *Construction site hydrology and hydraulics*).

Description

The stabilisation of broad, low gradient, earth surfaces using a mixture of relatively small size rock approximately 20 to 75mm in diameter.

The term “Gravelling” normally refers to the application of a layer of gravel or aggregate on roads or car parks. It is generally not used to describe the use of small rocks as garden mulch (see *Rock Mulching)*.

Purpose

Primarily used in high traffic areas to reduce soil compaction and control raindrop impact and wind erosion.

Limitations

The small rock size limits its scour resistance to relatively low shear stress and flow velocity.

Gravel should **not** be placed directly onto dispersible soils. Instead dispersive soil should be covered with a minimum 200mm layer of non-dispersive soil before placement of gravel.

Advantages

Produces a low cost, trafficable surface.

Gravelling the general construction office area and car park can significantly reduce the generation of mud during extended periods of wet weather.

Gravel roads generally produce less environmentally damaging sediment runoff than dirt roads.

Disadvantages

Effective service life of a single application of gravel can be short, especially during wet weather and/or when placed on weak clayey soils.

The cost may not be easily to justify if recommended for placement over short-term construction access tracks.

Common Problems

Compression of the gravel into soft, clayey soils.

Special Requirements

Placement of the gravel on an appropriate geotextile can improve the service life of the gravel.

Location

Light traffic access roads, car parks and general construction office area.

Site Inspection

Check even, continuous (100%) cover of earth.

Check if reapplication is required.

Check for rilling along the up-slope edges of the treated area, and the free passage of stormwater runoff across the gravel.

Performance Indicators

Application depth measured at random test locations.

Aggregate size, and particle size range measured using conventional particle size test procedures (if required).

Installation

1. Refer to approved plans for location, extent and application details. If there are questions or problems with the location, extent, or method of application contact the engineer or responsible on-site officer for assistance.
2. Supply enough gravel to completely cover the surface of the soil at the density and thickness specified in the approved plans. If the application rate is not supplied, then apply at a thickness of at least twice the mean rock size.
3. Make all necessary adjustments to ensure any run-on stormwater flow is allowed to pass freely across the treated area following its natural drainage path.

Maintenance

1. Inspect all treated surfaces fortnightly and after runoff-producing rainfall.
2. Check for rill erosion, or dislodgment of the gravel.
3. Replace any displaced gravel to maintain the required coverage.
4. If wash-outs occur, repair the slope and reinstall surface cover.
5. If the gravelling is not effective in containing the soil erosion it should be replaced, or an alternative erosion control procedure adopted.