Terram Geosynthetics are extensively used in civil engineering in the construction of highways - from preventing intermixing of sub-base and subgrade layers, control erosion on cut slopes, for roadside drainage, as part of SUDS projects for infrastructure access and in the construction of retaining walls, bridge abutments and steep slopes.

Improving granular layer performance

Geotextile selection

Drainage

Preventing frost heave

Preventing the capillary rise of salt water

Earth reinforcement

Controlling erosion on highway slopes

Load platforms and tree root protection

Grass and gravel surface stabilisation

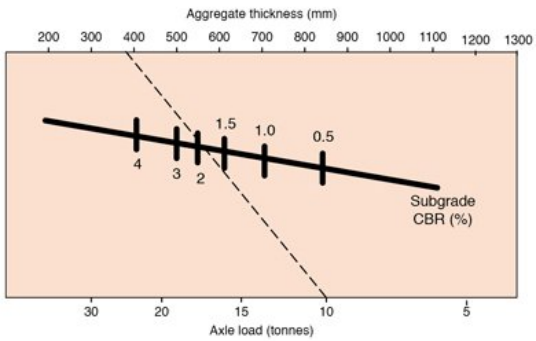
Demarcation and warning layers

Geotextile selection

Products
Standard Geotextiles

The thickness of a sub-base and/or capping layer should be determined using appropriate national design criteria. Other more simplified procedures may be adopted if these do not exist or are inappropriate.

For example, the nomogram shown is for the design of unpaved roads and may be used to check initial layer thicknesses for a paved road.



Example: Subgrade CBR = 2%,
Axle load = 10 tonnes,
Stone thickness required = 350mm

Where information is scarce, the following may prove useful for the selection and installation of the most appropriate TERRAM grade. These guidelines should not be used to replace more rigorous design and the experience of contractors familiar with the installation of geotextiles.

Subgrade strength and moisture content
The selection of the most appropriate TERRAM grade is largely dependent on the strength and moisture content of the subgrade. Site investigation should be used to assess these parameters. 5 may be used for guidance in the absence of field data.

Grade selection
The TERRAM grade must be sufficiently robust to resist installation damage. The lower the subgrade strength and the larger the stone, the more robust the grade needs to be.

Installation
The area should be cleared of any large objects, such as stones and

tree stumps, before geotextile placement. Ruts and sharp undulations in excess of 100mm should be filled and levelled. Strong perennial weeds, such as thistles, should be treated with weed killer. Other vegetation can be left undisturbed, if this is allowable and not detrimental to the structure. The presence of surface vegetation can actually aid construction with very soft soils i.e. CBR <10kn="" m2.<="" p="">

TERRAM geotextiles can be unrolled directly onto a subgrade with adjacent and subsequent rolls overlapped between 300mm and 1000mm - the softer the subgrade, the greater the overlap. A combination of overlapping and sewing may be more economical where the subgrade strength is particularly low, or in other critical situations (see the TERRAM Jointing bulletin).

Vehicles and plant must not run directly on exposed textile. Construction traffic should be restricted to areas of textile which have been covered with sub-base and preferably compacted to the minimum required depth.

Sub-base selection and placement

The sub-base must be well-graded, compactable and for permanent works, capable of transporting rising water and resistant to long-term degradation. Recommended grading bands for compactable granular materials are shown.

The sub-base thickness will depend on loading and on the strength of the subgrade. The thickness should take into account the maximum anticipated axle load, both during construction and in service, and should be increased by 10-20% on bends or where a slightly inferior sub-base is used.

Sub-base should be bladed forward over the textile and graded down to the required un-compacted depth. Typical practice with a firm subgrade is to place the sub-base in layers which are compacted to 150mm using a vibro-roller. Further advice is provided in the Department for Transport's Specification for Highways Works.

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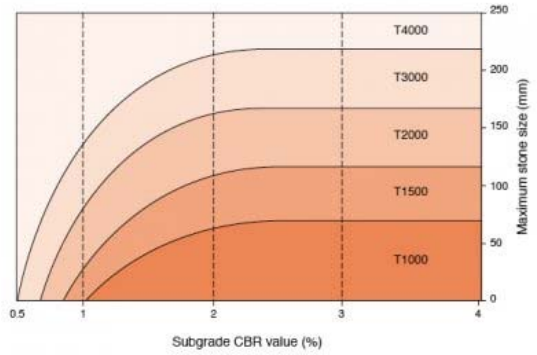
Soil type	Plastic index %	CBR% Depth of water table below formation level >600mm	<600mm
Heavy clay	70	2	1
	60	2	1.5
	50	2.5	2
	40	3	2
Silty clay	30	5	3
Sandy clay	20	6	4
	10	7	5
Silt		2	1
Sand (poorly-graded)	non-plastic	20	10
Sand (well-graded)	non-plastic	40	15
Sandy gravel (well-graded)	non-plastic	60	20

Some approximate CBR values for soils at their natural moisture content



With a soft subgrade it is prudent to place at least 300mm of lightly-compacted sub-base in one lift (500mm on an exceptionally soft subgrade) before overlaying this with a thinner layer of better-compacted material.

A very low-CBR subgrade, heavier traffic loadings, or a poorly-graded sub-base may require differing techniques. For example, heavy compaction with a very soft clay subgrade can lead to rutting and heave, and it may be necessary to increase the initial layer thickness and allow time for consolidation of the subgrade before the placement of thinner layers and applying more intense compaction.