Standard Test Method: **Guidelines for the selection of Geotextile Fabrics for Typical Applications**

1.0 SCOPE

These guidelines pertain to geotextiles used in highway construction and associated work. It is intended to cover the most common uses of geotextile fabric and is based on *AASHTO M288-06.*

2.0 REFERENCE STANDARDS

AASHTO Standards
M288-06 Standard Specification for Geotextile Specification for Highway Construction

MIT Approved Products List (Materials Engineering)
APL-161 Materials Specification for Geotextiles

3.0 GENERAL

These guidelines are indented to assist with the selection of geotextiles used in the following common applications for highway construction and maintenance by MIT:

i. Where geotextiles are used to provide added support beneath embankments constructed on soft wet soils or on thin deposits of peat (<1.0 m thick);
ii. Separation between subgrade soils and construction aggregates, typically where the geotextile is used beneath a pavement structure to protect the pavement aggregates from contamination by fine grain soils;
iii. Subsurface and pavement drainage, to prevent soil moisture or groundwater from entering embankments or pavement structures;
iv. Where geotextiles are used below rock riprap for erosion control.

These guidelines are not intended to cover all design and construction situations encountered in highway construction. The geotextiles for applications not listed above should be selected based on project and site specific conditions and requirements, including for example:

i. Support of embankments constructed on thick deposits of weak compressible soil or peat, greater than 1.0 m thick;
ii. Internal drainage of hydraulic structures;
iii. Reinforced earth embankments and retaining walls;
iv. Speciality products and applications such as frost protection, capillary break layers, and pavement reinforcement.

4.0 GEOTEXTILE CLASSIFICATIONS

MIT approves products for the following classes of geotextiles, which are suitable for the applications described in these guidelines.

Woven Class 1 (heavy duty)
Woven Class 2 (normal duty)
Woven Class 3 (light duty)

Non-Woven Class 1 (heavy duty)
Non-Woven Class 2 (normal duty)
Non-Woven Class 3 (light duty)

The above classes of geotextiles are intended for the typical applications described below. Product suppliers and Materials Engineering Branch of MIT can provide design support for construction situations and geotextile products not covered by these guidelines.

5.0 APPLICATIONS

5.1 Subgrade Support

Woven geotextiles are normally used where it is necessary to provide support to embankment on grades containing soft soils. Situations include: below the first lift of embankment material where it is not feasible to remove the soft soil prior to construction. The geotextile may be used to bridge isolated areas of soft clay or silt and provide additional support for compaction of the first lifts of embankment fill, and to provide separation between the embankment fill and underlying wet soils.

Class 2 normal duty woven geotextiles can be used where the exposed ground is smooth and cleared of large roots limbs and rocks.

Class 1 heavy duty woven geotextiles should be used if the exposed grade contains large limbs, roots and rocks and is uneven with depression and hollows of up to 450 mm deep and where large angular blast rock is used to bridge soft soil or peat deposits up to 1.0 m thick.

A project or site specific engineering design should be conducted for the following conditions:

i. Embankment support is required for large areas requiring large quantities of geotextiles fabric (>10,000 m^2);
ii. Embankments are to be constructed on thick deposits of compressible peat (>1.0 m);

5.2 Separation

Separation is the function of geotextiles used to prevent the mixing of fine grain soils with coarse grain soils, but where seepage control is not a primary function. The most common situation is to prevent the contamination of road construction aggregates by fine sub-grade soils such as to prevent the contamination of a coarse open graded aggregate or rock placed on silt or silty clay soils.

Woven geotextiles are usually used because they provide additional support due to the higher tensile strength and low elongation. Non-woven geotextiles can also be where strength, support, and reinforcement are not required.

Class 2 normal duty woven geotextiles are suitable for most applications, unless construction methods or site conditions pose a risk of tearing where Class 1 heavy duty woven geotextiles should be used.

The geotextiles often recommended below MIT's routine pavement structures (i.e. between the sub-grade soil and the sub-base aggregate) are intended primarily for separation and not to enhance or strengthen the pavement structures. A project specific engineering design should be conducted where the intent of the geotextile is to strengthen the pavement and/or reduce the thicknesses of the base course material and bituminous layers.

5.3 Subsurface and Pavement Drainage

Subsurface drainage situations are where seepage or high groundwater is intercepted and redirected into a drainage trench or into a granular drainage layer beneath a pavement. The seepage water or groundwater may need to be drained away to alleviate the potential for softening or frost damage to the sub-grade soils or base course materials. In some cases drainage measures are installed to intercept seepage and groundwater to improve stability of slopes. In all of these applications the geotextile is used to prevent the migration of fine grain soils into the free draining aggregate or perforated drain pipes. Otherwise the fine grain soils could eventually plug the drainage works.

In all of these cases, non-woven geotextiles are recommended because they have good flow and soil retention characteristics.

Class 2 normal duty non-woven geotextiles are generally suitable for most of these situations, including: in drainage trenches for sub-drains between the excavated trench walls and the free draining backfill; and between a wet sub-grade soils and the overlying drainage layer in a pavement sub-drainage system.

Class 1 heavy duty non-woven geotextiles can be used where there is a need to temporally support heavy construction equipment or where there is potential for the geotextile to be damaged during

construction on a sub-grade with large roots, small tree limbs or rocks or as a result of dumping large angular aggregate or riprap on the fabric.

Class 3 light duty non-woven geotextiles are suitable where there is low risk of damage during placing: such as to wrap drainage trenches where the drainage aggregate is to be placed by small equipment; or to wrap perforated drainage pipe that is not pre-wrapped from the manufacturer or supplier.

5.4 Permanent Erosion Control Under Riprap

Geotextiles are often used beneath riprap to prevent migration of the fine erodible soils into the voids between the riprap stones. It is always good practice to place a bedding layer of suitably graded granular material between the riprap and the soil being protected. A geotextile fabric is used below the bedding material as added protection to the fine grain soil.

Geotextiles below riprap or bedding material are intended to protect the soil from the forces of the moving water (i.e. wave action and currents) that are not absorbed by the riprap placed on top of the geotextile. It also functions as a separator to prevent fine grain soils from migrating into the voids in the riprap, which is often a cause of riprap failure where large open graded riprap is placed directly on the erodible soil without a suitably graded bedding material between the soil and riprap.

Class 2 normal duty non-woven geotextiles are suitable for installation below most riprap installations using Class 350, 450 and 600 ripraps provided the rocks or stones are placed without dumping directly on the fabric. Class 1 heavy duty non-woven geotextiles should be used where the construction conditions prevent careful placement of the riprap, particularly below riprap manufactured from large angular blast rock.

In some situations, a geotextile may not be used below riprap so that deep rooted vegetation can more easily establish through the riprap in the long term. Well established small trees and shrubs can significantly improve the effectiveness of the riprap. In these cases the gradation of the riprap and bedding material should be designed to prevent soil loss through the riprap and allow roots to penetrate into the soil without the barrier of a geotextile.

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