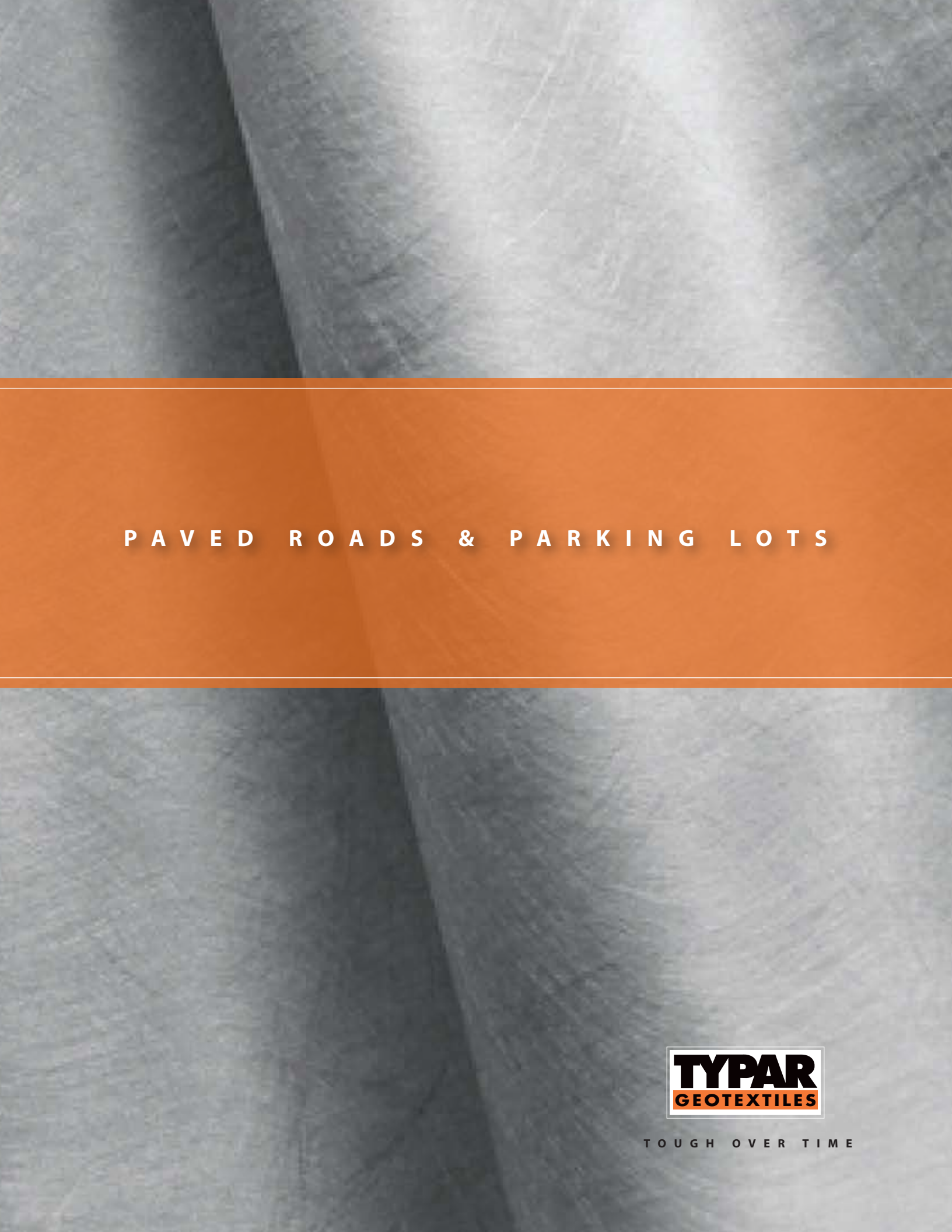


PAVED ROADS & PARKING LOTS

TYPAR GEOTEXTILES

TOUGH OVER TIME

PAVED ROADS & PARKING LOTS

TYPAR GEOTEXTILES

TOUGH OVER TIME

1.0 FEATURES OF PAVED ROADS AND PARKING LOTS

Paved roads are built for the comfort and convenience of the public. The key characteristics of paved roads and parking lots are their high initial cost, reliability, design life/length of useful service and cost of maintenance. The design of paved roads takes into consideration volumes and loads, sub-base soil, construction materials, environment, drainage and expected life-cycle.

Paved roads will fail prematurely if they can't support traffic loads over the subgrades on which they are built. Intermixing of the aggregate base and subgrade soil greatly reduces the load a road can support and consequently its expected life. Signs of premature failure include rutting, cracking and potholing of the pavement. Repairing a rutted and cracked roadway means large maintenance or capital improvement costs, not to mention traffic disruption.

Geotextiles are now a standard element in the construction of both rigid and flexible pavements due to their:

- Low cost
- Long-lasting separation of the base and subgrade material
- Preservation of load-bearing capacity
- Ability to extend the life of paved roads

An effective geotextile is one that provides separation to preserve the aggregate base and maintain the designed structure and load-bearing capacity of the road. It helps prevent failure of the base and therefore the pavement by allowing the passage of water and preventing fine soil from mixing with the base.

Light-use roads are usually constructed with thinner than required pavement thickness; these construction methods result in damage from the occasional passes of heavy delivery trucks or dumpsters, especially when the road is wet.

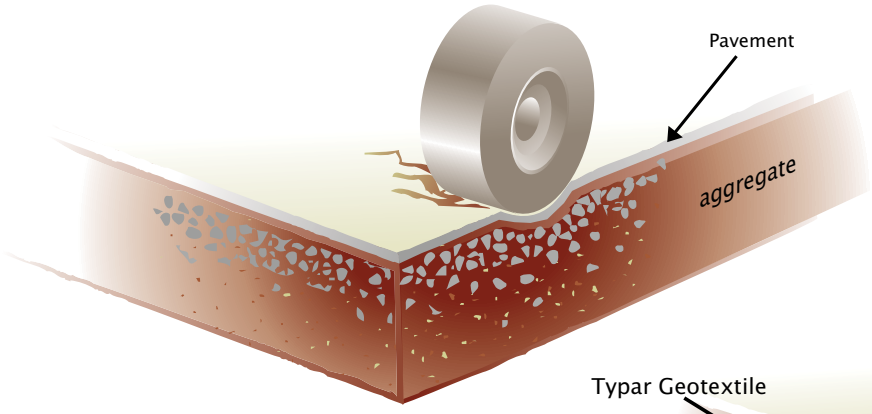


Figure 1 (Left): Without Typar, soil contaminates and weakens aggregate base and pavement, resulting in failure of the road.

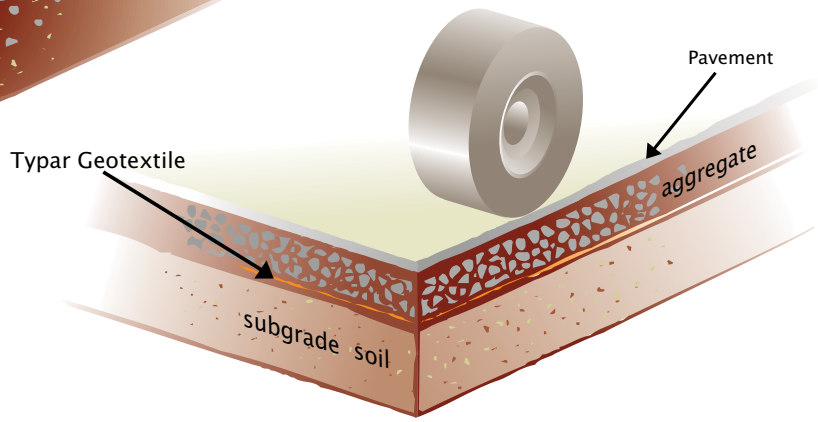


Figure 2 (Right): With Typar, aggregate and pavement won't sink into the soil and intermix with the subsoil.

Complete replacement of faulty asphalt or concrete sections using geotextiles to maintain the base and provide drainage is the most effective and permanent corrective action.

1.1 RIGID PAVEMENTS

Rigid pavements make use of reinforced concrete, which is laid in slabs and separated by expansion joints at relatively short intervals. The slabs are placed over a load-bearing aggregate foundation or base course. Failure normally takes place when the subgrade soil mixes with the aggregate base, destroying the load-bearing capacity of the base. With time, as the concrete slab moves under heavy loads, fines pump up through the expansion joints and create voids. Cracks form and rainwater seeps through, accelerating the process of overall pavement failure.

1.2 FLEXIBLE PAVEMENTS

Flexible pavements are built with a surface course of hot-rolled, bitumen-coated aggregate. Two layers are normally laid: a structural layer and a wearing course that is impregnated with hard, non-skid stone. The structural asphalt layer is placed over an aggregate foundation or base course. Failure normally takes place through the loss of aggregate base into the subgrade (Figure 1), which causes depressions or cracks. A sign of a well-designed paved road is a wearing course that only experiences surface deterioration rather than structural failure.

1.3 LOW-VOLUME ROADS AND PARKING LOTS

Low-volume roads and parking lots constructed with a geotextile separator experience long life, reducing costly unplanned maintenance. Designers that apply geotextiles in these roads and parking lots avoid unsightly potholes, cracks and heave bumps. Low-volume roads and parking lots–such as subdivision roads, side streets and shopping center parking lots–are often spoiled by crumbling pavements that could easily and economically be prevented by using a geotextile separator.

1.4 DRIVEWAYS

Driveways are an integral part of the aesthetic appearance of homes and businesses. Their surface layers vary from asphalt and concrete to decorative stone, cobbles and slabs. Driveways do not normally receive the same thickness of aggregate base foundation and surface course as streets and highways. An appropriate lightweight geotextile is important to prolong the life of these paved surfaces.

2.0 HOW TYPAR GEOTEXTILES WORK

The progressive downward movement of aggregate into the subgrade and the associated upward squeezing or pumping of subgrade soil into the aggregate base produces intermixing (Figure 2). This intermixing reduces road base thickness, therefore reducing the design strength and load-bearing capacity, which results in the failure of the road.

Typar geotextiles stabilize and strengthen paved roads by providing a permeable separation layer between the load-bearing aggregate base and the possibly very weak subgrade (Figure 2). The geotextile separator prevents intermixing and maintains the integrity of the aggregate base, preserving the original design (strength and permeability) and life expectancy of the roadway.

When Typar geotextiles are included in the design, between the aggregate base and subgrade soil,

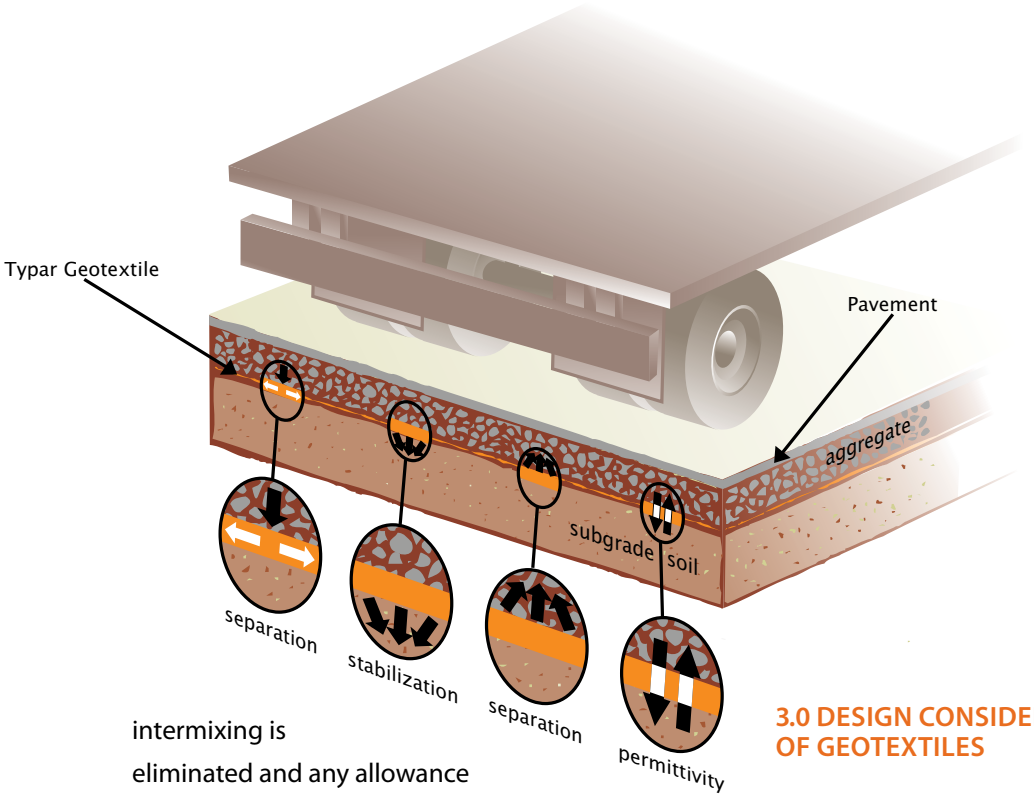


Figure 3: Typar stabilizes and strengthens paved roads by providing a separation layer between the aggregate base and subgrade.

intermixing is eliminated and any allowance of aggregate base for intermixing can then be reduced.

Typar's durability and tensile strength also confines the subgrade (Figure 3), which significantly increases the road's load-bearing capacity. Over time, Typar eliminates intermixing to help prevent deterioration of the base, which is critical in preserving the road structure.

3.0 DESIGN CONSIDERATIONS AND SELECTION OF GEOTEXTILES

Most paved roads are designed by a qualified architect or engineer referencing either State design specifications or the American Association of State Highway and Transportation Officials (AASHTO) Guide for Design of Pavement Structures. Please refer to AASHTO M288 for fabric selection specifications.

Paved roads should be designed for peak loads, not average loads. For instance, according to AASHTO, the pass of one 18-wheeler truck (20,000 lb. axle load) is equivalent to 5,000 passes of an automobile.

Soil Strength	SOAKED CONDITIONS		
	Notes	AASHTO M288 Class	Typar Style
CBR less than 1	1	–	3631
CBR between 1 and 3	2	Class 1 or 2	3631 or 3501
CBR greater than 3	3	Class 2 or 3	3501 or 3401

Notes:
1. Reinforcement is required.
2. Typar 3501 is recommended unless installation conditions are particularly harsh.
3. Typar 3401 is recommended unless installation conditions are particularly harsh.

Figure 4: Selection of AASHTO M288 Class and Typar style based on soil conditions at the time of installation.

3.1 GEOTEXTILE SELECTION OF PAVED ROADS

The maximum stress experienced by the geotextile used in paved roads with an asphalt or concrete surface–including light-use roads, heavy-use roads and interstate highways–is experienced at the time of installation. This stress is influenced by the subgrade and the thickness of the first lift. Once aggregate has been placed, the geotextile is insulated by the depth of aggregate and can be relied on to remain in position and perform the separation and stabilization function throughout the life of the road.

The AASHTO M288 specification is applicable for the use of geotextiles to prevent mixing of a subgrade soil and an aggregate cover material. The AASHTO geotextile class and Typar geotextile style is dependent on the harshness of the subgrade surface, the type of equipment used for installation, the strength of the subgrade soil and whether the soil is in a saturated or unsaturated state during installation.

Use Figure 4 as a guide to select the appropriate AASHTO class and corresponding Typar style of geotextile, based on soil conditions at the time of

GUIDE TO GROUND (TIRE) PRESSURE

Subgrade Conditions	**Low ground pressure equipment** (i.e. cars and light trucks) ≤25 kPa ≤4 psi	**Medium ground pressure equipment** (i.e. typical trucks) > 25 kPa ≤50 kPa > 4 psi ≤8 psi	**High ground pressure equipment** (i.e. earth moving equip.) > 50 kPa > 8 psi
Subgrade has been cleared of all obstacles except grass, weeds, leaves and fine wood debris. Surface is smooth and level so that any shallow depressions and humps do not exceed 18 inches in depth or height. All larger depressions are filled. Alternatively a smooth working table may be placed.	Low N/A Typar 3341	Moderate Class 3 Typar 3401	High Class 2 Typar 3501
Subgrade has been cleared of all obstacles larger than small to moderate size tree limbs and rocks. Tree trunks and stumps should be removed or covered with a partial working table. Depressions and humps should not exceed 18 inches in depth or height. Larger depressions should be filled.	Moderate Class 3 Typar 3401	High Class 2 Typar 3501	Very High Class 1 Typar 3631
Minimal site preparation is intended. Trees may be felled, delimbed, and left in place. Stumps should be cut to project not more than 6 inches above subgrade. Fabric may be draped directly over the tree trunks, stumps, large depressions and humps, holes, stream channels and large boulders. Items should be removed only if placing the fabric cover material over them will distort the finished road surface.	High Class 2 Typar 3501	Very High Class 1 Typar 3631	Not recommended N/A N/A

Recommendations are for 6-12 inch initial lift thickness. For other lift thicknesses:

12-18 inch – Reduce survivability requirement one level | 18-24 inch – Reduce survivability requirement two levels
> 24 inch – Reduce survivability requirements three levels

For special construction conditions like pre-rutting, increase fabric survivability requirement one class. Placement of excessive initial thickness may cause bearing failure of the soft subgrade.

Figure 5: Recommended Typar styles depending upon site conditions and construction procedure.

installation. The engineer should always refer to the AASHTO M288 specification for the final selection of the class of geotextile needed.

Site-specific installation conditions and procedures also have implications on the class of geotextile selected. Once the geotextile has been selected based on soil strength, reference Figure 5 to check that the site conditions and construction equipment being used do not require a higher grade of geotextile.

3.2 GEOTEXTILE SELECTION OF PAVED DRIVEWAYS, PARKING LOTS, AND PRIVATE ROADS

Typar geotextiles are recommended in all paved structures. However, certain light applications do not require the grade of Typar geotextiles specified for public road construction. Figure 6 offers an additional guide for these non-critical applications. If installation conditions appear harsh in any way, the designer should not use this guide, but should instead refer to the AASHTO M288 geotextile selection guide for paved roads.

	UNSOAKED CONDITIONS[1]	SOAKED CONDITIONS[2]
	Typar Style	Typar Style
Driveways	3301	3341
Parking Lots	3341	3401
Light Use Private Roads	3341	3401

Notes:
1. Unsaturated conditions relate to installation conditions that are dry with CBR greater than 3, and where sub-grade is cleared, smooth and level, and low ground pressure equipment is used (<25 kPa).

2. Saturated conditions relates to installation conditions that are wet with CBR greater than 1, and sub-grade is cleared, smooth and level, and low ground pressure equipment is used (<25 kPa).

Figure 6: Selection of Typar style for non AASHTO applications.

4.0 INSTALLATION GUIDE

The successful use of geotextiles in road design requires proper installation. Follow the sequence of installation in Figure 7.

Prepare the installation site by clearing grubbing, and excavating or filling the area to the design grade. Soft spots and unsuitable areas identified during site preparation or subsequent proof-rolling should be excavated and back-filled with select material and then compacted using normal procedures.

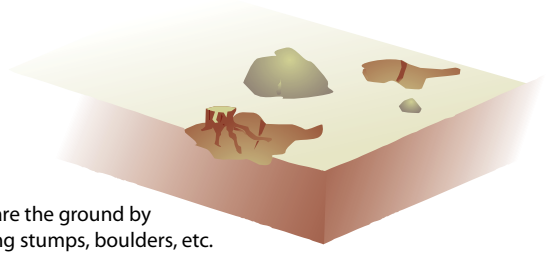
The geotextile should be laid smooth on the prepared subgrade without wrinkles or folds and in the direction of construction traffic.

Prior to covering, the geotextile should be inspected to ensure it has not been damaged (i.e. holes, rips, tears). If damage has occurred, the area should be covered with a geotextile patch that extends an amount equal to the required overlap beyond the damaged area.

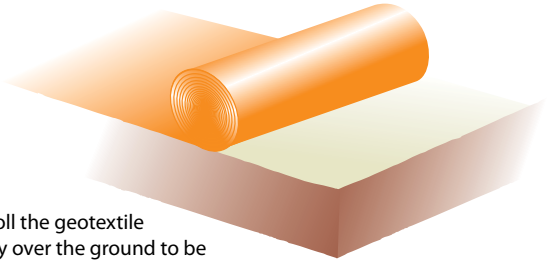
The base aggregate should be placed by back-dumping onto the geotextile or previously-placed aggregate and blading forward onto the geotextile.

Construction vehicles should not be allowed directly on the geotextile nor should vehicles turn on the first lift above the geotextile. Any low points during construction should be filled with additional base material and compacted. Do not blade aggregate to a low area from an adjacent area, but add new fill.

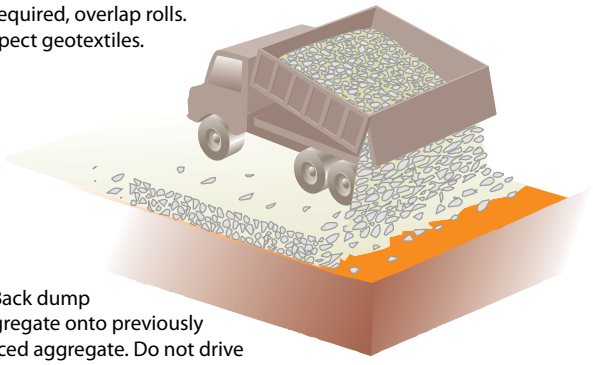
Once the geotextile is rolled out onto the surface, it needs to be covered with aggregate within 10 days to prevent degradation from ultraviolet light exposure.



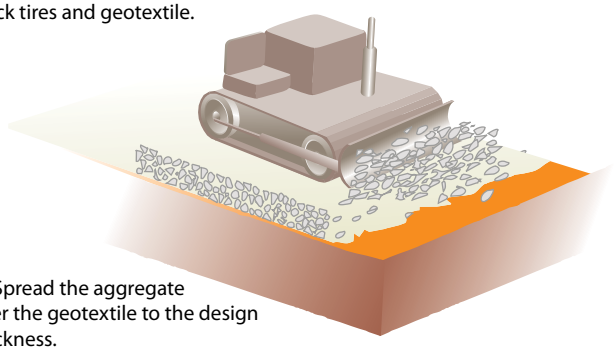
A: Prepare the ground by removing stumps, boulders, etc. Fill in low spots.



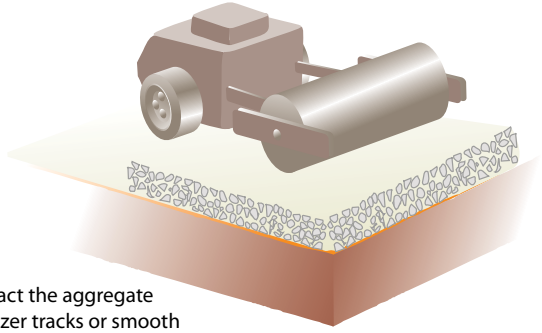
B: Unroll the geotextile directly over the ground to be stabilized. If more than one roll is required, overlap rolls. Inspect geotextiles.



C: Back dump aggregate onto previously placed aggregate. Do not drive on the geotextile. Maintain 150-300mm cover between truck tires and geotextile.



D: Spread the aggregate over the geotextile to the design thickness.



E: Compact the aggregate using dozer tracks or smooth drum vibratory roller.

Figure 7: Installation of Typar geotextiles.

5.0 OVERLAP AND JOINING

Overlaps provide continuity between adjacent geotextile rolls. Sufficient overlap is required to prevent fabric separation during base placement and compaction. The amount of overlap required is dependent on the sheer strength (California Bearing Ratio or CBR) of the subgrade soil (Figure 8).

SOIL CBR	MINIMUM OVERLAP
Greater than 3	1 - 1 1/2 feet
1 - 3	2 - 3 feet
0.5 - 1	3 feet or sewn
Less than 0.5	Sewn
All roll ends	3 feet or sewn

Figure 8: Overlap guide.

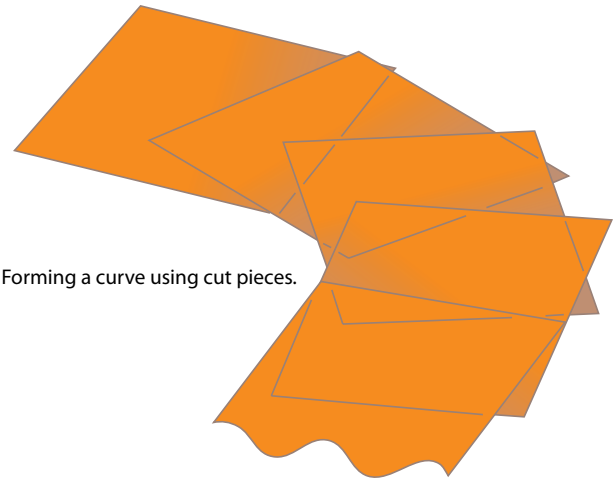
Pins or piles of stone may be used to maintain geotextile overlaps during installation. Geotextile roll widths should be selected so overlaps between rolls do not occur along anticipated primary wheel path locations. Overlaps at the end of rolls should be in the direction of the aggregate placement (previous roll on top).

6.0 SETTING SPECIFICATIONS

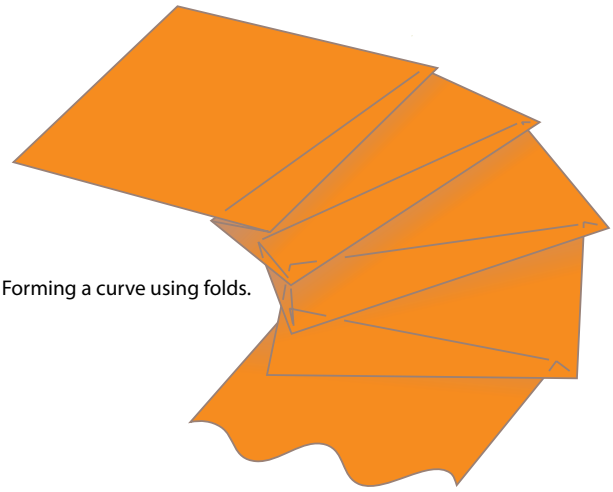
Specifications should generally follow the design considerations in sections 3.0 to 3.2. Primary considerations include the minimum geotextile requirements for survivability, soil retention and filtration.

For public roads, the engineer should specify an AASHTO M288 Stabilization Class of geotextile as follows:

AASHTO M288 Class 1 or TYPAR 3631,
AASHTO M288 Class 2 or TYPAR 3501, or
AASHTO M288 Class 3 or TYPAR 3401.



Forming a curve using cut pieces.



Forming a curve using folds.

Additional requirements should reference the AASHTO M288; i.e. "for certification, sampling, testing and acceptance, shipment and storage requirements of AASHTO M288."

When specifying Typar geotextiles for paved roads, driveways and parking lots, specify the appropriate Typar grade with the confidence that all Typar geotextiles are manufactured to the high quality standards required by the paved road construction industry.