GEOSYNTHETICS

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bidim®

General Civil Engineering Applications

KAYTECH
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Geotextiles you can design on

Since 1978 a range of nonwoven, continuous filament, needlepunched geotextiles has been manufactured by Kaytech at Atlantis, South Africa, and distributed throughout Southern Africa. Through the International Trading Division Kaytech also distributes to the rest of Africa and other parts of the world.

These high-performance geotextiles provide significant advantages in civil engineering applications.

The Kaytech range of geotextiles is manufactured from 100% recycled polyester. As such they have distinct advantages over other man-made fibres.

Some advantages are:

- Better modulus of deformation
- Better plastic yield stability (creep)
- Higher breaking strength
- Better resistance to high temperature (melting point 260°C)
- Less sensitivity to light (UV degradation)
- Better wettability

The mechanical process of needlepunching imparts the following characteristics:

- An appreciable thickness
- High porosity, even under heavy loads
- A high resistance to puncture, tearing and burst
- A high drainage capacity, in both the horizontal (transmissivity) and vertical (permittivity) planes
- A flexibility/conformability which is advantageous during laying operations

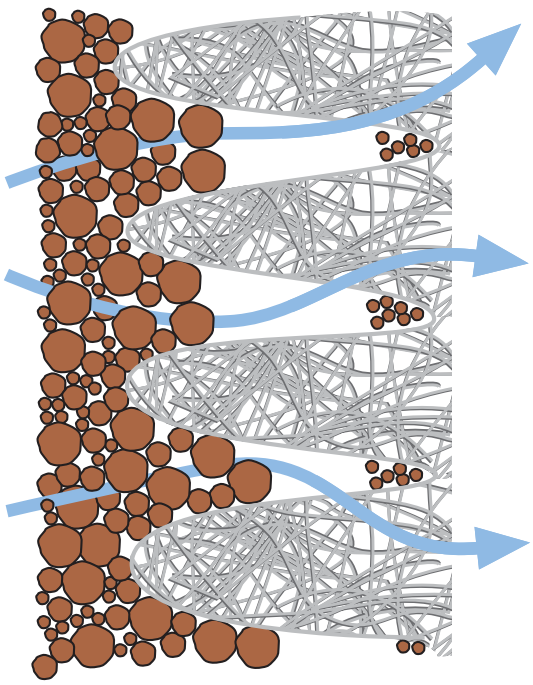
Filtration

Filtration involves the establishment of stable interface between the drain and the surrounding soil. In all soils water flow will induce the movement of certain amounts of fine particles. Initially the major portion of this fraction will be halted at the filter interface, some will be halted within the filter itself while the remaining fraction will pass into the drain.

The geotextile provides the ideal interface for the creation of a reverse filter in the soil adjacent to the geotextile. The complex needlepunched structure of the geotextile provides for the retention of fine particles without reducing the permeability requirement of the drain. Consult Kaytech's "Geotextile Filter Design Guide" and "Geotextiles as Filters" document for more details.

Schematic diagram showing geotextile filters

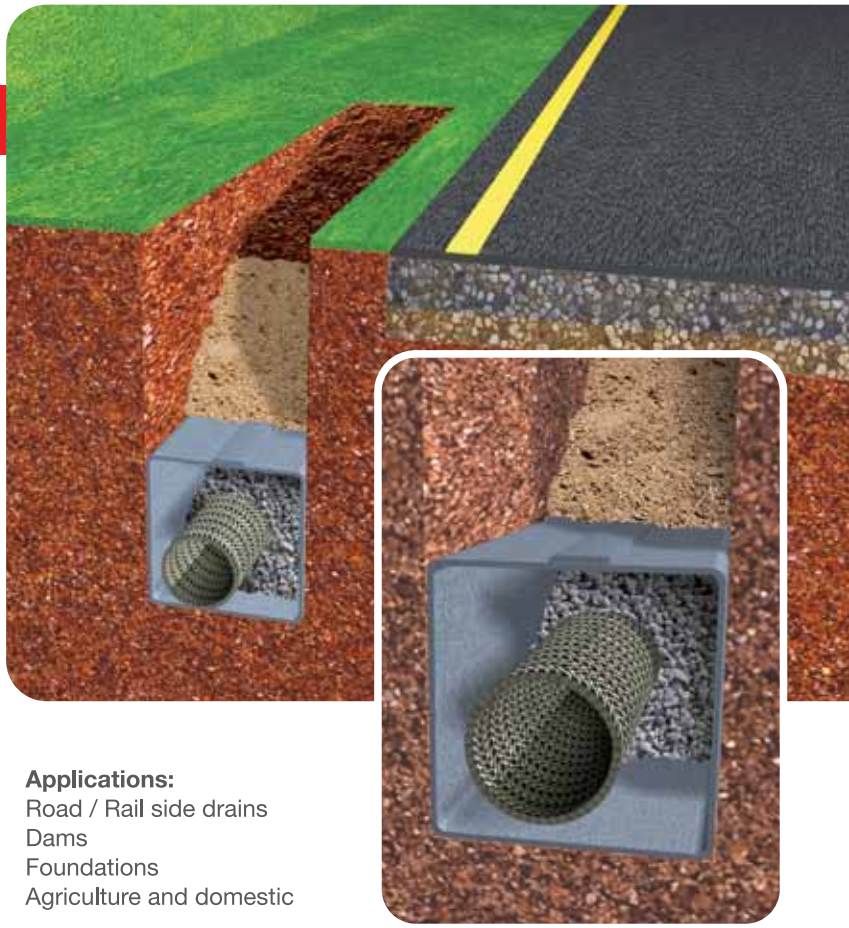
Nonwoven continuous filament needlepunched



Subsoil Drainage

Geotextile Requirements	Properties
Construction Survivability	Thickness
Good Filtration Behaviour	Permittivity
Drainage Capacity	Porosity
Conformability / Flexibility	Throughflow
Strength	Permeability
Durability / UV Resistance	Pore Size
	Penetration Load (CBR)

bidim® performs two functions when incorporated in a subsoil drain, that of a filter and a separator. Fine soil particles are prevented from entering the drain while water passes through, thus lowering the phreatic surface in the surrounding soil. For high-flow capacity drains the best solution is a stone filled trench surrounded by a **bidim®** filter jacket. Blanket-type drain variations may be used beneath or adjacent to structures and road/rail bed formations. Prefabricated drains such as **Flo-drain**, **Megaflo**, **Dimple-drain** and **Zip-drain** can be used in subsoil drainage systems as they are supplied pre-wrapped in **bidim®.** (Brochures are available.)



Applications:
Road / Rail side drains
Dams
Foundations
Agriculture and domestic

Sportsfield Drainage

Geotextile Requirements	Properties
Construction Survivability	Thickness
Good Filtration Behaviour	Permittivity
Drainage Capacity	Porosity
Conformability / Flexibility	Throughflow
Strength	Permeability
Durability / UV Resistance	Pore Size
	Penetration Load (CBR)

Sportsfields require fast and effective drainage systems that will ensure the surface remains playable during or after a downpour. A quick response time is essential after heavy rains to ensure the field dries adequately to prevent delays in starting an event.

bidim® needlepunched geotextiles have the highest possible throughflow rate while providing excellent filtration characteristics. A well designed topsoil mixture (growing medium) should be installed for effective drainage. Alternatively, the compatibility of the in-situ topsoil with the selected geotextile should be assessed against the filtration requirements.

Refer to Subsoil drainage above and consult Kaytech's "Geotextile Filter Design Guide" for more details.

Structural Drainage

Geotextile Requirements
Construction Survivability
Drainage Capacity
Good Filtration Behaviour
Conformability
Durability / UV Resistance

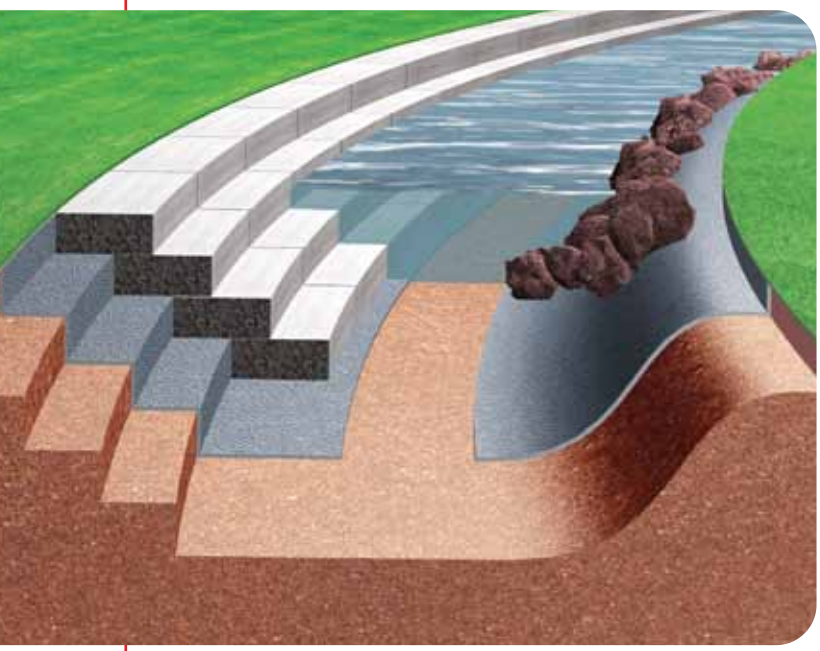
Properties
Thickness
Transmissivity
Permittivity
Porosity
Throughflow
Permeability
Pore Size
Penetration Load (CBR)

The cause of failure in most earth retaining structures is excess water trapped behind the wall or structure. Good drainage removes the excess pore water pressure thereby increasing the stability of the structure. Where low to moderate flows are anticipated, eg behind bridge abutments, a thick grade of **bidim®** is sufficient. Up to 1000 g/m^2 **bidim®** is now available. For moderate, consistent flows a drainage spacer should be included, eg **Flo-drain**, **Dimple-drain** or **Zip-drain**, behind basement walls (brochures are available). Where high flows are expected the best solution is a **bidim®** wrapped stone drain.

Applications:

Retaining Walls
Bridge Abutments
Basements
Cellars
Culverts
Waterproofing Membrane Protection

Erosion Control



Geotextile Requirements
Construction Survivability
Good Filtration Behaviour
Drainage Capacity
Conformability
Soil / Geotextile Friction
Durability / UV Resistance

Properties
Thickness, Transmissivity, Permittivity, Porosity, Throughflow, Permeability, Pore Size, Penetration Load (CBR), Tear Strength, Tensile Strength, Puncture Resistance, Roughness

Erosion of earth embankments by wave-action, currents and repeated drawdown is a constant problem requiring the use of erosion resistant protection in the form of rockfill baskets and mattresses. Incorporation of **bidim®** between the rockfill and the soil allows movement of water while retaining the fine soil particles. Baskets and mattresses not underlain by **bidim®** will settle due to scouring or leaching of the soil through the open structure of the rockfill. **bidim®** is easily placed, even under water. **bidim®** has very high permittivity characteristics allowing the rapid drawdown of hydrostatic pressures during flood or tidal surges. The excellent filtration properties of **bidim®** are thus critical to the stability of the erosion control structure.

Applications:

Canals
Bridge Abutments
Piers
Causeways
Breakwaters
Embankment Protection

Separation / Stabilization

Geotextile Requirements

Good Construction Survivability

Good Filtration Behaviour

Durability / UV Resistance

Properties

Thickness, Transmissivity, Permeability, Porosity, Pore Size, Grab Strength, Trapezoidal Tear Strength, Penetration Load (CBR), Burst Strength

bidim® is placed directly on a soft, saturated sub-grade or highly compressible in-situ deposit to ensure separation between the poor and selected materials. This function prevents the contamination of the selected base or fill materials. Vehicle or embankment loads increase pore pressures considerably in the soft sub-grade, which decreases the effective shear strength proportionately. **bidim®** allows the water under confining pressure to pass through into the free draining base materials while retarding movement of particles. Experience has shown that up to 50% less fill material is required when using **bidim®** as a separation layer.

Thick, heavy grades of **bidim®** transport water efficiently in the plane of the fabric itself, thereby transmitting excess water directly into the side drains. The tensile strength of **bidim®** is utilised very effectively as an aid during construction. Vehicles can safely move on the partly constructed road.

Applications:
Paved and Unpaved Road Construction
Low and High Embankment Fills

Railtrack

The installation of a heavy grade **bidim®** between the sub-grade and base materials ensures that minimal contamination of the ballast occurs.

The integrity of the ballast and the alignment of the track is thus maintained.

Water is able to move upwards into the free draining ballast, accelerating consolidation and increasing the shear strength of the sub-grade. **bidim®** transports water continually in the plane of the fabric, removing water efficiently into the side drains. **bidim®** is now manufactured up to 1000 g/m^2 giving excellent abrasion and puncture resistance properties. The need for a gravel or sand protection layer is thus obviated.

The use of lighter grades of bidim (340-750 g/m^2) would however require sand protection layers.

Geotextile Requirements

Construction Survivability
Good Filtration Behaviour
Drainage Capacity
Abrasion Resistance
Strength

Properties

Thickness, Permittivity, Transmissivity, Permeability, Porosity, Pore Size, Penetration Load (CBR), Tear Strength, Tensile Strength, Puncture Resistance

Reinforcing Soil Slopes

The heavier grades of **bidim®**, due to their high soil-geotextile friction coefficient and high tensile strength, are used to reinforce earth structures allowing the use of local fill material. The soil / **bidim®** friction coefficient is greater than 90% of the internal friction coefficient of the soil. **bidim®** is manufactured from continuous filament polyester which has a design life of over 120 years and low creep characteristics. The in-plane drainage capability helps prevent the build-up of pore water pressure within the soil structure thereby greatly improving its stability. Geotextile reinforced slopes have a proven track record as a safe and cost effective method of construction. For long term installation the exposed geotextile face must be sprayed with bitumen or acrylic coatings for protection. Otherwise pre-manufactured concrete blocks or natural stone may be incorporated in the design as a facing. Natural geotextiles (e.g. **SoilSaver**) may be used on the slope to aid the establishment of vegetation.

Geotextile Requirements
Strength
Construction Survivability
Soil / Geotextile Friction
Drainage Capacity
Durability / UV Stability

Properties
Tensile Strength,
Roughness,
Creep Resistance,
Penetration Load (CBR),
Trapezoidal Tear Strength,
Transmissivity, Permeability

Applications:
Flexible Retaining Walls
Steep slopes and embankments
Bund walls
Dykes
Biofilters

Liner Protection

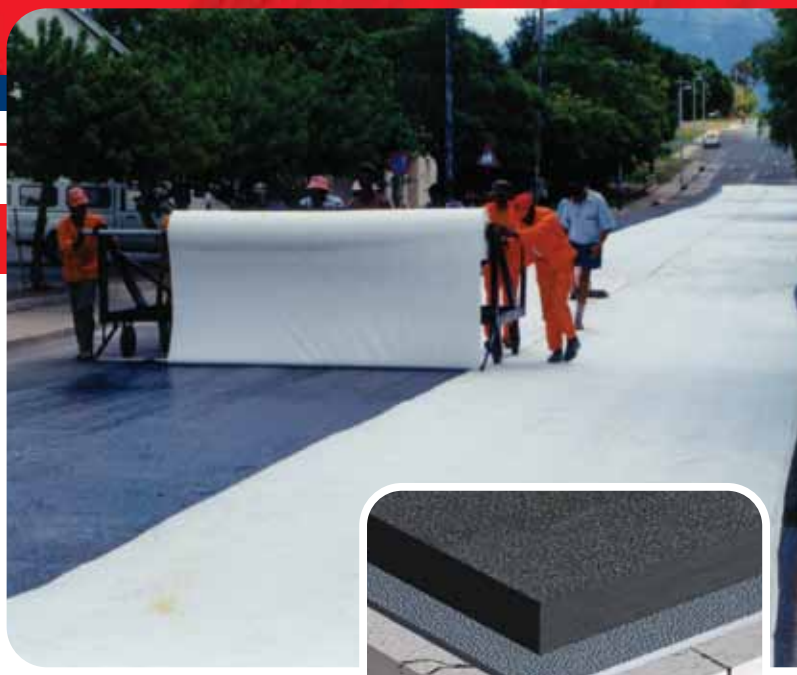
Geotextile Requirements
Strength
Needling Density
Liner / Geotextile Friction
Drainage Capacity
Survivability
Durability / UV Stability

Properties
Mass, Thickness,
Tensile Strength,
Penetration Load (CBR), Puncture Resistance,
Transmissivity

The resistance of thick, heavy **bidim®** grades to abrasion and piercing while still retaining a high tensile strength makes **bidim®** the ideal cushioning protection above or below waterproofing membranes. Ease and speed of installation compared to sand protection layers, especially on slopes, is a great advantage. The in-plane drainage characteristic dissipates pore water pressure build-up beneath the liner.

Applications:
Waste Landfill Liners
Reservoir Linings
Structural Waterproofing Liners

Road Maintenance



Geotextile Requirements

High Melting Point

Strength

Good Saturation Characteristics

High Conformity

Durabilty

Properties

Mass, Thickness, Tensile Strength, Penetration Load (CBR), Grab Strength, Trapezoidal Tear Strength, Puncture Resistance, Robustness, Bitumen Retention

Sealmac® paving fabric is a **bidim®** grade specially designed for use in resurfacing roads or upgrading gravel roads. The **Sealmac® System** has unique features providing a waterproofing and a stress relieving function. **Sealmac®** saturated with bitumen effectively seals the existing pavement and reinforces the surface treatment by enhancing the performance of the seal.

Experience has shown that Sealmac®:

- Prevents surface water ingress
- Bridges shrinkage cracks
- Retards reflective cracking
- Reduces crack width
- Reduces surface stripping
- Stabilises pavement moisture content
- Tolerates greater deflections

Sealmac® provides the following benefits:

- Lower construction costs
- Lower maintenance costs
- Prolonged fatigue life
- Reduced overlay thickness

Applications:

Cracksealing
Patching
Full Width Resealing

*A special **Sealmac®** brochure is available.*

Impermeable Linings

Impregnation of **Sealmac®** (a specialist **bidim®** grade) with a latex modified bitumen emulsion provides a waterproofing function. Thus, water retention structures (e.g. dams) and water conduit structures (e.g. canals) are constructed by waterproofing prepared soil slopes. The tensile strength of this **bidim®** grade reinforces, in addition to controlling the amount of bitumen impregnation. The system is flexible, easy to install and simple to maintain. This sealing system is also applied to cracks and joints in rigid concrete lined canals and reservoirs.

Applications:

Farm Dams
Reservoirs
Effluent Ponds
Stormwater Retention Ponds
Canals
Ornamental Ponds
Water Features

Geotextile Requirements

Strength

Good Saturation Characteristics

High Conformability

Durability / UV Resistance

Properties

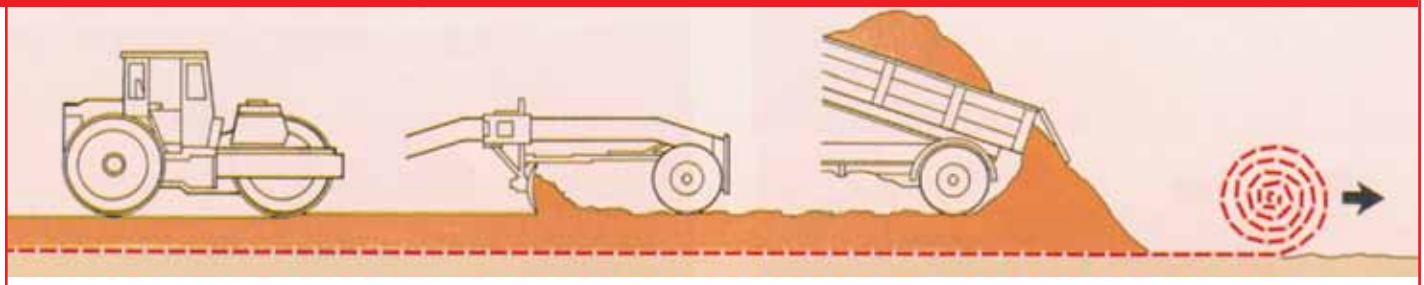
Mass, Thickness, Tensile Strength, Penetration Load (CBR), Grab Strength, Trapezoidal Tear Strength, Puncture Resistance, Robustness, Bitumen Retention

Handling and Storage

Smaller rolls of **bidim®** can be easily handled by labourers. Larger rolls can be rolled out by hand on site, however lifting these rolls may require a specially adapted fork-lift or small crane. Care should be taken on site to prevent tearing or piercing by heavy equipment and sharp objects.

bidim® is made from polyester, one of the most resistant man-made fibres to ultra-violet degradation. It will retain its strength characteristics even after several months of exposure.

Laying

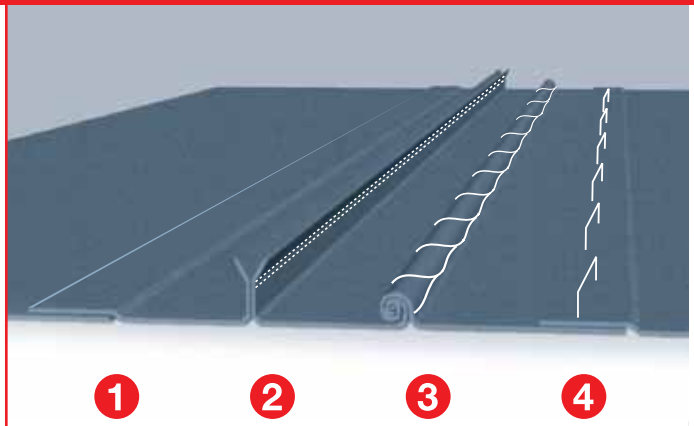


Geotextiles are often abused during placement. Although **bidim®** has a high tensile strength and is very resistant to piercing, heavy equipment must not be driven directly over it. A suitable laying sequence would be as follows:

1) Roll out **bidim®** over roughly prepared ground and dump fill by back tipping. Use only light equipment initially over very weak soils.
2) Level the fill by dozing and grading.
3) Several sequences of compaction and grading then follow.

A portion of the laying sequence is depicted above.

Joining



To ensure proper coverage **bidim®** is joined by one of the following methods:

1) Sufficient overlap to ensure frictional resistance
2) Sewing with polyester thread
3) Blanket stitching with galvanised wire or polyester thread
4) Stapling with rods or wire