MACDRAIN® ARCTIC BLANKET

MACCAFERRI

A DRAINAGE SYSTEM TO PREVENT GROUNDWATER CAPILLARY RISE AND FROST HEAVE

The design of paved roads in cold regions has always represented a challenge. This is mostly due to the freezing and thawing of soil water. In particular, the rise of ground water together with cold temperatures induce the formation of ice lenses in the soil underneath the road surfaces. When water freezes underneath the road, its volume expands by approximately 9%, producing a heaving of the road surface. This phenomenon is known as Frost Heave.

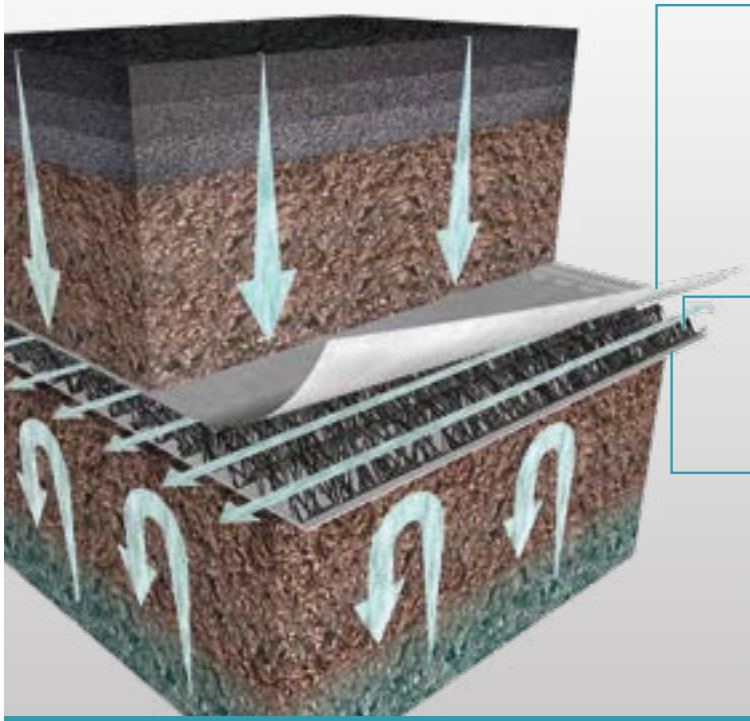
Dips, bumps, potholes and cracks could be a direct result of frost heave which has a direct impact on **road safety** and **maintenance cost**.

MacDrain® Arctic Blanket is the drainage system designed to prevent the frost heave phenomenon.

Benefits versus traditional capillary breaks:

- **Material savings**: Reduction of the layer thickness by up to 80% of the traditional layer
- **Fast Installation**: MacDrain® Arctic Blanket can be easily unrolled without requiring special equipment and any extra operation (granular soil laying and compaction)
- **Performance**: MacDrain® Arctic Blanket is engineered to resist to compressive loads and high flow vehicle rate. Periodical maintenance is prevented and a much more effective protection against frost heave is ensured
- **Cost reduction**: MacDrain® Arctic Blanket has a lower initial cost with no need for maintenance compared to a layer of clean granular soil

One way valve: resists upward flow of water, while remaining permeable to downward flow



Nonwoven geotextile

Selected to meet the highest standard of resistance during the loading and compaction phase in the overhead structure. The top layer acts as a filter allowing water from the overlying soil to enter the drainage core below, enhancing drainage along the plane of the geosynethetic and providing enchanced soil stabilization performance.

GeoMat with W-shaped

Developed to provide drainage characteristics with high resistance to compressive loads and high flow rate thus minimizing compressive creep.

Nonwoven geotextile with hydrophobic polymer enhancement

Designed to prevent the upward capillary rise of groundwater whilst remaining permeable to downward flow.

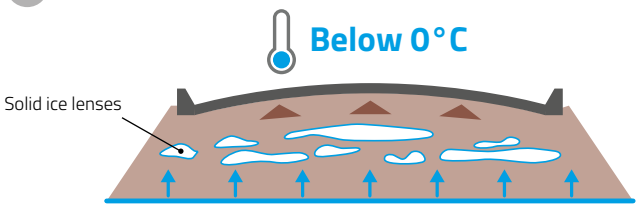
MacDrain® Arctic Blanket is a revolutionary drainage composite system which provides long-term flow capacity in cold climates. Its unique characteristics provide excellent protection against possible mechanical damage.

MACDRAIN® ARCTIC BLANKET

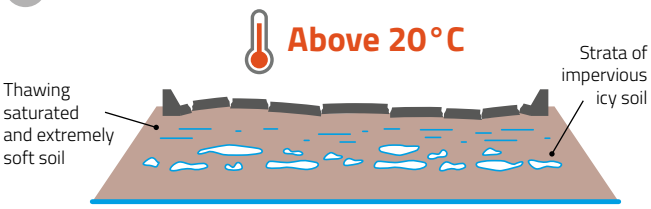
WITHOUT MACDRAIN® ARCTIC BLANKET

In frost susceptible soils, ground water is drawn up into the soil above by capillary action. When the moisture in the capillary zone freezes, water becomes solid ice. Due to the frost heave phenomenon during low temperatures, initial cracking and damage of the road surface occur. As the air temperature rises above freezing, the ground begins to thaw. Ice melting leads to the creation of voids in the road structure. The extensive use of the already cracked and weakened road surface results in further severe damage.

1 FROST HEAVE DEFORMATION AND CRACKING OF SURFACE ROAD LAYERS



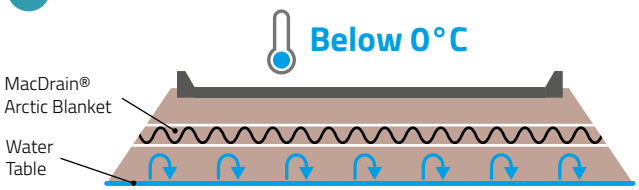
2 SURFACE ROAD DESTRUCTION DUE TO TRAFFIC AND THAWING



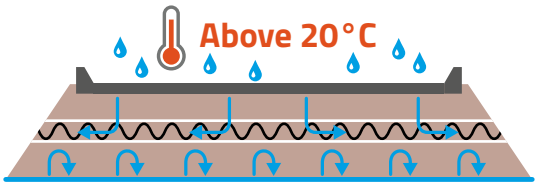
WITH MACDRAIN® ARCTIC BLANKET

MacDrain® Arctic Blanket is the cost efficient and best performing alternative to capillary break keeping the degree of saturation that is liable to freeze to a minimum.

1 NO DEFORMATION AND CRACKING OF THE ROAD SURFACE



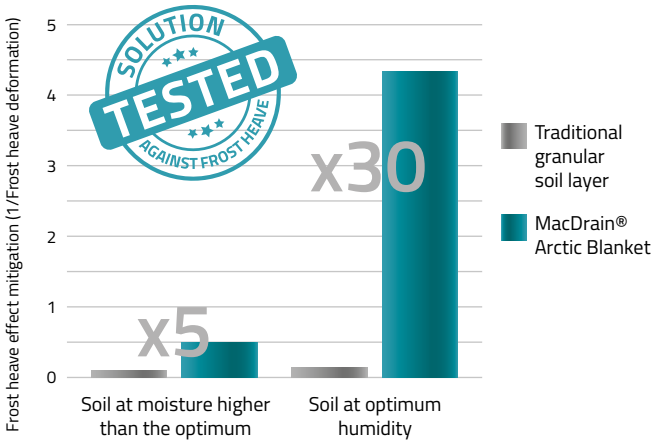
2 NO ACCUMULATION OF WATER IN THE ROAD SUB-BASE LAYER



FROST HEAVE TEST (GOST 28622-2012)

MacDrain® Arctic Blanket was tested according to GOST 28622-2012 standard. The frost heave deformation was measured in soil mixtures with and without MacDrain® Arctic Blanket. Characteristics of the test:

- Tests have been performed both with an optimum and an higher humidity for compaction.
- Measurement are made at intervals over a period of 96 hours.
- The samples used in the test were 150 mm high with the geocomposite located at 100 mm.



Frost heave test

MacDrain® Arctic Blanket, placed in soil mixtures, showed a reduction of the soil deformation up to over 30 times in road base layer.

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