

RoaDrain Geocomposite for Airstrip Serving The Athabasca Oil Sands Project (AOSP)

PROJECT NAME: Muskeg Mine - AOSP

LOCATION: Alberta, Canada

PRODUCTS: Tenax RoaDrain 770-2

DATE: 2007



The Athabasca Oil Sands Project in Alberta, Canada is a joint venture of Shell, Chevron Texaco, and Western Oil Sands. Currently, one of the largest construction projects on the planet, it is the latest fully integrated oil sands development in 25 years. With so many supplies, resources, and equipment needed to be delivered on a daily bases, the importance of a safe, dependable, and enduring airstrip was a number one concern. To help meet these logistical design challenges, Tenax was called upon the site by the engineer, owner and contractor to provide the airport strip with a subsurface drainage solution. Tenax RoaDrain 770-2 drainage geocomposite was selected because of its engineered triplannar structure, long-term proven

performance, and its capability in solving high watertable and silty sand subgrade conditions. Such as the AOSP - conditions that were prone to frost heave. In addition, the airport strip needed to be able to provide daily landings of the high loads of such aircrafts like Boeing 737 and Airbus A320. Ahead of schedule and below budget, Tenax RoaDrain 770-2 benefits were immediately obvious as it allowed for fast removable of water from the pavement structure provided excellent compressive stiffness to support the 125,000 lbs wheel load from the planes. It provided excellent capillary break; created seperation of the subgrade and base material; as well as provided additional strength to the pavement structure .

Dunaweal Lane

LOCATION:	Calistoga, CA
PRODUCT:	Roadrain™
APPLICATION:	Geocomposite Drainage Layer
DATE:	August, 2004
OWNER:	The Napa County Roads Department
ENGINEER:	Napa County

CHALLENGE

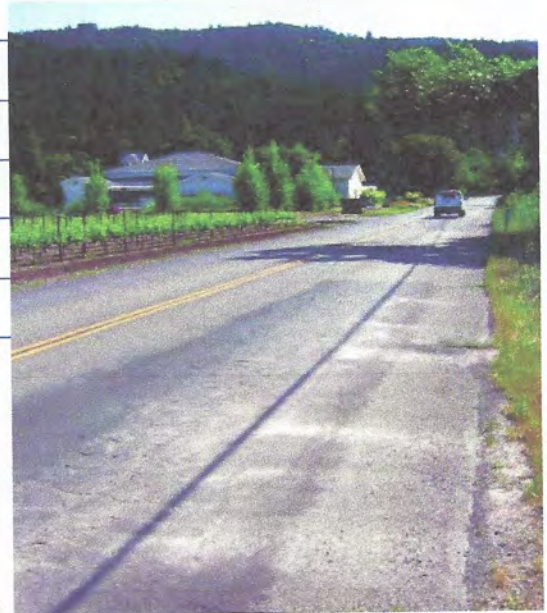
Flanked by vineyards in Napa Valley, Dunaweal Lane is located approximately one mile south of Calistoga, CA. This road is well traveled by cars and heavy trucks. Dunaweal Lane was constructed in a flood plane due to an underground spring just north of the area which causes frequent flooding of the roadway.

SOLUTION

The Napa County roads department elected to use RoaDrain™ on Dunaweal Lane as a lateral drainage medium under the base course to rapidly remove the flood water.

Benefits of Placing RoaDrain™ in a high water table environment:

- Quick removal of water from pavement structures
- Sufficient compressive stiffness to support traffic loading
- Capillary break
- Provides Separation and Strength
- Ease of installation
- Ready availability for shipment throughout the country



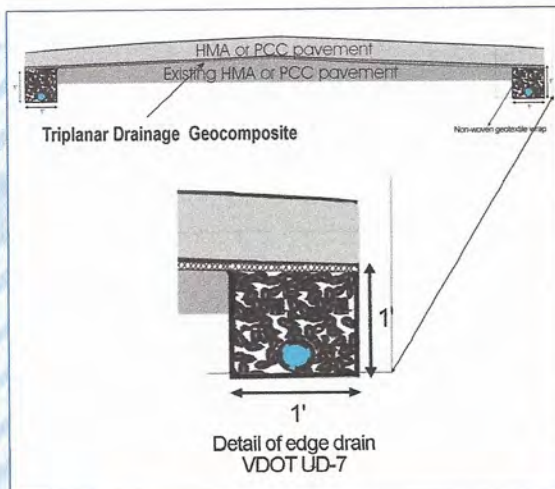
Tri-Planar Geocomposite for Roadway Subsurface Drainage

PROJECT NAME:	VA Route 58 from Emporia to Capron
LOCATION:	Franklin, VA
PRODUCTS:	Roadrain
DATE:	September 2001
INSTALLER:	Landsaver Environmental
ENGINEER:	Virginia Department of Transportation



This project specifies a triplanar geocomposite as a drainage layer on top of existing concrete pavement with full depth asphalt overlay. Roadrain will be used for 1 mile of roadway 2 lanes wide, i.e. milepost 14.65 to 15.65. The existing pavement is hydraulic cement concrete paving of varying depth and reinforcement. This pavement is jointed.

The work consists of breaking and seating the existing concrete paving for full depth



and full panel width; installing Roadrain drainage geocomposite on the existing concrete pavement section and overlaying with asphalt concrete. The pavement structure consisted of three layers totaling 9.5 in of asphalt concrete, i.e. 6 in BM-25

(Base), 2 in IM-19A (Intermediate), and 1.5 in SM-12.5D (Surface). The geocomposite will consist of a Triplanar geonet core with 8 ounce nonwoven geotextile laminated to each side.

Prior to the Roadrain installation, an asphalt tackifier was placed on the existing concrete paving. The Roadrain was then installed directly in the tackifier minimizing any wrinkles in the drainage geocomposite. A steel drum roller made two passes on top of the geocomposite to ensure good adherence to the existing pavement section. A 3.5- inch lift of base asphalt was then placed directly on top a Roadrain using a rubber tracked asphalt box. The asphalt was then compacted with standard static steel drum rollers.

After the initial lift of asphalt was placed, the road section was then opened to traffic with 3" of compacted asphalt directly on top of the Roadrain Triplanar geonet. The next lift of base asphalt was placed within 30 days to a final asphalt thickness of 9.5- inches.

US Route 1

LOCATION:	Madawaska, Maine
PRODUCT:	Roadrain™
APPLICATION:	Geocomposite Drainage Layer
DATE:	October, 2001
OWNER:	Maine Department of Transportation
ENGINEER:	Maine Department of Transportation

CHALLENGE

The Madawaska highway reconstruction project is a one-mile portion of urban roadway which is located in extreme northern Maine along the US and Canadian border. The existing pavement failed and had severe cracking, rutting, and potholes. Premature pavement failure on US Route 1 has long been attributed to poor subgrade soil drainage, breakdown of the aggregate base, and the migration of fines. The original design called for 6 inches of asphalt and 24 inches of base gravel. However, a good quality low cost aggregate was unavailable.

SOLUTION

RoaDrain™ was incorporated into the new design. The RoaDrain™ layer between the aggregate base and the silty subgrade soils provided an excellent drainage path. RoaDrain™ also dramatically shortened the drainage path, reducing time to drain from months, to less than a day. In addition, the RoaDrain™ also provided separation and strength to the pavement section. After reviewing their design using RoaDrain™, Maine DOT determined that the base aggregate thickness of 24 inches could be reduced to 12 inches, while still maintaining the same roadway service life.

Benefits of Placing RoaDrain™ under the base course:

- With the void maintaining area of the tri-planar structure, RoaDrain™ is a true capillary break that limits groundwater capillary action into the base course.
- The two 8 oz non-woven geotextiles heat bonded to the drainage core provides separation of the structural base course from the subgrade conditions.
- Excellent drainage as defined by AASHTO, 1993 Guide for Design of Pavement Structures.



Roadrain™ as a capillary break in a MSE wall project close to the Tampa Bay Airport

PROJECT NAME:	MSE Wall
LOCATION:	Tampa Bay, FL
PRODUCT:	Roadrain™
APPLICATION:	Surface water drainage and gas venting

Roadrain™ - a void-maintaining triaxial drainage geocomposite - replaces a 12" thick aggregate capillary break layer. This capillary break layer consisted of 2 geotextiles and coarse rock in the sandwich position. The general contractor, FTS, in Florida had a very difficult time sourcing the coarse aggregate material.

Roadrain™ was proposed as a value engineering alternative to the 12 inch rock sandwiched between geotextiles. The positioning of the Roadrain was chosen on top of the original 12 inch layer, and constitutes the 100 year flood elevation. Thus below the capillary break stainless steel straps and armor are used in concrete wall elements. Above the capillary break, galvanized straps and armor are used.

Positioning and placement of the Roadrain was pretty straightforward, the subcontractor grasped the concept quickly and was able to quickly install the materials. Some minor modifications were made to the standard Roadrain™ installation recommendations to accommodate for the MSE walls.

This project is strictly controlled by the FDOT to assure the MSE wall is built per the design specifications. The highly engineered drainage geocomposites make it easy for the field inspectors to check for quality and installation layout.



Highway 35 Road Reconstruction at Bridge Abutment

LOCATION:	Owatonna, MN
PRODUCT:	Roadrain™
APPLICATION:	Collection of water in base material and subgrade of roadway
DATE:	August 2002
OWNER:	Steele County, MN
ENGINEER:	Steele County Highway Department



CHALLENGE

After the initial construction of this roadway section, including an asphalt base course, significant deformation and rutting of the roadway surface was observed. Exploration by limited excavation of the road section revealed that underground springs and perched water within sand lenses surrounded by fatty blue clay was saturating the subgrade and road base materials, thereby reducing the bearing capacity and structural integrity of the roadway base. It was determined that a drainage system to collect water from the springs and sand lenses would be necessary to maintain the integrity of the roadway base material. Initially, a geotextile wrapped aggregate rock drain was considered, however, Roadrain™ was suggested because it would do the job faster, better, and at significant cost savings.

SOLUTION

Roadrain™ was specified due to its ability to efficiently collect all the water, and provide total coverage of the road section. It was determined that the collection capacity and high flow rate of Roadrain™ would be sufficient to keep the base aggregates dry and that the compressive strength of Roadrain™ would be sufficient for long term serviceability and installation stresses.

Benefits of Placing Roadrain™:

Benefits of Placing Roadrain™ in a high water table environment:

- Exceptional collection capacity and flow rates
- Excellent compressive strength
- Prefabrication allows for faster construction
- Provides Separation and Strength
- Significant Cost Savings over natural alternative



Southwest Parkway Street Reconstruction

LOCATION:	William Cannon Drive to Austin City Limits and Southwest Parkway at Republic of Texas Boulevard
PRODUCT:	Roadrain™
APPLICATION:	Drainage Geocomposite Under Base Course
DATE:	September, 2003
OWNER:	City of Austin, Department of Public Works
ENGINEER:	Onthon Inc., Consulting Engineers

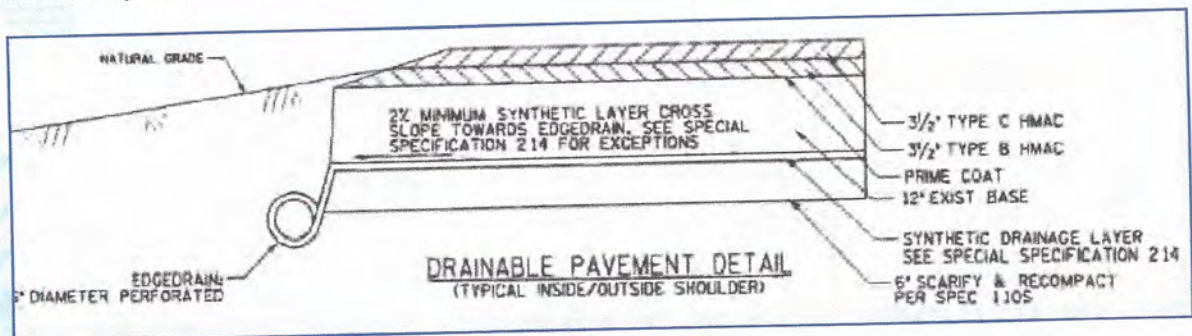


CHALLENGE

Othon Engineers, Inc. was tasked with the challenge of redesigning and reconstructing Southwest Parkway in Austin, Texas. This 6 lane stretch of highway has been problematic since the road was built in the mid 1980's. One of the major problems on this 7,600 foot reconstruction project was a 2,940 foot section in the middle of the roadway, exposed to underground water rise that infiltrates the structural base course. This saturation of the base course contributes to premature failure of the pavement.

SOLUTION

Roadrain™ was specified under the structural base course as a drainage conduit to channel the groundwater to a collection system.



Benefits of Placing Roadrain™ under the base course:

- With the void maintaining area of the tri-planar structure, Roadrain™ is a true capillary break that limits groundwater capillary action into the base course.
- The two 8 oz non-woven geotextiles heat bonded to the drainage core provides separation of the structural base course from the subgrade conditions.
- Excellent drainage as defined by AASHTO, 1993 Guide for Design of Pavement Structures.



TENAX ROADRAIN FOR
SUBSURFACE DRAINAGE LAYER

TENAX[®]

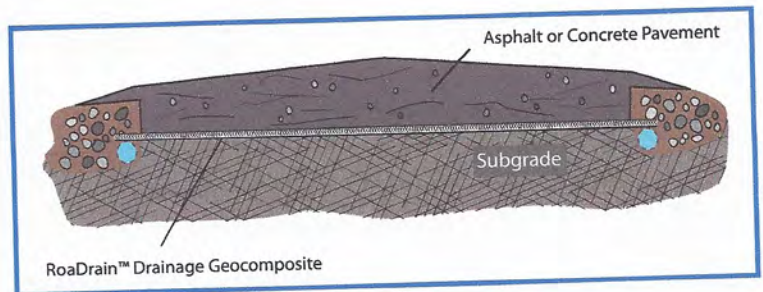
TENAX ROADRAIN: VOID-MAINTAINING* GEOCOMPOSITE SUBSURFACE DRAINAGE SYSTEM



Water in pavement is the primary cause of pavement failure. Without due consideration for adequate drainage design, pavement is unlikely to perform satisfactorily. RoaDrain™ is the engineered solution to problems associated with drainage in roadways, parking lots, paved walkways, airports, railway facilities, embankments and dike drainage. By providing excellent drainage, RoaDrain™ greatly extends their life and reduces service maintenance costs. Plus, RoaDrain™ is easy to install and readily available.

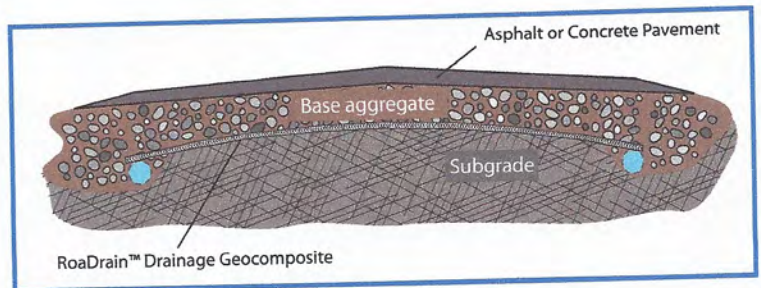
DRAINAGE BENEATH PAVEMENT SURFACE

Placed directly beneath the pavement surface to rapidly remove water from the pavement.



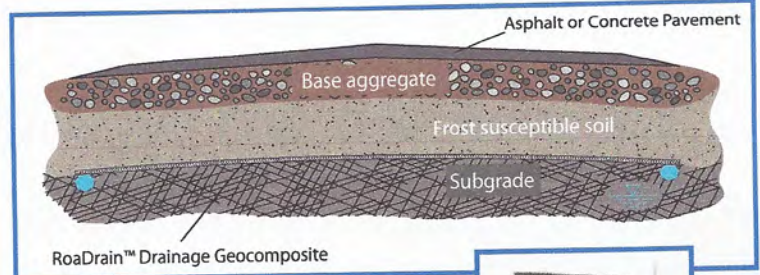
DRAINAGE BENEATH BASE COARSE

Under the base course, RoaDrain™ shortens the drainage path. Drainage provided by RoaDrain™ allows for an increase in the structural support of the pavement system, and the use of less select base materials.



BENEATH FROST-SUSCEPTIBLE SOILS or WHERE CAPILLARY RISE IS PROBLEMATIC

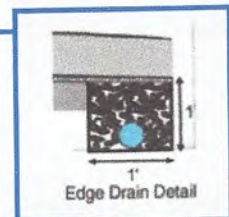
At a lower depth under frost-susceptible soils, RoaDrain™ acts as a capillary break and helps eliminate frost-heave.



*US Patent No. 6,802,669, October 2004:
"Void-maintaining synthetic drainable base courses and methods for extending the useful life of paved structures"

US Patent No. 6,505,996, January 2003:
"Drainage system with unitary void-maintaining geosynthetic structure and method for constructing system"

Case studies and detailed installation instructions are available. Contact your Tenax representative for more information.



TENAX ROADRAIN: VOID-MAINTAINING* GEOCOMPOSITE SUBSURFACE DRAINAGE SYSTEM

PCC JOINT REPAIR

Water infiltrates through the PCC joints and cracks, dynamic traffic loading will cause pore water pressure buildup. When water is discharged from the joint, it also carries with it fine grain soil. Gradually the PCC slab will lose support from the subgrade, and the PCC will subsequently break up. Roadrain can quickly drain water, and prevent the migration of subgrade fines up through the PCC joints.





ROADRAIN

Concrete pavement drainage - Steele County, Minnisotta



ROADRAIN

Base course subsurface drainage - Maine DOT, US Route 1



ROADRAIN

Asphalt pavement drainage - Virginia DOT Route 58



ROADRAIN

Capillary barrier - Minnisotta Steele County Highway 35 Road Construction



ROADRAIN

Subsurface drainage - Mendocino County, CA



ROADRAIN

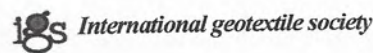
Seepage water interception, Austin Southwest Parkway - Texas



ROADRAIN

PCC joint repair - Missouri DOT

MEMBERSHIP AFFILIATIONS INCLUDE



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09/27/2006

Roadrain™ as a capillary break in a MSE wall project close to the Tampa Bay Airport

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APPLICATION:	Surface water drainage and gas venting

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