



NEOLOY® GEOCELL Load Support Reinforcement for Highways



Stabilizing an unstable world!

PROJECT AT A GLANCE

Application

Load Support and Road Embankment for Trans-European Motorway

Subgrade/Soil

Clay subgrade

Location

Section between Swierklany Junction (km 548+897) and Gorzyczki on the Polish border with the Czech Republic (km 567+223)

Region

Silesia, Southern Poland (Rybnicko – Jastrzebski)

Installation Date

2008

Client

Contracting Authority - General Directorate for National Roads and Highways (GDDKIA), Poland; Contractors – Alpine Consortium: Alpine Mayreder Bau GmbH (leader), Austria; Austria, Germany & Czech Republic, Germany & Czech Republic.



At the Crossroads

Poland is at an important crossroads in the European Union due to its physical location and its developing economy. Significant investments are being made by the government and the EU to upgrade the Polish highway system, and a large number of international engineering and contracting firms have offices and representation in Poland.

In the field of geosynthetics, there is widespread awareness, acceptance and accreditation of the PRS Neoloy Cellular Confinement System. Neoloy is a well known brand name in the professional academic, contractor and civil engineering community for its outstanding properties and performance.

The widespread adoption of Neoloy by civil engineers is demonstrated by its increasing use

in structural reinforcement of paved roads. This brochure highlights a number of recent highway construction case studies.



Structural Reinforcement for A1 Trans-European Motorway

The A1 is a key transportation artery through Poland, as well as a main corridor in the Trans-European Transport Network (TEN-T). The Swierklany - Gorzyczki section of the A1 motorway includes numerous bridges and bypasses, junctions, drainage solutions, slope reinforcement, and traffic management systems. In addition the route intersects with major rail, utility lines and mining sites.

THE CHALLENGE

Designed as an A-grade (class I) international highway, A1 is planned for very heavy traffic (KR6) at speeds of 120 km/hr and a surface load of 115 kN/axle. The 18.3 km road includes 2 x 2, 3.75m wide lanes with 3m hard shoulders and wide grass verge. The road alignment entails extensive embankments that typically reach heights of 17m. Geotechnical evaluations of the planned route revealed multiple sections of poor load-bearing clay soils, including sections that traversed mining operations.

OLD APPROACH

Replacement of the problematic soil was unfeasible, due to the enormous quantities of soils involved. In addition to the cost, labor and time, the use of vast quantities of replacement/virgin soil and aggregate resources stands in contrast to EU guidelines for sustainable construction practices. From all points of view the only viable approach was advanced soil reinforcement technology.

PRS NEOLOY SOLUTION

Neoloy was the only solution considered by the geotechnical designers. Neoloy's 3D reinforcement properties make it the best available practice to reinforce the substantial embankments (local sandy soil) over the problematic soils. Dr. Leon Maro, a leading geotechnical consultant in Central Europe, divided the route soils into "geotechnically homogenous" sections, and performed a computational analysis of the sub-base reinforcement using Neoloy for each problematic section. The resulting design utilized double Neoloy layers (10, 15, or 20 cm height) with granular infill, to generate the optimal reinforcement for each section. The perforations of Neoloy in this case were an essential part of the calculations, due

to the considerable filtration needs of the 8-17m high earth embankments.

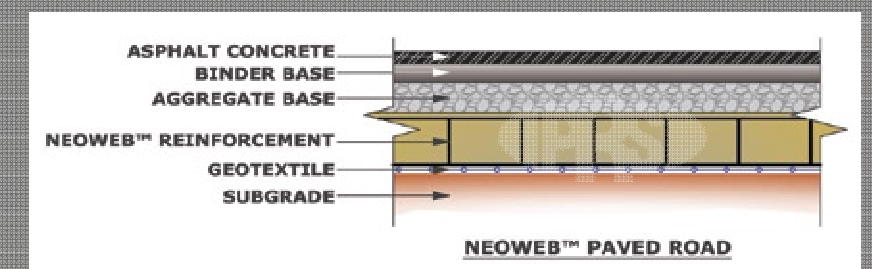
QUALITY CONTROL

The Alpine consortium first tested the Neoloy pavement structures by building in-situ test sections. After compaction, these sections were subjected to stress from a VSS loading device at 0.15-0.25 MPa. The results validated that double layers of Neoloy (15 cm) with sandy gravel infill (0/32) underneath a 20 cm top layer of crushed stone aggregate (burnt shale, 0/63) produced maximum reinforcement.

Client Benefits

- Neoloy 3D reinforcement was most effective for large-scale embankments over poor soils
- Neoloy was chosen due to its superior stiffness, strength and dimensional stability
- Fast and simple installation is most suitable for large scale project
- Price and technology were competitive with all other solutions
- Use of Neoloy technology "freed up" earthmoving equipment, labor and time to focus on construction of embankments
- Use of Neoloy and ability to use inferior local infill best aligns with EU guidelines for sustainable construction practices

The ability to quickly "cover" large sections of the route enabled quick progress in the construction of the road embankments. Half the total 250,000 m² was installed in 2008 and the remainder in 2009.



PRojeCt At A GLAnCe
Application

Load Support and embankment reinforcement for major highway

Subgrade/Soil

Clay

Location

Grójec – Białobrzegi (km 418+546 to km 436+380)

Region

South of Warsaw, Central Poland, Europe

Installation Date

2008-2009

Client

GDDKiA – The Polish national road association. Consortium of Polish contractors led by Drogbud Podkarpacki Holding Budowy Dróg Sp. z o.o. ul. 1 Maja 42 38-100 Strzyżów,

Upgrade of National Road to S7 Expressway

As part of the national effort to upgrade the Polish road infrastructure, the National Road DK7 was upgraded as part of the S7 Expressway to EU standards (also part of trans-Europe E77). The Grójec – Białobrzegi section focused on upgrading 2 lanes on the western side on the 17.8 km long section.

Extensive clay subgrade along the route required reinforcement for the road embankments. Due to the familiarity of the Polish designers, consultants and contractors with the Neoloy cellular confinement system, they were all in agreement that this was best available solution and the natural choice

for reinforcement in these severe soil conditions. To maximize the reinforcement double Neoloy layers were used: Neoloy 15 cm was placed over the clay subbase (on top of a geotextile) and Neoloy 10 cm on top of that, both utilizing local sandy soil for infill.

Client Benefits

The objectives of the client were met:

- Fast and simple installation
- Engineers avoided soil replacement
- Saved tons of imported soil, lowered environmental impact and reduced carbon footprint
- Saved up to 30% on project costs



Structural Reinforcement for S22 National Expressway

The S22 upgrade of 28.8 km of the national express road between Elblag and Grzechotki on the northern border of Poland included a service road for heavy construction vehicles. Much of the route was over clay soil with a poor load-bearing capacity (30-40 MPa). Neoloy was tested and selected by MSF-TGA engineers to meet their requirements for a 140 MPa load bearing capacity.

Neoloy 20 cm was deployed with sandy soil infill, overfilled by 5 cm of sand and 10 cm of recycled concrete construction waste and 6 cm of asphalt. The reinforced road successfully supported the traffic of heavy construction and haul vehicles in all weather conditions. The temporary section was cost-effective, installed quickly, removed without damage to the environment.



Client Benefits

- Neoloy reduced the structural pavement thickness by as much as 44%, and lowered project costs by 30%
- Inexpensive, fast and easy installation
- Increased load-bearing capacity and reduced road failure
- Minimal on-site environmental impact
- Easy future removal, as necessary

PRojeCt At A GLAnCe
Application

Load Support and reinforcement for paved road

Subgrade/Soil

Clay

Location

Elblag –Grzechotki

Region

Northern Poland (Baltic Sea) Europe

Installation Date

2007

Client

Contracting Authority - General Directorate for National Roads and Highways (GDDKiA), Poland; Contractors - MSF-TGA, a Portuguese road building consortium active in Poland.



RojeCt At A GLAnCe Application

Load Support and reinforcement
Subgrade/Soil
Sand

Location

Starolecka Street, Poznan

Region

Western-Central Poland, Europe

Installation Date

May 2008

Client

Skanska (Poznan Branch) - Operating in all segments of the construction market: general, road, bridge, railway and hydro-engineering construction with presence in the Polish market since the 1970's.

Urban Road Repair of Embankment Failure, Poznan

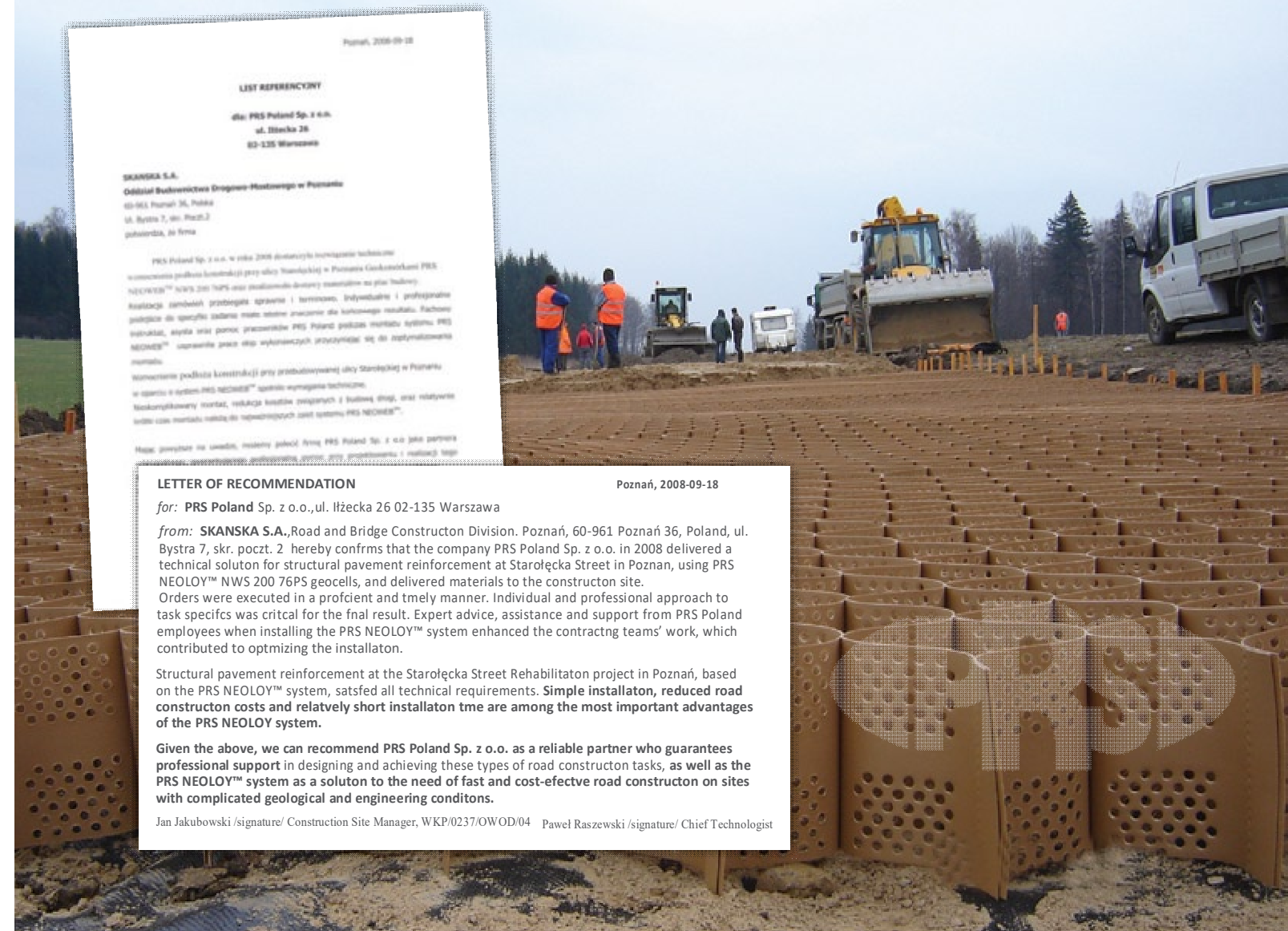
Ruptured sewer pipes washed out the road embankment on one side of a busy street in central Poznan. Soil replacement was not only expensive and logistically difficult; soil compaction under the pavement structure could cause further damage to the sewer system or to the undamaged side of the road.

Neoloy was chosen as it fast to implement, tolerant of saturated conditions, and could be installed with minimal interference to vehicular traffic. 20 cm Neoloy was used with local

poorly graded soil as infill material to stabilize and restore the pavement structure. Thanks to Neoloy and its high load bearing capacity, the sewage system remained intact and the contractor could repave the road and finish the project quickly.

Client Benefits

- Fast installation
- No need for expensive soil replacement
- Eliminated the need to replace the sewage systems
- Ease of installation enabled traffic on the undamaged side of the road



Neoloy Structural Pavement Reinforcement

ENGINEERING AND ECONOMIC BENEFITS

Neoloy is being increasingly adopted by the engineering community worldwide, as in Poland, as the most effective soil reinforcement solution available for structural pavements. Neoloy's engineering properties and durability extend its design life well beyond conventional geocell technology. This aligns Neoloy with the long-term lifespan of civil engineering projects, and provides Neoloy with a clear value proposition compared to other geocells, geogrids or other reinforcement solutions.

ENGINEERING

- 3D geocell beam with high flexural strength and stiffness
- Distributes loads and increases bearing capacity
- Reduces structural thickness by 40-70%
- Utilizes inferior local soils for infill (sand, quarry waste, recycled material)
- Outperforms any geogrid

MATERIAL

- Unique polymer technology
- Very high creep resistance
- Very long-term allowed stress for design under high temperatures (60°C)
- High dimensional stability
- Outperforms any HDPE geocell

OPERATIONAL

- Fast installation
- Improved drainage
- Improved road performance
- Low degradation
- High durability reduces repairs and downtime

ECONOMIC

- Lower construction costs – initial savings
- Increase pavement lifespan – long term savings
- Extend maintenance schedules and reduce costs
- Shift limited road resources/budgets from repairs to new construction



About PRS

PRS is the world's leading supplier of cost-effective soil stabilization solutions. Combining unique, proprietary technology with specialized engineering expertise, PRS delivers proven solutions for load support, slope and channel protection, earth retention, reservoir and landfill applications. With a global network of fully owned subsidiaries and independent local distributors, PRS provides a full range of end-to-end support services. Since its establishment in 1996, PRS has implemented thousands of successful projects in over 80 countries worldwide.

