

## Pavement Structural Reinforcement DK3 State Road — Pyrzyce, Poland



Simpson Strong-Tie worked together with the road administrator to come up with a long-term, durable solution.

**BACKGROUND** State road in Poland needed new asphalt pavement layers to curb extensive rutting.

The DK3 state road runs through the city of Pyrzyce in the Polish province of West Pomerania. The existing pavement structure consisted of a gravel subbase with asphalt layers on top. It was determined that the load bearing capacity of the surface was limited by the capacity of the gravel subbase, calling into question the structural integrity of the road's composition.

**THE CHALLENGE** Traditional rehabilitation methods called for milling the existing pavement and replacing it with thicker layers of asphalt.

The road administrator's initial renovation plan called for milling the existing asphalt layers to a depth of 8.3"–9.0" (21–23 cm) and then applying new layers to a total thickness of 10.6" (27 cm). However, because in some places the overall thickness of the existing structural layers was less than 9.0" (23 cm), milling so deeply would have meant interfering with the road's substructure. Therefore, the road administrator decided to consult Simpson Strong-Tie engineering on the best reconstruction design for this project.

**THE SOLUTION** Apply two layers of asphalt reinforcement grid to strengthen the road's surface while reducing labor and materials.

Working together, the team devised a solution to create a surface that would better resist structural rutting while making optimum use of the road's existing construction. The solution consisted of applying two layers of Simpson Strong-Tie asphalt reinforcement grids at different depths to ensure the road could withstand future traffic loads.

### PROJECT INFORMATION

**Project**  
DK3 State Road in Pyrzyce,  
Poland

**Project Category**  
Pavement Structural Reinforcement

**Date**  
2006

**Simpson Strong-Tie Products**  
Glasphalt™ G pre-bituminized asphalt  
pavement reinforcement grid;  
Carbophalt™ G pre-bituminized asphalt  
pavement reinforcement grid

#### CHALLENGE

Ensure road's long-term structural integrity and load capacity with minimal milling existing asphalt and adding up to 10.6" (27 cm) of new asphalt layers.

#### SOLUTION

Apply two layers of Simpson Strong-Tie asphalt reinforcement grids to strengthen rather than completely replacing the existing structure.

#### RESULTS

No damage observed in the eight years following the less costly installation, along with significant decrease in structural deflection; success led to adoption of the solution on several other state roads.

Simpson Strong-Tie asphalt reinforcement grids consist either of carbon- *and* glass-fiber strands (Carbophalt™ G reinforcement grids) or exclusively of glass-fiber strands (Glasphalt™ G grids) — in either case, impregnated with bitumen. The flexible weave allows laying in curves as well as bonding to the subgrade or its surface structure. Granular aggregate in the new asphalt layers can penetrate the grid meshes, resulting in a very high bond between layers. This ensures that the fibers are optimally bonded with the structure to absorb crack-generating tensile forces, inhibiting reflection of cracks from the existing pavement into new asphalt layers. The reinforcement also increases the overall stiffness of the system to help prevent future stress cracks.

The plan entailed six separate steps:

1. Milling only to a depth of 0.8"–1.2" (2–3 cm)
2. Applying a 1.2" (3 cm) leveling layer
3. Installing bituminized Simpson Strong-Tie Carbophalt G asphalt reinforcement grid onto a bitumen tack coat
4. Installing a 2.4" (6 cm) binder course on top of the Carbophalt G grid
5. Installing a bituminized Simpson Strong-Tie Glasphalt G asphalt reinforcement grid onto the next bitumen tack coat
6. Finally, laying down a 1.6" (4 cm) stone-matrix asphalt (SMA) wearing course on top of the Glasphalt G grid

This combination of two different asphalt reinforcement products at distinct depths followed a specific rationale: The high-tensile carbon fiber in the Carbophalt G reinforcement placed on the underside of the new asphalt structure is engineered to increase flexural strength and stiffness, allowing for more uniform load transfer across the entire structure, while installing Glasphalt G just under the asphalt wearing course provides an additional safeguard against the possible reflection of cracks from the road's substructure and against the propagation of stress cracks from the road's traffic load.



2006 — Asphalt reinforcement grid installed.



2006 — Asphalt layer being installed on top of asphalt reinforcement grid.



2014 — Even eight years later, there is still no damage to the wearing course and only the longitudinal joint where the two pavement sections were merged is visible.

## THE RESULTS

The team's economical design reduced future cracking and rutting in the road, inspiring similar solutions elsewhere in the province of West Pomerania.

Following the new design recommended by Simpson Strong-Tie, the thickness of the newly laid asphalt layers was approximately 5.1" (13 cm) total, down from 10.6" (27 cm) of new layers in the original plan. This represented substantial savings on time, labor, construction materials and traffic closures.

In spring 2007, new road measurements were taken, revealing a significant decrease in deflection compared to what was found in 2004 — before the reinforcements. Furthermore, the observable success of the project prompted the decision to implement this technology as a standard solution for other aging state roads. In 2007, approximately 8,000 m<sup>2</sup> of road section on the DK6 in Malechowo were relaid using this technology. And the same solution was adopted in 2009 near the towns of Ryman and Nieradz.

As for the DK3 project through Pырzyce, Simpson Strong-Tie continued to track the performance of the reinforcements. Their success can be seen in the images above from 2011 and even eight years after the installation, in 2014, where no damage was observed on the wearing course.

## MORE INFO

For complete information regarding specific products suitable to your unique situation or condition, please visit [strongtie.com/asphalt](http://strongtie.com/asphalt) or call your local Simpson Strong-Tie Pavement Specialist at (800) 999-5099.