



Sierra® Slope Retention System: Installation in Service Since 1982

CANADIAN PACIFIC RAILWAY WATERDOWN, ONTARIO (CANADA)

Tensor® Geogrid reinforcement is well suited to the repair of railway embankment landslips. The speed of installation often minimizes service disruption and repair expenses resulting from track closures.

Application: A grade separation solution was to address cracks in an embankment shoulder adjacent to railroad tracks located along the Niagara Escarpment in Waterdown (now part of Hamilton), Ontario.

The Challenge: Canadian Pacific Railway (CPR) is a Class 1 North American railway that provides freight transportation services over a 14,000-mile network in Canada and the U.S. In 1982, the railway needed a quick and cost-effective repair to a heavy rail embankment landslip. The embankment, located below the ballast and railway subgrade, needed to withstand the sizeable surcharge of a locomotive.

Site Conditions: In 1958, high groundwater pressure had caused a slope failure. At that time, ballast fill was placed over the glacial till to reinstate the track; however, problems of track disturbance continued, and surface run-off periodically activated movement along the old shear surface. Following an exceptional thaw in December 1982, rail traffic was completely suspended when cracks were discovered within the embankment shoulder.

The Solution: Site topography, repair costs and the need for a speedy repair advanced the use of a reinforced soil structure. A Sierra® Slope System reinforced with Tensor Uniaxial (UX) Geogrid was specified to repair the embankment cracks. The till placed 24 years earlier was excavated down to the bedrock, with benched steps cut into the undisturbed soil. Granular fill was installed to promote slope drainage and help avoid surface frost heave as it lowered the water table. Also, the reinforced granular fill helped CPR achieve a higher factor of safety.

The geogrid's open structure enabled soil particles to interlock through the apertures, mobilizing the high strength of the grid and achieving efficient anchorage. To ensure local surface stability, each layer of geogrid was wrapped up the slope face, turned back and secured into the fill. Finally, the slope face was topsoiled and hydroseeded. The repair was successfully completed in 12 days.

Follow-up: A visual site inspection conducted in 2008 by representatives of Canadian Pacific Railway and Tensor revealed no evidence of subsequent failure. Conversations with long-term CPR track maintenance employees indicated no prior events as well.