



# geoTALK™

## Canadian Tire on a Roll With SierraScape®

### WIRED-FORMED WALL SAVES \$1 MILLION ON PROJECT COSTS

When the owners of the Canadian Tire Store in Tillsonburg, southwestern Ontario, announced they wanted to relocate and expand operations, the news sent chills through the small town's economy. The store had anchored the downtown mall for decades, and a move to the suburbs was likely to have serious consequences for the entire central business district. When the mall owner offered a nearby, but sloping strip of land for the new store, Canadian Tire Store was willing to take it—if site work wouldn't push costs through the roof.

"The land fell away steeply into a ravine with a small stream called Lisgar Creek," said Colin Atkinson, PEng., president of Atkinson, Davies, Inc., a geotechnical, environmental and materials engineering firm in London, Ontario. "The general contractor was considering several options, including a concrete soldier pile wall with tie-backs next to the stream to retain the site. But it was a very expensive option."

Atkinson suggested that the general contractor, Ontario-based Traugott Construction, consider a proprietary system for building a mechanically stabilized earth structure (MSE), like the SierraScape® Retaining Wall System from Tensor Earth Technologies, Inc. (TET). Traugott contacted Kent Frame, field specialist for TET distributor Terrafox Geosynthetics, to determine the feasibility of using the system in this application.

### LIMITED SETBACKS CREATE UNIQUE CHALLENGES

Frame secured footing loads from the project's structural engineers, Brenik Engineering, Inc. of Concord, Ontario, asked TET engineering to develop a retaining wall design for the site. Although preliminary analysis indicated that the project would require a very tall MSE, he was certain that the SierraScape System could deliver equivalent performance while saving significantly on construction costs.



Construction of the 13.5 meters (44 feet) tall stone-faced wall started in June 2004.

The design had to address the location of the building's exterior wall footing, which was within 2.5 meters (8 feet) of the wall face, as noted by TET senior construction engineer Gerry Kehler. "Our analysis showed that the footing would be within the structure's active wedge. To avoid this issue and minimize possible movement, we asked Brenik Engineering to change the footing location to put it outside the wedge."

"We pushed the building back a bit away from the wall face and put the outside skin on a grade beam," said Peter Kulba, PEng., project engineer for Brenik Engineering. "We anticipate the structure can tolerate the maximum long-term settlement amount that was provided by the soils consultant."

### RAVINE TRANSFORMED INTO BUILDING SITE

Construction of the 13.5 meters (44 feet) tall stone-faced wall started in June 2004 and was performed by Blue Con Inc., a local retaining wall contractor with no previous SierraScape System experience. The steep terrain, confined site conditions and extensive fill requirements made the project challenging from a logistical standpoint, noted Frame.

"It was a challenging site," TET regional manager Daniel Jette said. "We had to take into account the hydraulic effect of the creek, the heavy load on top, the height of the wall and settlement limitations imposed by the future building on top."



The newly acquired land fell away steeply into a ravine creating challenges on how to excavate the land for building the new store.



The workers tied the adjoining facing units together and unrolled precut lengths of Tensor Uniaxial (UX) Geogrids perpendicular to the wall face on every course.



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Even so, Blue Con's crew was able to quickly master the process of stacking the geogrid-reinforced, welded-wire forms. The workers tied the adjoining facing units together and unrolled pre-cut lengths of Tensar® Uniaxial (UX) Geogrids perpendicular to the wall face on every course. They then used SierraScape loop and connection rods to mechanically join the UX Geogrids to the facing units.

The crew used heavy equipment to spread 225-mm (9-inch) lifts of screened aggregate over the geogrids. Tensar® Biaxial (BX) Geogrids were also installed to provide secondary reinforcement and maintain facing alignment during backfilling. The entire structure was completed by August 2004.

"The wall could have been built with a vertical (90 degree) face," Atkinson said. "But psychologically everyone seemed more comfortable with a slight slope." The finished structure has an approximately 10% batter.

### PROJECT DELIVERS BIG SAVINGS

Post-construction monitoring indicates the building's foot has settled between 9 and 21 millimeters. "There has to be some movement as expected," Atkinson said. "Anything less than 25 millimeters is considered reasonable."

"Most of the settlement that will occur takes place during construction," Frame noted. "All settlement should occur within 3 to 6 months."

With construction complete, all parties agree that the site presented less than ideal conditions for a traditional big-box store, but the results have been very satisfactory — both from a performance and cost perspective. Final assessments indicate the owners were able to build the store they wanted — where they wanted — and still save more than \$1 million (CDN) by selecting the SierraScape System.



Owner realized savings of more than \$1 million (CDN) by selecting the SierraScape System.

"This really was a landmark project," Frames concluded. "It showed that a near-vertical SierraScape Wall can support a large structure and do it for a lot less than traditional solutions." ❖❖❖