

LOCATION

Costco Wholesale
EAGAN, MINNESOTA

PRODUCT

Diamond Pro® HD, 18" x 18" x 12"
Mirafi® Geogrid - 5XT, 8XT and 10XT

MANUFACTURER

Northfield West,
an Oldcastle® company

COLOR

Gray

WALL INSTALLER

Structures, Inc.
Chasta, Minnesota

GENERAL CONTRACTOR

Novak Construction
Becker, Minnesota

PROJECT ENGINEER

Joseph W. Kowalski, PE

WALL AREA

52,634 square feet

**THE CHALLENGE**

The land selected for Costco Wholesale had more than a 50-foot grade difference from the South to North end of the site, making a flat surface a challenge to create. Elevation changes required seven segmental retaining walls of varying heights across the site, with the need to design two vehicle ramp accessways at either end. Adding to the challenge: the build had to be completed in less than 90 days to meet the grand opening schedule. Diamond Pro® HD blocks (8" x 18" x 12") were chosen for the segmental retaining walls because they can be installed quickly, provided the needed aesthetics, and offered the durability to withstand Minnesota's harsh winters. Diamond Pro is approved by the Minnesota Department of Transportation for its higher resistance to freeze/thaw degradation.

THE SOLUTION

The massive amount of earth being moved while block was being laid required materials that performed efficiently.

"The mechanically stabilized earth (MSE) walls constructed for Costco are comprised of alternating layers of compacted granular backfill affixed to the Diamond Pro wall face," explained Joseph Kowalski, Project Engineer. The MSE walls were backfilled using alternating layers of 8 to 16 inches of sand and gravel and Mirafi® geogrid reinforcement. The geogrids are extended to near the face of the Diamond Pro HD blocks.

"The downward lip at the back of the Diamond Pro also provides an extra mechanism to easily connect the geogrid to the block," said Craig Vardy, construction manager of Structures, Inc., the firm responsible for constructing the MSE walls. "That's one of the reasons we enjoy working with the Diamond Pro block."

Vardy noted the natural texture and earth-tone colors blend easily into any environment while providing the needed stability. "It's all about the plant, how they produce the look and aesthetic, and needing to make sure that we get the block from a consistent run," he said. "The Northfield West plant did a great job to make sure it matched up."

Kowalski agreed that the design and ease of Diamond Pro block was a big timesaver for this job. "They are ideal for demanding commercial applications like this," he added, noting that the block's cores were filled with an angular stone. The combined weight of the blocks and the stones pushing through some of the apertures in the geogrid keep the material firmly in place.

One of the two largest walls on the property is 1,350 feet long and approximately 30 feet high. The wall was designed to take the live load of large semi-trucks and firetrucks. The largest wall on site was 32 feet high, but not nearly as long as the other. It retains the earth and supports the back, northeast corner of the warehouse. There are three different types of Mirafi geogrid in this section (5XT, 8XT, and 10XT), and the grids are 33 feet long where the building gets closest to the wall.

"It's not that common to have walls that tall. We had no structural concerns, though, because we were working with good material and in accordance with the Federal Highway Administration's design methodology for wall design; it results in a resilient and conservative structure," said Joseph Kowalski, Project Engineer and Architect.

Structures began construction of the walls in April of 2019, laying 1,000 sq. ft. of blocks a day, in a choreographed effort to meet the tight timeframe.

THE RESULT

Costco opened its new facility on Friday, November 15, just in time for holiday shopping. "Building on a site like this with cast-in-place retaining walls would've been cost-prohibitive and many developers would not have attempted it," noted Kowalski. "The technology of these types of walls has become more advanced, and engineers are more aware of what can be done with reinforced soils."

For future segmental retaining wall projects of this magnitude, both Kowalski and Vardy stated they have the confidence in Diamond Pro HD blocks to bring the project in on time, with durability and aesthetics—even in the most severe climates.



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