Parking Reimagined Permeable Paving Advantage

Year of Construction: 2019
Location: Richmond Hill, ON
Product Installed: Ecoraster Bloxx
Category: Stormwater Management

CASE STUDY

PROBLEM: A DETERIORATING PARKING LOT CREATES CHALLENGES

Parishioners and maintenance staff of a church north of Toronto, Ontario, Canada, faced ongoing difficulties with an adjacent gravel parking lot spanning approximately 1,764 m2 (2,110 yards2). Over time, the lot had deteriorated significantly due to constant vehicle traffic, leading to numerous ruts (Figure 1), dust during dry seasons and mud during wet weather. Maintenance staff faced a growing burden, and parishioners experienced inconveniences, including tripping hazards and unsafe conditions.

Filling in the ruts was considered a temporary fix as this approach was unsustainable and failed to address the root issues. Seeking a long-term solution, the church engaged an engineering firm to redesign the parking area with conventional asphalt. However, they quickly encountered a significant challenge: a large and shallow gas pipeline running the length of the lot. The pipeline's presence imposed strict constructability restrictions, rendering traditional asphalt pavement impractical. Installing asphalt would have required excavation for site servicing and drainage structures such as catch basins, manholes and pipes, which are items the gas company prohibited.

PROPOSAL AND SOLUTION

Faced with these challenges, the engineer consulted Terrafix Geosynthetics, Inc. to explore alternative solutions. After thoroughly reviewing the site conditions and requirements, the Ecoraster Bloxx, a surface reinforcement system that promotes stormwater infiltration, was recommended. Reducing the total volume of stormwater runoff can mitigate localized flooding and reduce the potential for erosion in the catchment area.

Manufactured in Canada from recycled low-density polyethylene (LDPE) plastics, the permeable pavement system offers environmental and structural benefits. Each grid is a preconnected unit measuring 1 m by 1.33 m (3.28 feet by 4.36 feet) and weighing only 9.41 kg (20.7 pounds). The system is designed to accommodate 48 custom-fabricated concrete pavers per grid, with water infiltration enabled through

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(con't) perforations in the cell walls and spaces between the pavers. With a runoff reduction factor of 0.15, this design eliminates the need for extensive site servicing and minimizes excavation, making it a solution for sites with shallow utilities, such as the church's parking lot.

EXECUTION: EFFICIENT INSTALLATION AND MINIMAL DISRUPTION

A contractor was hired to implement the project with four workers. One key advantage of the permeable pavement system is its ability to preserve the existing base, which eliminates the need for deep excavating or importing drainage stone. This ability reduced project complexity and costs. The only excavation required was for shallow sub drain pipes installed along the perimeter and down the center of the lot.

The installation process began with filling the existing ruts and covering the base with a permeable leveling course using a skid steer equipped with a dozer blade. Notably, the skid steer was the heaviest equipment used on the project, which demonstrates the minimal disruption involved.

The grids were then laid by hand starting from one corner of the lot. Workers ensured that the lugs on the first row pointed in the direction of their progress, which allowed subsequent rows to interlock seamlessly (Figure 2). The crew installed grids at an impressive rate of 100 m2 (1,077 feet2) per person per hour.

Following the grid installation, the custom-fabricated concrete pavers were inserted into the cells. The client selected two colors: gray for most of the lot and terra cotta for parking space delineation. In total, over 1,300 grids and nearly 64,000 pavers were installed to create a parking area with 65 spaces, including a central access lane (Figures 3 and 4).

PERFORMANCE: A DURABLE, SUSTAINABLE SOLUTION

The system is engineered for long-term durability. Its load-bearing capacity is rated up to 800 tonnes per m2 (1,138 psi), making it suitable for high-traffic areas. Also, the system is designed to withstand extreme temperature fluctuations, with

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(con't) a dimensional stability range of -50 C to 90 C (-58 F to 194 F). Thermal expansion is managed by built-in expansion elements, ensuring stability over time.

The material's chemical resistance further enhances its longevity, as it is unaffected by exposure to ultraviolet rays, acids, alkalis, oils, gasoline, de-icing salts and acid rain. Snow removal is straightforward and requires only a plow blade with a flexible rubber or protective lipped edge to prevent damage to the surface.

BENEFITS AND OUTCOMES: A WIN FOR STAKEHOLDERS

The completed parking lot delivered advantages in functionality, aesthetics and sustainability (Figures 5, 6 and 7). The most immediate benefit was cost savings. By avoiding extensive excavation and site servicing, the church reduced construction expenses. The system complied with the gas company's strict excavation limitations, which addressed a critical project constraint. Over time, the permeable pavement's low maintenance requirements and durability are expected to enhance its lifecycle value by reducing ongoing repair and maintenance costs.

SAFETY AND AESTHETICS

Safety was another priority. Unlike traditional interlocking pavers, which are prone to differential settlement due to frost heave, this system provides a stable, interlocked surface that minimizes tripping hazards. The clean, modern design complements the church's architecture, which enhances the overall aesthetic appeal of the site.

ENVIRONMENTAL IMPACT

The system also contributes to environmental sustainability. Its permeable structure allows rainwater and melted snow to infiltrate directly into the ground, which reduces surface pooling and re-freezing. This feature minimizes the need for de-icing salts, which can harm nearby vegetation and contaminate groundwater. Also, the system supports groundwater

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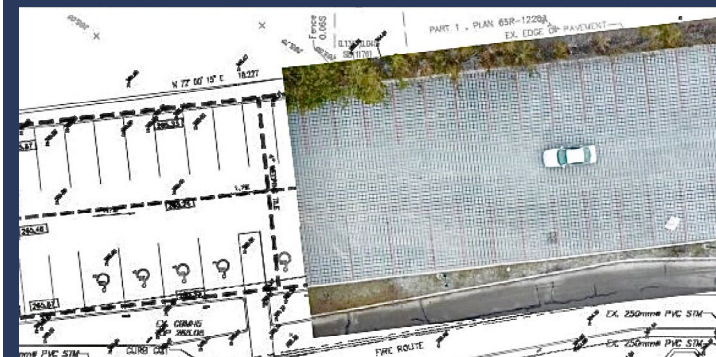

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(con't) recharge, which alleviates pressure on municipal stormwater infrastructure.

By reusing post-consumer and post-industrial plastics in its production, the system contributes to the circular economy and aligns with broader sustainability goals.

CONCLUSION

The successful transformation of the church's parking lot in Richmond Hill highlights the potential of permeable pavement systems to address complex site challenges. By offering a cost-effective, durable and environmentally friendly alternative to traditional asphalt, the project demonstrates how engineering ingenuity can solve real-world problems.

The system not only met the client's immediate needs but also delivered long-term benefits, including reduced maintenance, improved safety and enhanced environmental performance. As communities face increasing demands for sustainable infrastructure, this project serves as a model for reimagining parking solutions to balance functionality, aesthetics and environmental stewardship. (See the overview installation video at bit.ly/4h7Afsp)