



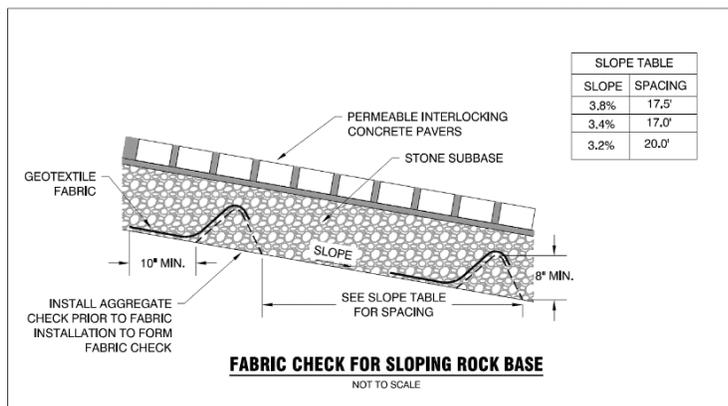
Grand Crossing PICP Parking Lot Waterloo, Iowa

CGA served as the design engineer for the Waterloo Grand Crossing Parking Lot, entirely designed with permeable interlocking concrete pavement (PICP). CGA assisted in coordination with the City of Waterloo Engineering Department and the IEDA as part of the Iowa Green Streets Initiative. They prepared the design plans and specifications, and coordinated with the prime contractor and sub-contractors during the project's construction phase.

The site presented an engineering challenge due to the high developed runoff rates, the low existing runoff rate, shallow city storm and the possibility of contaminated soils. The selection of bioswales, a permeable paver detention system and impermeable liners to protect contaminated areas offered combined solutions to these challenges.

Also, while the original site was relatively flat, the building design included an underground garage, which elevated the main entrance well above existing grades. This caused some areas of the parking lot to exceed the flatter slopes preferred in the design of the PICP system and associated storage medium.

Instead of increasing the rock depth, internal fabric berms were installed to assist in the reduction of lateral movement within the rock storage medium, and allow the runoff to infiltrate into the subgrade.



Another challenge, discovered during the subsurface exploration, and verified during excavation, was the presence of contaminated soils. With design revisions during construction, CGA assisted in identifying the limits of these areas and isolating them with a liner in order to prevent additional infiltration.

At the time of the design, the CGA engineering team incorporated a “draft”

version of the SUDAS (Statewide Urban Design and Specifications) standards for interlocking pavers. The SUDAS standards for interlocking pavers were not finalized until after the design was completed. They were on the leading edge of the logistics of the paver system the same time SUDAS was, and coordinated with the IEDA’s design review representative to refine the application as it pertains to this particular site.

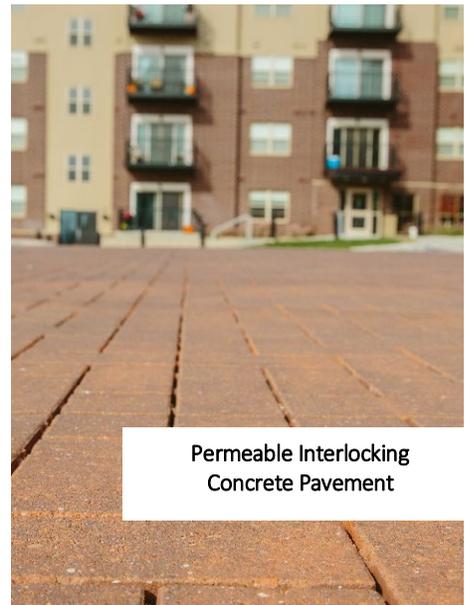
The sheer scale of the PICP system is an additional unique aspect. It was utilized over the entire parking area, made possible by a grant program coordinated by the IEDA. The goal with this funding was to go above and beyond the typical requirements of the Iowa Green Streets Criteria. With the use of PICP throughout the site, in conjunction with the bioswales and bioretention ponds, almost all runoff on-site is treated and detained.

Most permeable pavers incorporated for parking lots include painting of the stall lines and handicap spots. The Grand Crossing PICP Parking Lot utilized pavers with contrasting colors to designate these areas instead of paint.

This site could potentially be used as an example of zero-to-low runoff design and construction. With the use of multiple detention and infiltration techniques, in practice, sites such as these could be designed with zero runoff during flood level rainfall events, assisting in the reduction of localized flooding.

CGA also intends to study this site in the future to assess the long-term functionality of the system, particularly the ultimate site runoff.

A major limitation to the application of a PICP system is the cost, but the funding made possible through the IEDA allowed for a unique design opportunity. The CGA team was able to work with the owner and design the site within the budget and guidelines allowed by the IEDA coordinated grant. CGA, along with the owner and IEDA representatives, were able to successfully



Permeable Interlocking
Concrete Pavement

design a site that is attractive, treats pollutants at a higher rate than traditional detention systems, and met funding guidelines.



Grand Crossing PICP Parking Lot, Waterloo, IA

As the civil engineer, CGA is proud to be associated with this development, playing our part in the overall process. Sustainable design is at the heart of the Iowa Green Streets Initiative. The design incorporates permeable pavers, bioretention ponds and infiltration, all elements that reduce pollutants, peak runoff and runoff quantity.



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