SOLMAX

TECHNICAL NOTE

Concrete pullout report for GSE Polylock

The **GSE**® Polylock material is an HDPE concrete embedment strip designed to be imbedded into poured concrete to provide a welding surface for geomembranes. The three anchor fingers that are embedded in the concrete provide a high strength mechanical bond between the **GSE** Polylock and the concrete structure to the concrete. The purpose of this study was to evaluate the performance of the **GSE** Polylock concrete attachment. The performance measured is the loading at which the **GSE** Polylock was pulled out of concrete using direct pullout testing and lateral shear testing.

Direct pullout

Direct pullout of the **GSE** Polylock profile with a pull direction oriented perpendicular to the finished concrete surface was performed on samples of **GSE** Polylock three inches long embedded in concrete blocks 3 in x 18 in x 6 in (7.6 mm x 45.7 mm x 15.2 mm); see figure 1. A length of HDPE plank 1/4 in (0.64 mm) thick was extrusion welded to the top of each profile for pullout testing as shown in Figure 1.

After fabrication of a concrete block holder to replace the upper grip on the tensiometer, pullout testing of the profiles was performed using an Instron tensile tester at our laboratory. The pull orientation for this testing was performed at 90 degrees to the surface of the concrete.

Profile type	Peak load [Avg./3 in (7.6 mm) width]	Notes
GSE Polylock	1130 lb (5026 N)	Principal load on one leg

Table 1: Test results

The grip separation rate of the test was set at 2 in (5.0 mm) per minute. The test was conducted until one leg of the **GSE** Polylock profile pulled out of the concrete. The test was terminated at that point. The test results are summarized in Table 1.

Pullout testing of the **GSE** Polylock profile provided a distinct mode of failure. After initial loading and some elongation, the center leg of the profile pulled out of the concrete with localized cracking and breakout of the concrete surrounding the center leg.

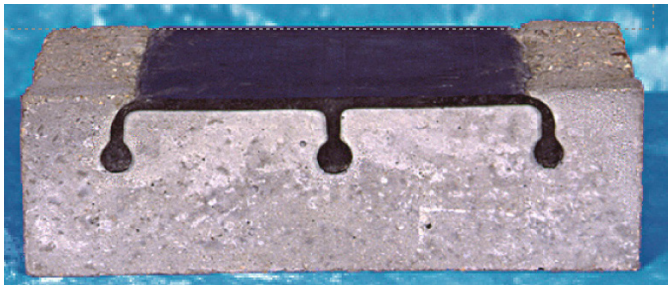

Figure 1: GSE Polylock sample embedded in concrete block

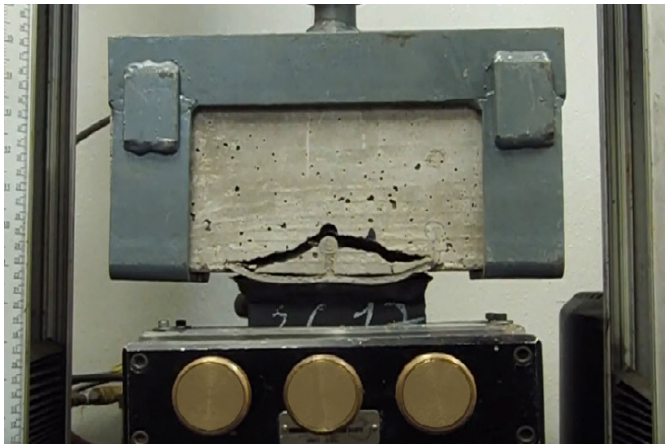

Figure 2: Direct pullout tests

This test configuration is 90 degrees to the loading typically encountered in service but demonstrates the pullout strength of **GSE** Polylock most directly. The typical service load geometry enables the embedment to exert more resistance to pull out due to the loading geometry.

Shear testing

Shear testing was performed on the **GSE** Polylock profile in a configuration that simulates the service loading condition to which the profile is typically subjected. The configuration, as shown in Figure 3, tests the weld connection in what is referred to as the shear mode.

Testing was accomplished by extrusion welding a 0.25 in (0.06 in) HDPE plank to the surface of the profile in a similar fashion to a geomembrane welded to the profile. A block holder was fabricated to replace the lower grip on the tensiometer to accommodate testing. The direction of pull was parallel to the surface of the profile as shown in Figure 3.

The grip separation rate for the shear test was set at 2 in (5.0 mm) per minute, and the test was conducted until rupture of the plank, the profile, or one leg of the profile pulled out of the concrete. Test results are summarized in Table 2.

Profile type	Peak load [Avg./3 in (7.6 mm) width]	Notes
GSE Polylock	2430 lb. (10,809 N)	Principal load on one leg

Table 2: Test results

Shear testing **GSE** Polylock in this service load condition yielded similar strength for the specimens dislodged from the concrete as for those that ruptured in the 0.25 in (0.64 mm) HDPE plank adjacent to the weld.

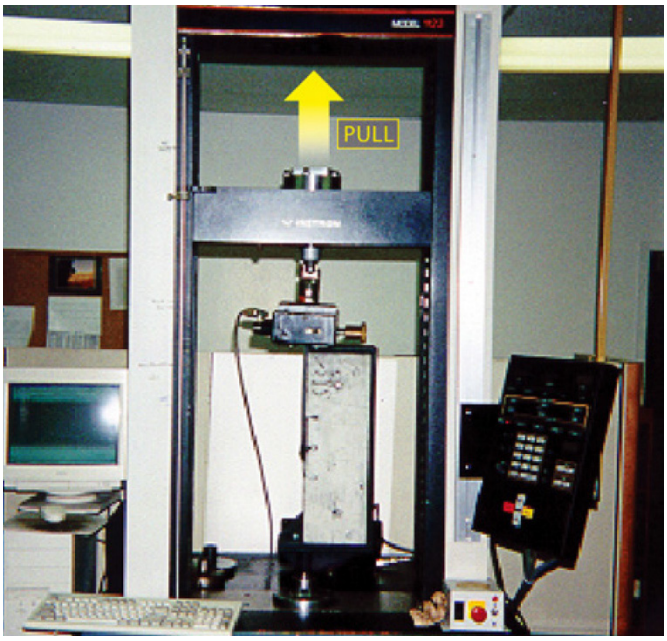

Figure 3: Shear mode testing

Conclusion

Pullout testing of the **GSE** Polylock profile indicates that the resistance to pullout of the profile from concrete is much greater than the loading applied by any geomembrane welded to the **GSE** Polylock surface during service. Testing shows that from typical service loading conditions (shear), the pullout resistance is generally two to three times that of any geomembrane.

The tests were conducted under controlled lab conditions and the variability of concrete type, quality of concrete placement, and other site specific issues are not addressed in this report. Therefore, each specific project should be addressed by an engineer familiar with the site specific conditions of the project.