Public Abstract
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Steel H-piles are small displacement deep foundation elements. Typically, H-piles are driven to/into a hard stratum and the axial capacity of the pile is derived from the end bearing of the pile tip on the hard stratum. However, H-piles can be and are used as friction piles. Presumably, if the side shear capacity of a given H-pile can be increased, the use and applicability of H-piles will also increase. Conventional H-piles have smooth flanges. The objective of the research presented was to evaluate the effect that texturing of the pile flanges has on the side shear capacity of an H-pile.

Experimental data was obtained from laboratory axial load tests on eight foot sections of smooth HP-piles and textured HPX-piles. The experimental apparatus includes a chamber assembly, reaction frame, bladder system, and instrumentation system. All tests were performed using clean poorly graded sand. The experimental apparatus was constructed such that the piles were not subjected to any end bearing; only side shear was measured. The load test procedure was based on of the ASTM D-1143 Quick Load Test Method. Axial load was applied via a hydraulic jack. Instrumentation included dial gauges for measuring pile settlement, a load cell for measuring axial load, and a pressure transducer to measure the bladder pressure.

The testing program consisted of eight series of load tests; three test series for HP 14x76 piles and five test series for HPX 14x76 piles. Each test series consisted of multiple load tests performed at vertical effective stresses ranging from approximately 1300 psf to 4000 psf. Pile settlement, axial load and bladder pressure were monitored and recorded for each load test. The unit weight of the sand was measured for each test series.

The ultimate unit side shear and side shear parameter ï•¢ were back calculated based on the ultimate pile capacity, pile-soil interface area, and vertical effective stress. The unit side shear was evaluated in terms of vertical effective stress. The side shear parameter ï•¢ was evaluated in terms of vertical effective stress and over consolidation ratio. Pile settlement at failure was also evaluated. Statistical analyses were performed for all evaluations to assess the significance of differences between the HP and HPX piles. The back calculated side shear parameter ï•¢ values were compared with typical literature values and the ultimate pile capacities were compared to side by side field load tests of HP and HPX piles.

Results from the laboratory testing program suggest that HPX-piles have approximately 10 percent greater side shear capacity than conventional HP-piles, on average. Unit side shear and the side shear parameter ï•¢ for both smooth and textured piles generally increased with increasing effective stress and increasing over consolidation ratio. HPX-piles were found to exhibit slightly greater settlement at failure than HP-piles, although scatter in the settlement data was significant.