

Model 288 Push Piers

Project: *Wainwright Hall*
Location: *Fort Riley, Kansas*
Date: *January 2015*

Challenge:

Wainwright Hall at the Fort Riley Military Reservation in north central Kansas was constructed in 1889. A 50-foot-long by 10-foot-wide porch in the southeast corner of the south wing was later enclosed using the same native cut limestone block as the original structure with the exterior walls and columns supported by a continuous concrete footing. This remodeled area settled away from the main structure.

A geotechnical investigation identified a general soil profile of up to seven feet of fat clay fill over variable alluvium consisting of lean clay, silt, and sand. The native soil was underlain by hard, weathered limestone bedrock, observed at 30 to 40 feet below grade.

Solution:

Design engineers determined that the poor condition of the existing footing would limit spanning capability of the foundation and the spacing of a retrofit pier system. Retrofit helical piers were originally considered, but later determined to be a less desirable option due to installation difficulties and the potential for group effects. A system of hydraulically-driven push piers was ultimately selected to permanently stabilize the settled portion of the building. Push piers can be installed at a relatively tight spacing, in difficult access conditions, and with smaller equipment.

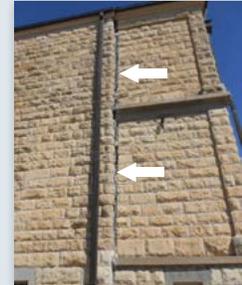
Thirty-six (36) Model 288 (2.875-inch OD by 0.165-inch wall) push piers were staggered along the inside and outside of the exterior walls at a two-foot, center-to-center spacing. The piers were installed opposite each other at the existing column locations. The footings were notched back to the face of the walls and the vertical and horizontal concrete surfaces trimmed smooth for uniform bearing against the retrofit bracket. The push piers were advanced to depths from 37 to 40 feet below grade to bear on the competent bedrock and achieve hydraulic fluid pressures of at least 4,000 psi, corresponding to approximately 56.7 kips of drive force. The piers were then connected in series to be simultaneously reloaded and locked off at a hydraulic pressure of approximately 2,650 psi, corresponding to 25.5 kips. The lock-off load greatly exceeded the design working load of 8.7 kips; however, care was taken during this process so as not to mobilize the structure (stabilize only). A factor of safety of at least 2.2 was achieved (FOS = drive load/lock-off load).

Project Summary

Project Engineer: *SFA Design Group, LLC*
Geotechnical Engineer: *Kleinfelder*
General Contractor: *Blinderman Construction Company*
Certified Installer: *Foundation Recovery Systems*
Products Installed: *(36) Foundation Supportworks® PP288 Push Piers, Depths from 37 to 40 feet, Design Working Load of 8.7 kips*



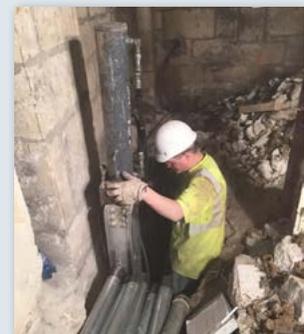
Southeast corner of wing experiencing settlement



Vertical crack observed on south face of corner



Trimming footing for retrofit bracket placement



Installing interior push piers



Installed piers at exterior corner