

The First Law of Foundation Stability: Buildings Built on Land Fill will Settle

Jackson County, Florida

This Renewable Energy Facility Building was built in 2004 on land fill. The 20,000 square foot single story building was constructed with slab on grade foundation, concrete block walls and steel truss roof supports. The construction documents showed that the building is supported on a 30 inch wide continuous grade beam situated 28 inches below the finished floor slab elevation. Concrete pads are present under multiple large 16 cylinder Caterpillar generators and other pieces of equipment, and equipment supports.



Google Earth historical aerial imagery showed the building straddles the west edge of a closed landfill cell. The original building plans have a detail for the over excavation of the unsuitable land fill materials. Evidence shows that this specification was skipped by the original contractor. The existing building shows signs of foundation movements and instability. These appeared as separations between the wall and floor slab, stair-step fractures and vertical cracks in the masonry work and differential movement with cracks in the floor slab. The east wall of the building showed lateral movement toward the east along with wall rotation causing several roof joists to pull away from the west wall bearing plates.



Foundation Piers Installed in 2011

In 2011 a local competing foundation repair company installed 75 push piers under parts of the east wall and floor slab on the south half of the building. There were areas of the concrete slab showing evidence where previous foundation work had been installed. Patches were visible on the interior and exterior masonry and on the slab. No foundation repairs were made on the north end of the building. The plant manager stated that after the previous foundation underpinning and repair was complete, some parts of the building were better than before and some parts were worse. The building continued to move both in the area of previous foundation work and in other portions of the building.

The owner hired Larry M. Jacobs & Associates in December 2016 to prepare a Geotechnical Exploration Report and requested Joe Derueil Associates, LLC to prepare plans in December 2018 prior...

Photos show 2 previously installed push piers, filthy perched water flowing from below the structure and a huge pile of decaying garbage removed at a pier location.





... to Foundation Professional of Florida being asked to inspect and prepare a repair and restoration plan based upon the engineers' findings.

The remediation procedure was designed to vertically and laterally stabilize the foundation of the structure. Recovering the lost floor elevation and vertically stabilizing it was accomplished by installing ECP Steel Piers that provide end bearing resistance against a verified and proof loaded tested stratum deep below the surface.

The lateral movement of the concrete footings required ECP Tieback Anchors attached to the ECP steel piers. There was also need for 20 slab piers to support, lift and stabilize the settlement and slab misalignments. At the locations of differential slab movement, the defects were corrected using ECP Torque Anchor compression piles connected to slab brackets. Steel angle supports were installed at the ends of 34 roof trusses to provide load bearing.

Foundation Professionals of Florida had to overcome several obstacles to complete the project. Many massive concrete bollard foundations were encountered and had to be removed to gain access for the installation machinery. The original underpinning placement plan had to be modified several times due to conflicts with the 75 previously installed piers from 2011. There were serious amounts of garbage and debris excavated from under the structure. Even though over-excavation of areas with land fill were specified originally, the building contractor failed to remove the debris and replace it with control fill. The existence of sub-surface garbage, liquids, and major debris caused major time delays. Over excavated foundations under canopy support were encountered and some footings were larger than specified on plans causing extra time and work to remove and replace.



Over excavated footing

Products Installed

- 38 - ECP PPB-350 Steel Piers - 3-1/2" outer diameter pier pipe with TAF-150-84 12-12-12, Torque Anchor Tieback Assemblies.
- 36 - ECP PPG-300 Steel Piers - 2-7/8" outer diameter pipe (without tieback assembly).
- 20 - ECP AB-288-HSB-T Torque Anchor Slab Brackets with TAF-288-84 10-10-10 2-7/8" diameter tubular helical screw piles.

