POWER LIFT FOUNDATION REPAIR INC.

PROJECT SUMMARY

LOAD TESTING PROGRAM

LOAD TESTING PROGRAM

Helical Piles have been in use for hundreds of years, and volumes of data are available concerning their installation and capacity. However, since Power Lift manufactures and installs project specific pile designs, we subscribe to the philosophy that custom designs should be field verified. Therefore on most of our projects, comprehensive full scale load testing in accordance with ASTM D1143 is conducted to the piles ultimate design capacity. The field data collected allows our design team to provide the most efficient design possible, while ensuring our piles deliver the support capacity our clients need.

POWER LIFT FOUNDATION REPAIR INC.

PROJECT SUMMARY

KROGER #539

Overview:
Owner: The Kroger Company, Inc.
General Contractor: McInnis Brothers Construction
Richard Harris (318) 861-0221
EOR: Smith Engineering, Inc.
Brian Smith (318) 741-1088
Specialty Engineer: Cutler-Gallaway Services, Inc.
Earl Cutler (210) 496-3326
Scheduled Completion Date: August, 2009
Contract Amount: $1,910,000.00
Maximum Column Load: 150 kip
Lift Amount: 8”

Project Description: Kroger #539 is located in a very high end shopping center bordered by Barnes & Noble and Starbucks. The Tilt wall structure was built over reclaimed land, and a 40’ deep filled gorge. Settlement began before construction was completed. Compaction grouting and installation of 430 minipiles failed to arrest the settlement which was measured at more than 12” which affected much of the store’s operation.

Subsurface Conditions: The additional 15’ of fill dirt needed to raise the site grade, coupled with the filled gorge overloaded and compressed the underlying soils creating a “drag down” effect which overloaded the original cast in place concrete shafts and the previous repair efforts. A dense sand layer located between 60’ and 70’ below grade was determined to offer the best solution for re-supporting the structure.

KROGER #539

Design Details: Driven piles were excluded from repair options due to the 12’ overhang, which would require removal of large portions of the roof, and substantial noise disturbance to neighboring stores, not to mention extended closure of the store. The EOR specified piles with 300 kip ultimate capacity providing a 2.0.1 factor of safety. Power Lift installed (118) 7” O.D. Helical Piles with 24” helical plates 1” thick to depths of 60’ to 80’.

The project consisted of providing piles to support and raise the existing tilt wall structure and support approximately 16,000 sq ft of new 8” thick suspended concrete floor. All work was completed while the store remained fully functional, closing only small areas at a time.

The piles were installed using specially designed attachments for Power Lift’s equipment allowing piles to be installed with as little as 12’ of headroom. In low overhead clearance areas the piles were installed in 10’ sections. A specialized process weld was developed to provide full penetration welds in approximately 10 minutes per connection. Each pile was installed to a minimum installation torque of more than 80,000 ft/lbs. to insure the 300 kip ultimate capacity was achieved. After all piles were installed, the structure was raised more than 8” using Power Lift’s proprietary lifting equipment and is now permanently supported on Power Lift Piles.

POWER LIFT FOUNDATION REPAIR INC.

PROJECT SUMMARY

KILGORE COLLEGE
PORTER BUSINESS BUILDING
FOUNDATION LEVELING

KILGORE COLLEGE – PORTER BUSINESS BLDG.

Overview:
EOR: Cothren, Graff, Smoak Engineering
Sam Graff (318) 687-3732
Specialty Engineer: Smith Engineering, Inc.
Brian Smith (318) 741-1088
Completion Date: June, 2009
Contract Amount: $131,000.00
Maximum Column Load: 194 kips
Lift Amount: $2^{3}/_{4}$”

Project Description: The multiple story concrete framed business building had experienced settlement for several years. Cracking of the masonry veneer, sloping interior floors, and inoperable doors were present as typical with most settlement problems. Tired of continual adjustments to maintain operations, the College decided underpinning was in order.

Subsurface Conditions: Expansive clays were present to a depth of 30’. The soil borings reflected desiccated soils in the upper 10’ to 15’, likely associated with large trees located close to the structure. A clayey shale formation was located at a depth of 20’ and beyond. The Engineer of Record determined that support elements bearing in the shale would be suitable for underpinning the structure. However, the contractor was charged for the complete design of the underpinning system.

KILGORE COLLEGE – PORTER BUSINESS BLDG.

Design Details: Power Lift worked with Smith Engineering, Inc., in designing a large capacity helical pile underpinning system for the project. 8-5/8" O.D. pile with ultimate capacities ranging to 300 kips were designed. The piles were equipped with multiple ¾" thick helical flights and were founded at depths of ± 25'. The foundation support brackets were equipped with sleeves to stiffen the piles in the high moment area due to the eccentric load. Once all piles were installed, foundation load was transferred to the new helical piles. The original concrete drilled shafts were severed from the grade beam and Power Lift's synchronized lifting system was utilized to raise the foundation to the correct elevation. Once raised, the piles were welded to the foundation support brackets and permanently supported on Power Lift's power torqued helical steel piles.

POWER LIFT FOUNDATION REPAIR INC.

PROJECT SUMMARY

RUSTON FURNANCE
ST. GOBAIN CONTAINERS

Overview:
Owner: St. Gobain Containers
Jack Creviston, P.E. (765) 741-7123
EOR: Smith Engineering, Inc.
Brian Smith (318) 741-1088
Completed Date: January, 2010
Contract Amount: $874,000.00
Maximum Column Load: 210 kips

Project Description: The St. Gobain Containers facility in Ruston, LA was established in the 1950's. In 1965, an additional furnace was added to increase production. Furnace #2 was supported on a 3' thick conventionally reinforced mat foundation. The furnace and foundation weighed in excess of 2-1/2 million pounds. Movement of the furnace had been observed for some time, but accelerated in the months leading up to repair.

Subsurface Conditions: Smith Engineering, Inc., was contacted to investigate the situation. As part of their investigation, multiple soil borings were taken around the site. Moisture accumulated in all borings and retrieved samples revealed water temperature of more than 100 degrees. Furthermore, the upper 10' of the soil mass was found to be saturated. As large volumes of water were utilized in the manufacturing

process, it was determined that leakage of below-grade drainage systems had allowed water infiltration into the soil mass reducing the soil's capacity, thus prompting settlement of the mat foundation.

Design Details: Due to the lack of access below the furnace and low overhead clearance, repair methods were very limited. This was compounded by the massive loads present to be re-supported. Bryan Smith, P.E., called upon Power Lift for repair recommendations. After considering the situation, driven steel piles were the selected repair option. 7" diameter .408 wall steel piles were advanced 30' below grade and founded in the shale formation. Specially designed anchorage assemblies were manufactured and installed by Power Lift to transmit the load of the mat and furnace onto the piles. The piles were installed in sections 8' in length and connected with full penetration welds. The piles were jacked to an ultimate capacity of 320 kips. After the piles were installed to the proper depth and capacity, the mat elevation was adjusted and secured to the anchorage assembly via welding the piles to the anchor plates. The site was fully restored and returned to operation while the plant was shut down between Christmas and New Year, with construction taking only 7 days to complete.

RUSTON FURNANCE – ST. GOBIAN CONTAINERS

POWER LIFT FOUNDATION REPAIR INC.

PROJECT SUMMARY

WATER TREATMENT PLANT

Overview:
Owner: City of Norman, Oklahoma
EOR: Frankfurt, Short, Bruza Oklahoma City, Oklahoma
General Contractor: BRB Contractors Topeka, Kansas
Average Drive Torque: 5,500 ft-lbs
Test Load: 30kips

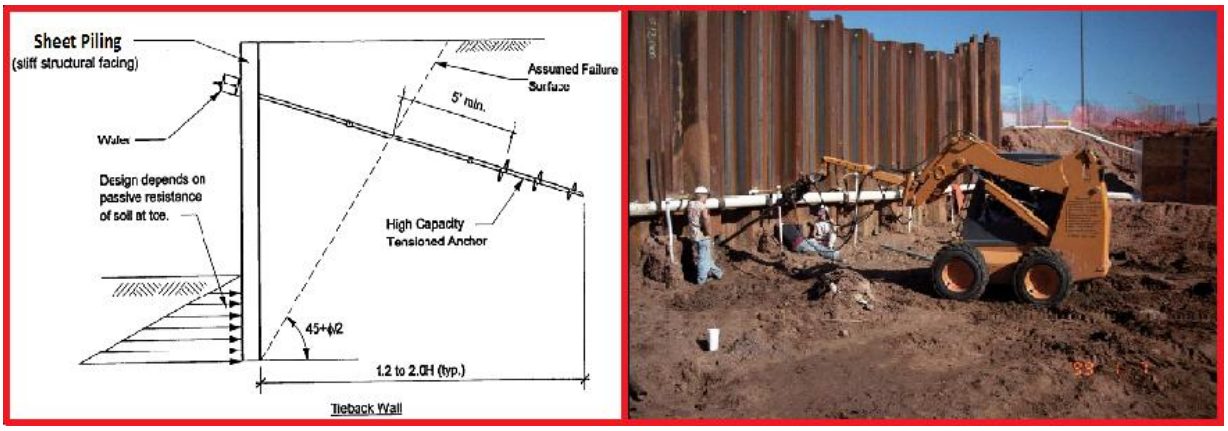
Project Description: The growing pains of most cities are felt first in the utility sector and Norman Oklahoma was not exempt. The expansion of the water treatment plant had a few obstacles to overcome the greatest of which was how to excavate 15 feet below grade without destroying existing equipment and structures. A sheet-metal wall was installed and Helical Tieback Anchors were employed to retain the soil directly below very sensitive equipment.

Soils Description: The water treatment plant was located near the south Canadian river and though Oklahoma is known for its red clay that was not what was encountered. The soil report showed sand to a depth of over 50 feet. The Standard Penetration Blow Counts for the sand ranged from 13 to 18. Based on the geotechnical data a multi-flight 8”-10”-12” helical tieback configuration was designed to provide the required resistance in the low blow count soil. This tieback anchor design provided easy and rapid penetration to a sufficient depth to achieve the 30 kip horizontal resistance required.

Solution: As excavation progressed, helical tieback anchors were used to stabilize the Sheet-pile wall shoring surface. The helical tieback anchors were installed through an opening cut in the sheet piling and the sheet piling was then secured with a short steel I-beam whaler. The helical tiebacks were installed quickly and immediately ready to load resulting in rapid project completion.

WATER TREATMENT PLANT

Per the EOR design the Piles were installed at the required angle as seen in (lower right) photo. As well, the design required that 33% of the Piles be proof loaded to the Ultimate Design Capacity before being locked off at the working load.



Each helical tieback anchor was driven to a desired installation torque. The sketch (upper left) shows the excavation and the proper angle specified to install the helical anchors. Once the helical anchors were installed a steel I-beam whaler was attached and proof loading was preformed to confirm capacity.

The project was finished on time, within budget and to the customer's satisfaction.

POWER LIFT FOUNDATION REPAIR INC.

PROJECT SUMMARY

ENTERGY SUPPLY WAREHOUSE

ENTERGY SUPPLY WAREHOUSE

Overview:
Owner: Entergy New Orleans, Inc.
General Contractor: Mapp Construction, LLC.
John Alberstadt (225) 330-4060
EOR: Harmon Engineering, LLC.
Matt Harmon (504) 552-4441
Completion Date: June, 2010
Contract Amount: $740,000.00
Ultimate Pile Capacity: 60 kip

Project Description: Entergy New Orleans, Inc., the electrical provider for the city of New Orleans and all of southern Louisiana maintains its central supply warehouse on Tulane Avenue in New Orleans. During the flooding related to recent hurricanes, their supply center was out of service during the most critical periods of service needs. To make the facility more functional, it was determined that existing warehouses would be demolished and the site grade raised approximately 3' so as to mitigate future additional flooding.

Subsurface Conditions: Soil borings reflected very poor soils with extremely low blow counts to a depth of 55'. A dense sand layer extended between 52' and 58'. The EOR specified 30 ton piles be founded in the deep sand layer to support the new structures.

ENTERGY SUPPLY WAREHOUSE

Solution: Power Lift manufactured and installed (470) 3-1/2" O.D. piles with 8", 10", 12", and 14" diameter, 3/8" thick flights. To increase the speed of installation, Power Lift manufactured the majority of the piles in 30' sections so as to reduce the number of couplings required. However, much of the site was congested with overhead power lines. In those areas, 15' pile segments were installed to insure Power Lift personnel's safety. The Power Lift crew installing the project averaged Approximately 20 piles per day and maintained the contractor's schedule.

The contractor provided flat pad sites for the warehouse buildings. A surveying firm established pile locations in the field and set installation stakes at each pile location. The layout was tied to a grid coordinate system which was downloaded to Power Lift's digital torque monitoring equipment. This allowed Power Lift to provide a digital installation log for every pile installed verifying installation torque and depth. Once pile installation was complete, the piles were cut off at the appropriate grade and pile caps were installed.

The grade was then raised to the required elevations, forms set, and the slab cast. Once the buildings were complete, the exterior grade was raised and all flatwork cast. The complex now complete should ensure that Entergy will always be able to rapidly respond to the city of New Orleans needs.

POWER LIFT FOUNDATION REPAIR INC.

PROJECT SUMMARY

ENNIS INTERMEDIATE SCHOOL

ENNIS INTERMEDIATE SCHOOL

Overview:
EOR: Thornton-Tomasettie
Pat Coleman (972) 387-8393
General Contractor: Harrison, Walker & Harper, LP
Hunter Moore (903) 785-1653
Specialty Engineer: Cutler-Gallaway Services, Inc.
Earl Cutler (210) 496-3326
Completion Date: September, 2002
Contract Amount: $679,322.00
Maximum Column Load: 302 kips

Project Description: Before construction was completed, substantial movement of the building had occurred. Litigation began prior to contract closeout. The structure had experienced movement in excess of 12" at the time work was undertaken, when the building was just 4 years old. The movement was wide spread and was affecting most all areas of the 45,000 sf middle school.

Subsurface Conditions: Extensive investigation determined the structure was suffering from substantial heave. The site consisted of highly expansive clay soils to depths of 40' – 45'. The original structural design called for over excavation to a depth of 7' and replacement of removed soil with select fill. Next, drilled shafts with bells were installed at a depth of 15' below grade. The shafts were designed to support suspended grade beams cast on carton void forms. Testing determined that deep seated heave was occurring which was actually lifting the drilled shafts, in turn lifting the perimeter grade beams. The heave resulted due to no provisions being made to drain the select fill.

ENNIS INTERMEDIATE SCHOOL

Power Lift entered a design/build contract with the construction manager, Harrison, Walker & Harper, LP, to develop a solution for the ongoing perimeter heave. Due to the magnitude of the problem, it was decided a complete re-support of the perimeter foundation would be necessary. The re-support focused on the installation of driven steel piles and abandonment of the existing drilled shafts.

Design Details: Small diameter driven steel piles were selected as the underpinning elements due to the strong likelihood for additional soil swelling. The slender steel shafts would provide the end bearing needed to carry the heavy loads if they were founded in the shale formation ± 40' below grade. But, due to the small surface area, soil adhesion would not likely produce uplift of the steel piles if sufficient load was placed on the piles. Power Lift provided specialty engineering for the project through an association with Cutler-Gallaway Services, Inc., San Antonio, TX. Earl Cutler, P.E., analyzed the structural loads and the building's design and designed an underpinning system utilizing Power Lift's proprietary driven steel pile foundation support systems. Nearly 400 piles were installed to re-support the entire perimeter foundation of the building. Column loads varied from 24 kips to 302 kips in the gymnasium area. After pile installation, the original drilled shafts were severed and the foundation adjusted as required utilizing Power Lift's synchronized jacking equipment.

POWER LIFT FOUNDATION REPAIR INC.

PROJECT SUMMARY

RENOVATIONS TO TAMU BLDG. #457 TAES ANNEX

Overview:
Owner: Texas A&M University
General Contractor: Alpha Building Corp.
Chris Jennings (979) 846-0100
EOR: Cutler-Gallaway Services, Inc.
Earl Cutler (210) 496-3326
Completion Date: September, 2004
Contract Amount: $194,960.00
Maximum Column Load: 384 kips

Project Description: This concrete framed building was built in 1934 as the original Animal Husbandry building. Founded on spot footings 10' – 12' below grade, the grade beams were isolated from the soil. The footing ranged in size from 6' x 6' to 8'- 6' x 8' – 6". The columns ranged from 18" x 24" to 30" x 30". With time the building was converted to offices and remodeled. Throughout the years, settlement progressed causing cracks throughout the building to the point that remediation was required.

Subsurface Conditions: Highly plastic clays were present to depths of more than 30' to where the underlying rock formation was located. Testing reveled the soils were very desiccated to depths beyond the footing depths. As the site was covered with mature Live Oak trees, it was clear the moisture removal by the trees had caused significant long-term shrinkage prompting settlement of the footings.

TEXAS A & M

Design Details: As the college did not wish to remove the trees, a deep foundation system was needed. When contacted to evaluate the problem, Power Lift recommended the engineering services of Cutler-Gallaway be retained. CGS, Inc. was recommended due to their vast experience in designing remedial solutions, intimate knowledge of the local soil conditions, construction methods utilized in the area, and their unsurpassed reputation for quality, integrity, and attention to detail.

From early on, it was clear the high column loads would be the greatest challenge of the project. This was compounded by the fact the top of the footings were 8' – 10' below grade. Power Lift worked closely with CGS in developing the most economical repair approach. It was determined that casting concrete collars around the columns would be necessary for the re-support. Sleeves were driven down to the top of the original footings and the footings cored. Depending on the column load, a series of piles ranging from 2 to 6 per collar, were driven through the sleeves and down to the rock strata at ± 35' below grade. Each pile was proofed to more than 100 kips each so that an appropriate factor of safety was achieved. In the areas where settlement was greatest, the column was severed below the collar and the structure raised as needed utilizing Power Lift's synchronized lifting system. Final support of the structure was left on Power Lift's piles.

TEXAS A & M

POWER LIFT FOUNDATION REPAIR INC.

PROJECT SUMMARY

QUAIL SPRINGS MALL

Overview:
Owner: Quail Springs Mall
EOR: L A Fuess Engineers, Dallas TX
Average Test Load 23,000 lb (Pier Cap)
29,000 lb. (Columns)
Average Drive Torque 7,500 ft-lbs

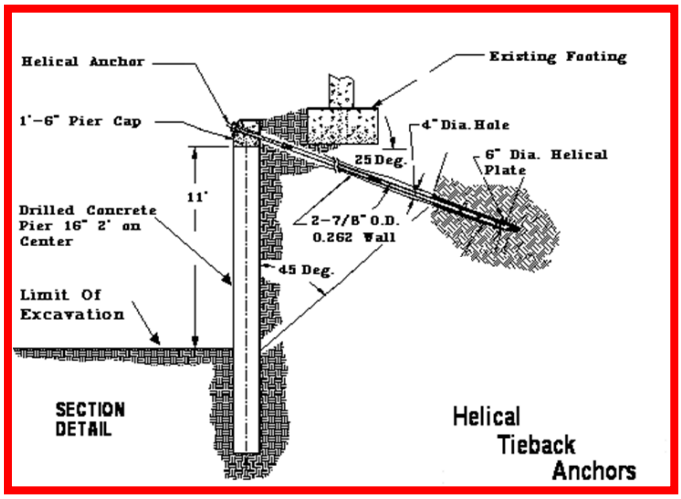
Project Description: A large multi-screen cinema was being constructed adjacent to existing structures at this Oklahoma City mall. The Engineers were concerned about collapse of the soil below the existing buildings if excavations were made near these structures. Drilled concrete soldier piles were needed due to the high surcharge load. A method to secure the tops of the soldier piles against lateral soil forces was also required.

Soils Description: The retail shopping center footings were constructed upon approximately three feet of clayey sand fill. Below this fill material was ten feet of clay and clayey shale. The Standard Penetration Blow Counts for the clay and clayey shale ranged from 23 to over 50. Conventional helical tieback anchors could not penetrate this material to a sufficient depth to provide the required resistance.

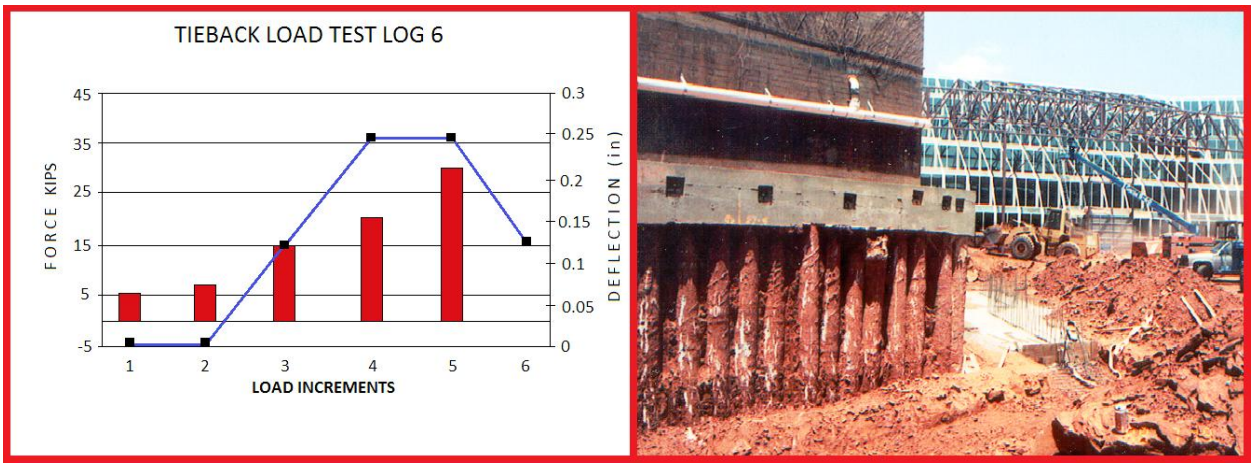
Solution: Four inch diameter holes were pre-drilled to a depth of 15 to 25 feet depending upon the soils encountered. This allowed the Helical Tieback Anchors to reach the targeted soil layers at depths of 16 to 26 feet. In some areas where space permitted, a pier cap was constructed and the Tiebacks were attached to the Pier Cap, in other areas with limited space, the helical tieback anchors were installed between the concrete piers and secured with a short steel I-beam whaler.

QUAIL SPRINGS MALL

Each helical tieback anchor was driven to a required installation torque and seated in the targeted bearing stratum. Each tieback anchor was proof tested to a load greater than required for the lateral support of the concrete piers. The sketch on the right shows the excavation needed to construct the new foundation for the cinema, and how the helical tieback anchors were installed below the footing of an existing building, into the targeted shale layer.



The problem was solved by working with the EOR and the General contractor to find a solution. Many ideas were presented. For example, Epoxy Grouted Rock Anchors were not feasible because of water seepage into the borings. The water diluted the epoxy grout and produced unacceptable strengths. Also, standard helical tieback anchors could not penetrate to the desired depth before exceeding their ultimate capacity in torsion.



VERIFIED RESULTS!

Each Helical Tieback Anchor was load test to verify the working capacity. The graph (upper left) shows actual test results from load test log on June 6 1998.

QUAIL SPRINGS MALL

POWER LIFT FOUNDATION REPAIR INC.

PROJECT SUMMARY

SANTA FE RANCH

Overview:
Owner: Santa Fe Ranch LTD.
Owner's Representative: Westdale Asset Mgmt.
Mike Charron (469) 628-5482
Specialty Engineer: Cutler-Gallaway Services, Inc.
Earl Cutler (210) 496-3326
Completion Date: January, 2008
Contract Amount: $2,092,668.20
Maximum Column Load: 110 kips
Lowering Amount: 12"

Project Description: Santa Fe Ranch is a luxury multi-family property located in Valley Ranch, Texas. Power Lift was contacted by the management company representing the owner concerning ongoing movement and related distress at the leasing office/clubhouse. Mike Charron, Construction Director for Westdale Asset Management, indicated the problems associated with the building's movement had steadily increased from the time the owner had purchased the building two years prior. An elevation survey conducted by Power Lift personnel revealed the five year old 8,000 sq. ft. structure had experienced more than 17" of differential movement.

Subsurface Conditions: Power Lift entered an investigative contract with Westdale to investigate the cause of the movement and develop an appropriate repair solution. The engineering firm, Cutler-Gallaway Services, Inc., was retained to assist in the investigative effort. Extensive geotechnical sampling was undertaken taken at multiple locations around the site to depths of 60'. Highly expansive clays extended to a depth of 40' with a shale formation underlying the expansive clay. The investigation determined the building's problem was due to swelling of the expansive soil causing foundation heave.

Design Details: Due to the nature of the soil present in the Las Colinas area, the only true corrective measures for this structure would have either been demolition and reconstruction or complete suspension of the structure above the expansive soils. Due to parking lot elevations, sidewalk grades, ADA compliance, and tie-ins to adjacent buildings, elevating the structure was not an option. As the owner felt demolition and reconstruction would be too damaging to their leasing efforts, the only practical solution was to lower the structure. **Furthermore, the owner charged Power Lift with the requirement that the building must remain fully operational during the entire construction activity**. Power Lift worked closely with Earl Cutler, P.E., to develop an underpinning, shoring, earth retention, and building stabilization plan that would improve the building's condition and isolate the foundation from volatile soil movements.

As the structure was built into a hillside with a deepened foundation on the downhill side, it was decided to underpin the west wall of the structure, remove a section of the west deepened foundation, and begin excavation eastward beneath the building. As the excavation progressed, shoring was erected beneath the structure for safety. As underpinning locations were exposed, driven steel piles were advanced through the unstable soil and seated in the shale at 45' below grade. Each pile was jacked to 100 kips installation capacity. The piles were comprised of multiple segments of 3", 3 ½ ", 4 ½ ", and 5 ½ " diameter pile material. Once excavation was complete and all piles had been installed, Power Lift's synchronized lifting system was utilized to lower the building more than 12". The piles were welded to the pile heads and secured

SANTA FE RANCH

permanently in place supporting the structure. Voids were established around the entire perimeter of the structure's foundation and void retainers installed around the exterior to prevent soil intrusion. Steel bracing was installed to provide lateral stability to the pile system. To anchor the building in place, two 36" diameter drilled shafts (one on each side of the building) were installed by Power Lift personnel and socketed into the shale to a depth of 55' below grade. The shafts were equipped with a pile cap that was doweled and anchored into the building to further stabilize the building against lateral movement. To restrain earth movement on the uphill side of the structure, 8 5/8" diameter helical soldier piles were installed every 24" to a depth of 50' and filled with grout. Wire fabric with a geo-membrane and coarse aggregate was installed across the entire uphill side of the building behind the soldier piles. Upon completion, a strip footing was poured across the west end and cast on-site wall panels were erected to retain the backfill along the outside. Float activated sump pumps and a power ventilation system were also installed. The structure remained fully functional during the entire project with the exception of the day of lowering. The owner was extremely pleased that leasing rates remained high and were unaffected throughout the construction.