CASE HISTORY

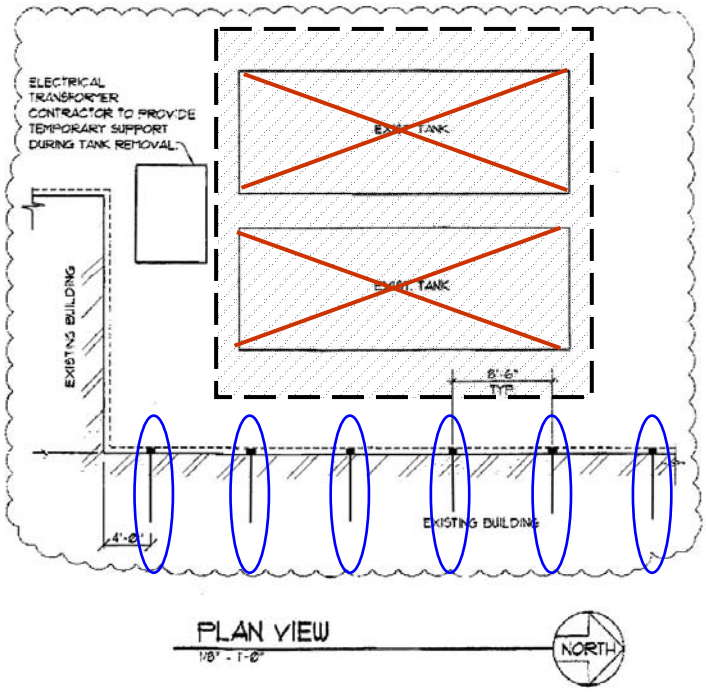
ECP STEEL PIERS™
ECP TORQUE ANCHORS™

Removal of Fuel Tanks near an Existing Structure
Brooklyn Center, MN

Earth Contact Products' Steel Piers™ with integral Torque Anchor™ tiebacks were selected to support this existing municipal bus facility while nearby fuel tanks were removed. The engineer determined that a loss of soil support from under the building's footings was possible and he wanted to provide supplemental lateral and vertical support during excavation operations.

ECP Model 350 Steel Piers™ were recommended for the vertical supplemental support along with Torque Anchor™ tieback anchors to lateral stabilization of the footing.

The plan below shows the engineer's sketch of the two storage tanks and the proximity to the existing structure. One can easily see from this scale drawing that soil could drift from under the footing of the building during the excavation and removal of the tanks. The engineer called for ECP Steel Piers™ with tiebacks to be installed at locations circled at the bottom of the plan.



Each pier was advanced through the soil until the pier encountered firm load bearing. Once firm bearing was reached, each ECP Steel Pier™ was field load tested to a proof load or test force averaging 33,467 pounds. This method of individually testing each pier after reaching end resistance provided verification that the bearing stratum was suitable for support of the perimeter beam. The test results confirmed, on average, a factor of safety of 1.5 between the field load test and the steel pier working loads.

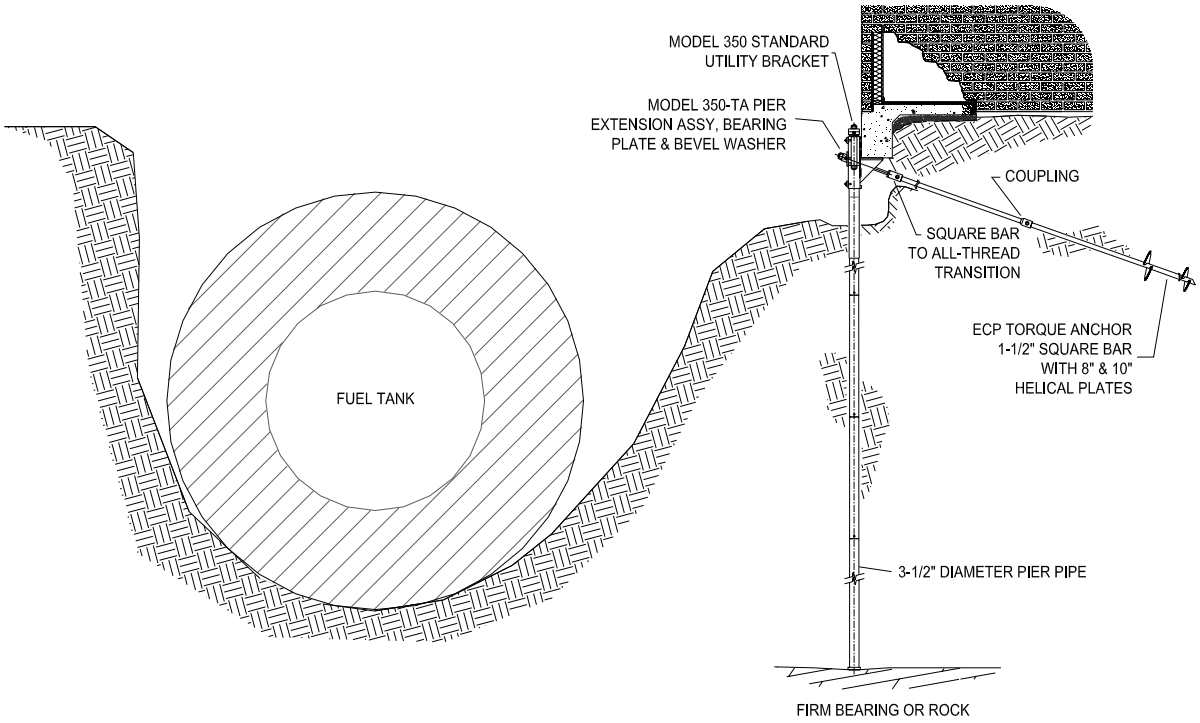
During installation of the ECP Steel Piers™ end bearing was encountered at a shallower depth than anticipated. The engineer decided to reduce the design loading of the steel piers by increasing the number of pier placements to nine thus reducing the working loads on each pier. These additional pier placements did not require tiebacks because the original tieback design loading was achieved with six Torque Anchors™.

Project Summary	
Project:	Fuel Tank Removal
Installing Contractor:	Lipe Brothers Construction, Inc Duluth, MN
Design Engineer:	Structural Design Associates, Inc Champlin, MN
Tieback Installed:	TAF-150 8-10 Torque Anchor™
Number of Placements:	6 Tiebacks
Average Install Length:	10.3 ft
Average Install Torsion:	2,400 ft-lb
Average Working Load:	12,000 lb
Steel Pier Installed:	ECP Model 350 Steel Pier™
Number of Placements:	9 Piers
Average Pier Depth:	15 ft
Ultimate Capacity Rating:	99,000 lb
Average Pier Test Load:	33,467 lb
Avg. Pier Working Load:	22,333 lb
Factor of Safety:	1.5 : 1 Test Load to Working Load 4.4 : 1 Ultimate Rating To Working Load

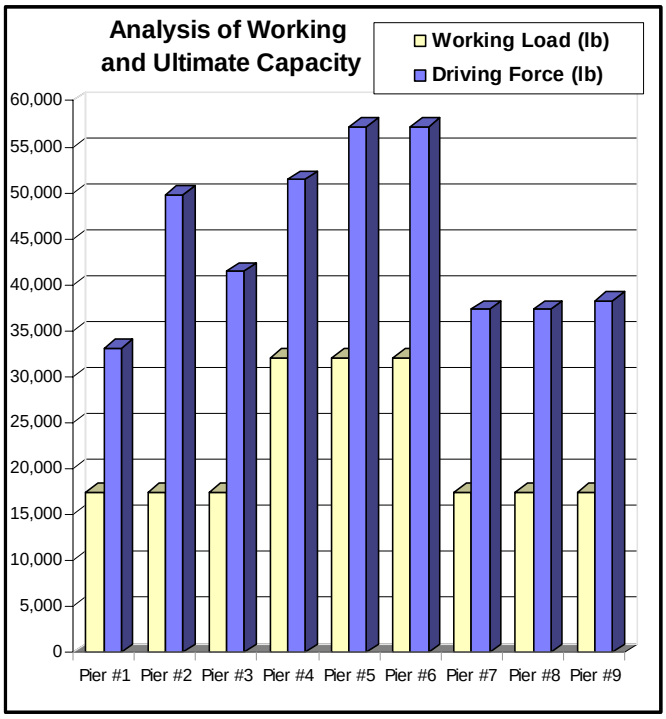
The photo at upper right shows a hydraulic motor installed on a backhoe being used advance a Torque Anchor™ tieback under the structure. Once accomplished, technicians installed the pier driving equipment against the wall. Notice that the footing has been carefully notched to place the pier bracket under the structural wall. The final configuration of ECP Steel Pier™ and Torque Anchor™ tieback is shown left.

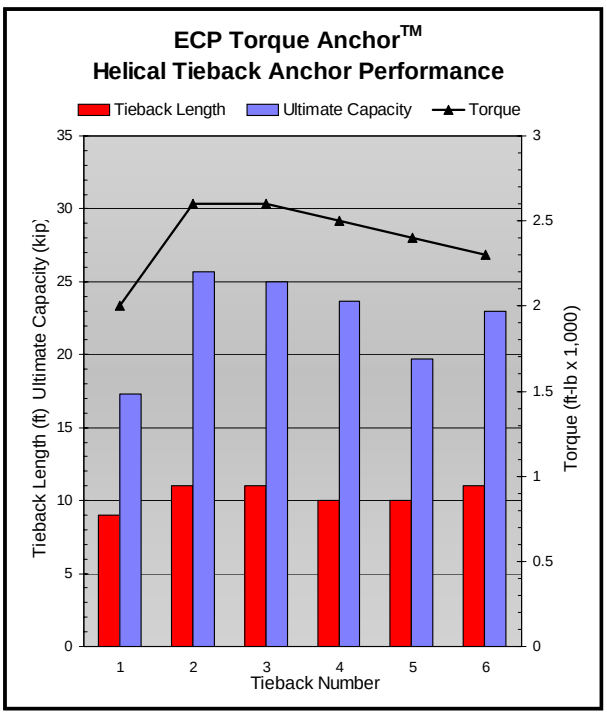
Once the supplemental supports were in place, excavation and removal of the fuel tanks began. The progress is shown below. The photograph at lower left shows the tops of the two fuel tanks. The pier placement locations along the wall are also visible. The photograph at lower right demonstrates the size of the fuel tanks and why the engineer chose ECP products to stabilize the building during tank removal operations.

ELEVATION VIEW OF THE CONSTRUCTION SITE



The elevation sketch above shows that basic configuration of the project. One can see the engineer's concern for loss of soil support from under the structure during tank removal. The graph below left represents the factor of safety demonstrated by the field load testing during the ECP Steel Pier™ installation process. Each pier was tested to a load approximately one and one-half times the working load. The right graph presents the Torque Anchor™ tieback installation data showing the installed tieback length along with the relationship between installation torsion and ultimate tieback capacity.





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