



Solar Power Substation Lifted and Supported by 186 ECP Steel Resistance™ Piers

Central, California



This part of the substation is where a huge transformer and wiring framework settled and needed underpinning.

This solar power substation in Central California was damaged by an earthquake at the beginning of 2020. The earthquake caused settlement of transformers and other structures within the substation. Some foundations dropped as much as six inches. The movements at column foundations caused misalignment of the framing for the electrical distribution structures. This distress had the owner considering suspending plant operations because the framing misalignments were causing serious stress to the high voltage cables.



Technicians are preparing the transformer footing for bracket installation.

The massive transformer seen above needed to be lifted and restored to the original elevation. The special foundation for the huge transformer was designed to contain transformer oil leakage. If the transformer leaked, oil would be held within a four foot deep well surrounding the transformer pad. The load of the transformer needed to be supported with piers adjacent to the transformer pad. Additionally, underpinning was required at the outer perimeter of the oil containment foundation.



Workers are installing wall mount pier brackets on the transformer footing.

Some of the project's towers were constructed on thirty foot deep concrete caissons. This project required raising a number of these large concrete caissons. The design required surface mounted curved brackets on opposite sides of each caisson. The dual pile system allowed lifting of the tower foundations back into place. This corrected the misalignments and stress on the electrical cables. ECP had experience designing and producing a similar concave surface mount plate bracket that was installed on round concrete caissons in New England in 2009. Producing a similar bracket design for this application was not difficult.



Hydraulic jacks are used to lift the transformer and footing.

The design and specifications were prepared by Waypoint Engineering of Vancouver, Washington 98660. The design called for ECP PPB-350 WM Flat Wall Mounted Brackets along with ECP PPB-350 WM Curved Wall Mounted Brackets. The 124 placements used 3-1/2 inch diameter tubular pier pipe. In addition, 62 ECP PPB-300 Eccentric Underpinning Brackets were installed to lift and level the building structures. The PPB-300 ECP Steel Pier™ System mounts under the footing and uses a three inch diameter tubular pier pipe. The average installed depth was 35 feet below grade.



The special concave column mounted bracket is shown.

All piers were proof load tested before being loaded. Once an entire structure was underpinned and tested, hydraulic jacks at each pier gently and carefully recovered lost elevation and restored the structure to specifications.



This is a view of a completed pier installation on a caisson.

Because electric generation is produced during sunlight hours, the restoration work had to be completed at night and the work took two months to complete.



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