



## CASE STUDY

## Duct Bank Construction

### DESCRIPTION

E&E Construction was contracted to perform deep trench excavation, shoring, and installation of 3,600 linear feet of concrete-encased conduit duct banks within a major maintenance rail yard.

This project presented significant challenges due to incomplete designs, highly unstable soil conditions, intersecting (existing) utilities including high voltage lines and active firewater, storm drains, and sewer lines. In addition, a complex combination of shoring including hydraulic jacks and sheeting, trench shields, lag and beam, and slide rail shoring had to be installed with some trenches situated within 15 feet of active energized rail lines.

### MAIN TASKS

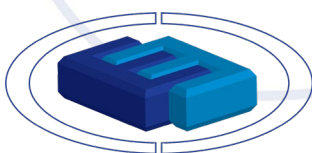
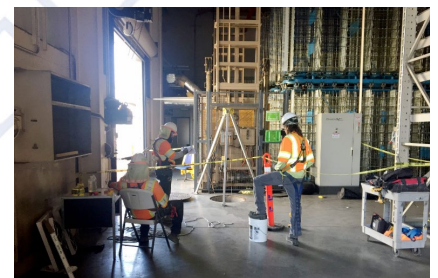
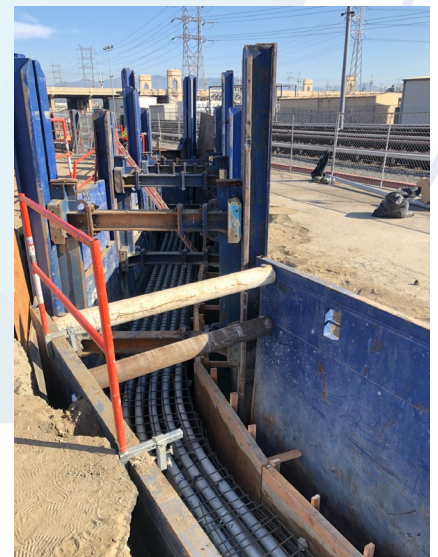
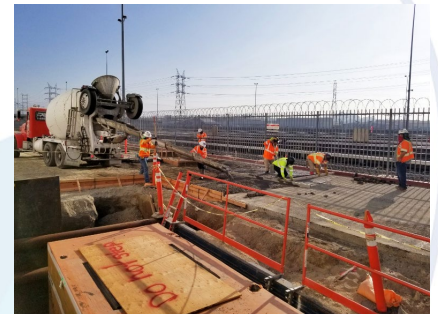
- The primary tasks included trenching and shoring to as deep as 16 feet below ground surface (BGS) and ranging from 4' to 20' wide.
- Installation of stacked electrical conduits ranging from 3" to 6" in diameter within dense rebar cages, forming and pouring of encasement concrete and subsequent backfilling with 1 and 2 sack slurry. The number of conduits within the duct bank lines ranged from 3 to 36.
- Existing underground duct banks and other utilities had to be either suspended in place or removed and replaced.
- A total of 9 large precast manhole vaults were installed using a combination of 60, 90, and 140-ton cranes.
- The project also included installation grounding for all new duct banks, installation of temporary power including new power panels, and installation of concrete pads

### CHALLENGES

The design of the duct bank was not complete at the outset of the project and E&E had to work very closely with the design team to overcome many obstacles and unforeseen conditions. Every duct bank line required realignment and some of the vaults required repositioning. The soil was a very dry, loose, sandy material (Class C). Extensive shoring including slide rail and lag and beam had to be designed quickly and constructed for the deep trenching, unstable soil conditions, and potential hazards caused by rail carloads and associated vibration in close proximity. Existing, concrete encased high voltage duct banks and other active utilities frequently (diagonally) intersected trench paths requiring the building of support structures below and above the conflict points. Rebar cages for the duct bank were built both as pre-assemblies before placing in the trench and in other instances built in the trench to go below existing utilities.

### INTERESTING POINTS

Due to incomplete as-built data of existing utilities, to avoid unforeseen underground hazards and to help validate the data, E&E employed a hydro-vac subcontractor to open exploratory trenches preceding any excavation activities. Adding to the complexity, E&E had to build the structures in non-continuous segments to keep the project advancing while real-time design changes were being developed. No injuries were sustained throughout the year-long execution of the project. The E&E project was executed within the same footprint of a large maintenance building demolition project and was completed while the next contractor was staging railroad track and welding equipment for track welding operations that would ultimately occupy the areas where E&E was executing its work. Throughout the duration of the project rail operations were only suspended on one track for one week.



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