



BUILDING

Micropiles

PROVO CITY TEMPLE

Provo, Utah, USA



Owner:

Church of Jesus Christ of Latter Day Saints

General Contractor:

Jacobsen Construction

Duration of Work:

Two Years

Subsurface Conditions:

Alluvial sands and gravels overlying sensitive lacustrine clay deposits

Approximate Key Quantities:

Micropiles 136

Needle Beams 48

The Provo City Center Tabernacle was damaged by a fire on December 17, 2010, that left only the brick façade and rubble foundation. The façade was immediately braced to preserve its integrity with the goal of incorporating it into the rebuilding plan. Just two years later, The Provo City Planning Commission approved plans that gave the Church the needed space to construct an impressive new Temple with over 85,000 square feet from the shell and spires of the old Tabernacle.

PROJECT BACKGROUND

Intense preservation and design work were required in order to begin construction on the new Provo City Temple. Care was taken to preserve

the original historic beauty of the exterior, and the new structure’s interior components were modeled after the originals.

The original limestone foundation, which was four feet thick and five feet deep, was removed and the excavated stone was donated to the City of Provo. Archeological finds during the excavation were preserved and displayed at Brigham Young University’s Museum of People and Cultures.

The site is located in the Wasatch Range of alluvial fan sands and gravels overlying very sensitive lacustrine clay deposits. The surficial water table was nearly 20 feet below existing



(1) Excavation with micropiles at Provo Temple (2) Micropiles at Provo Temple

grade. These site conditions created an environment that required closely coordinated construction efforts, and tight tolerances on dynamic variables.

Nicholson was tasked with developing and constructing an elaborate underpinning system so that two levels of basement could be constructed below the structure. This work also included construction of a support of excavation system around the entire complex and a groundwater cutoff wall and dewater system around the new Temple. The underpinning system was monitored by SolData to assure that the performance was consistent with the design expectations.

THE WORK

Installation of 140 temporary 12-inch micropiles were installed to a depth of 90 feet immediately adjacent to the mortar and cobble foundation. Next, sections of the original foundation were removed and twin “needle” beams were installed at 56 locations and supported by the micropiles. The piles were pre-loaded with hydraulic jacks. A race to excavate 25,000 cubic yards began around the building as welders and steel workers braced the exposed piles.

A 710-foot long, 53-foot deep cutoff wall was constructed using a mixture of existing soil, cement, and bentonite slurry outside the footprint of the structure in 72 hours. This trench effectively created the sides of a bath tub around the building to hold back the water as a second phase of excavation below the original water table began.

Four dewatering wells and two monitoring wells were installed during this hustle to drain the tub in concert with the excavation. The cutoff wall stopped the dewatering effort from extending beyond the basement to not consolidate or overstress the sensitive clay, which would cause significant settlement of adjacent properties. The next tier of bracing was installed, and the remaining 20 feet of soil was excavated.

Arriving at design grade, 390 permanent piles (most on 2 foot centers) along the perimeter were installed to support the basement walls of the Temple.

Additional scope included the installation of a 20-25-foot deep beam and lagging retaining walls with tiebacks around the two city blocks perimeter. In areas that were below the water

table, jet grout was used as the lagging in order to control the inflow of groundwater.

THE RESULT

When finished, the Temple will consist of four levels - two above and two below ground, plus an underground parking garage. The upper levels include the chapel, endowment rooms, sealing rooms, lobbies, and offices, while the lower levels feature the baptistry, dressing rooms, offices, and bride room. Parking lots will be both above and below ground. Extensive landscaping- public gardens, benches, a fountain, and a Victorian pavilion- will adorn the lawns of the finished Temple.

Despite dealing with harsh conditions such as sub-zero temperatures, high winds, and frozen ground, the work for this high-profile project was completed on schedule, and with the interest and support of the local community.

The Temple will serve both the local Provo community and neighboring communities. Expected completion for the entire complex is in late 2015.