

PROJECT PROFILE

ANCHORED RC DIAPHRAGM WALL FOR DEEP EXCAVATION SUPPORT



Drilling associated with inclined anchor installation at Cambridge Hospital.

D'Appolonia designed an anchored, reinforced-concrete (RC) diaphragm wall associated with the construction of a below-grade parking garage and hospital facility expansion at the Cambridge Hospital in Cambridge, Massachusetts. The reinforced-concrete diaphragm wall was designed to provide temporary excavation support, to serve as the permanent exterior wall of the parking garage, and to act as the foundation wall for a multi-story addition to the existing hospital.

The excavation depths associated with the parking garage and hospital expansion generally ranged from 39 to 55 feet, and much of this interval consisted of soft marine clay. The wall design was complicated by the presence of the soft marine clays, perched groundwater horizons, a confined sand and gravel aquifer, and the location of sensitive nearby structures. The excavation as planned extended far below the footings for the existing hospital, abutted the right-of-way of a major roadway and utility corridor, and was located very close to several historic structures. Therefore, movements related to wall deflections, stress relief in the soils,

ground water drawdown, and soil loss during anchor drilling were major considerations in the wall design.

The initial design for the reinforced-concrete diaphragm wall was based on design criteria and loadings developed by the owner's engineer. The owner

determined that the excavation support costs were too high based on the design requirements and solicited input on possible cost-saving concepts from various design-build teams. In cooperation with Nicholson Construction Company, D'Appolonia conducted a supplemental subsurface exploration program to obtain more detailed geotechnical parameters that would allow better characterization of the soil behavior models for the generalized subsurface layers and to better define appropriate design ground water conditions at the site.

Based upon the data from the subsurface exploration program, D'Appolonia formulated a finite element model for analyzing the various excavation stages and key construction tasks (e.g., anchor stressing) of the anchored, reinforced-concrete diaphragm wall and for predicting the attendant movements associated with each stage. D'Appolonia was able to achieve a substantial reduction in the required number of tieback anchors and in the total embedment depth of the reinforced-concrete diaphragm wall panels, thus allowing the project to be completed to meet the owner's objectives.



View of foundation excavation with anchored diaphragm wall in place.