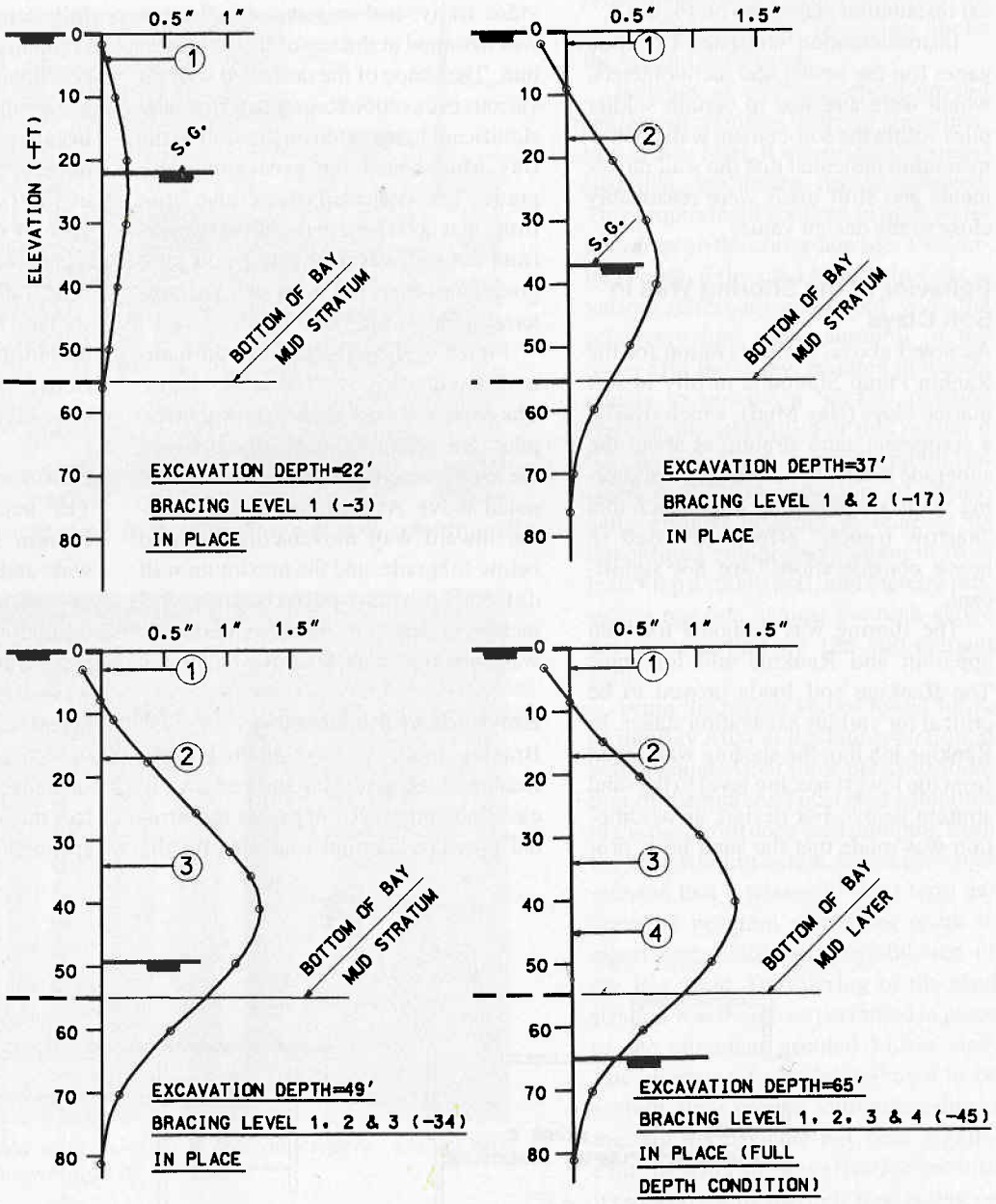
COMBINED

to the sand layer, with the soft Bay Mud providing little or no support to the walls.

In these cases with deep excavations in soft clays, adequate toe support for the wall is essential. If in-situ soils provide insufficient passive pressure (for needed toe support), then remedial methods can be taken to increase the available toe support. In sands or gravels, methods such as grouting or dewatering can be used successfully to support large horizontal pressures (including hydrostatic pressures), and provide effective toe support.

With a known soil stratigraphy, well defined soil properties, and the existence of a competent soil stratum for toe support at subgrade, wall deflection and bracing loads can be predicted accurately. Predictions can be made from commonly-used geotechnical theory and elastic beam analysis, without the necessity of using sophisticated computer modeling such as the finite element method.

This project shows the limitations and potential dangers in the use of equivalent trapezoidal soil diagrams where the soft clays extend to large depths below the bottom of excavation. Many designers model active soil loads in the shape of a trapezoid which ends at the subgrade; in this model the soils below subgrade are assumed to provide a reaction to the shoring wall. In this case with deep and soft clays, the use of such a model is inappropriate, and can lead to adverse consequences (including failure of the wall and shoring).



WALL DEFLECTION AT VARIOUS STAGES OF EXCAVATION

Figure 5

Notes

David Berti is a Principal and Kumar Singh is an Associate at Jacobs Associates, San Francisco. They designed the shoring and performed construction related activities for the City of San Francisco. James Chia is Project Manager of the Rankin Pump Station for the Department of Public Works, City and County of San Francisco.

The Contractor is a joint venture of Amoroso and Kulchin-Condon & Associates. Mike Webster is Project Manager and Jerry Brown is Project Superintendent. Bill Bydewell and C. John Daughrity were in charge of shoring fabrication and installation. John Barsky is the Resident Engineer for the Bureau of Engineering, the project Construction Manager.

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