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The Application Research and Discussion on a Viaduct Artificial Excavated Pile Technology

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Abstract: A viaduct of the Qinghai expressway fourth contract was artificial excavated piles. The construction technical work was regarded as an example. The technical comparison were done between the artificial excavated pile and the bored pile on the pile foundation bearing capacity and the retaining wall effect. The artificial excavated pile replacing the bored pile was feasible, and the construction technology and the key problems of the artificial excavated piles were confirmed. The references were provided to the similar projects.

The project summary

The Malan to Lincun section design standards of the Qinghai expressway are two-way six lanes, a speed of 120 km/h and load level I. It is typical demonstration for environmental protection engineering.

A viaduct of the Malan section of the fourth contract is the pile foundation. The pile diameter were 1.8m and 1.5m, the pile length 20m. A 1.8m × 1.2m excavated pile caps are arranged between the pile foundation and the pier. The diameter of the under pier is 1.6m, 1.3m upper pier. The pier column average height is above 18 m.

The type choice of pile foundation

The design is bored pile at first. As considering the construction cost and the environmental protection, the artificial excavated pile is adopted at last. The bored pile is priority on the highway bridge pile foundation design at the present. So the design of pile foundation do not specifically targeted at appropriate holes formation of operation to excavated pile design. Therefore, this design of excavated pile work in its technology and feasibility analysis.

The technical basis of changing bored pile to excavated pile as follows.

- The bearing system of the original design is weak weathered shale rocks, the excavated pile construction is permissible in regulation.
- The basic geological condition in the strong and weak level joints weathered limestone and clay shale. The stability of surrounding rocks is good after excavation pile bore hole. Because the geological condition is good and ground water levels is deep (or no groundwater), so the bored pile is replaced by excavated pile construction. In addition, the excavated pile of concrete city meeting quality is better than bored pile of underwater concrete construction quality.
- Pile perimeter (U) and the pile bottom section area (A). The retaining wall of excavated pile adopts stepped-weir concrete supporting slurry-supported. Compared with drilling pile, the pile bottom diameter increases 30m to 40m, then $U_{exc} > U_{bored}$, $A_{exc} > A_{bored}$, so the bearing capacity of the pile digging general than bored pile.
- The clear coefficient of the hole bottom soil deposition influence (m). Drilling pile bottom sediment layer is difficult to clean up. Its ply is commonly 0.4 ~ 0.6, and dug hole pile bottom is no sediment, so the excavated pile bearing capacity is higher than bored pile.

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