



Columns and Pile Caps: A Solid Connection

When completed, the new bridge at the Port of Long Beach will be one of the tallest bridges of its kind in the United States. With two 515-foot towers and a majestic cable-stayed design, the new bridge will be visible for miles and an icon for Long Beach and Southern California.

From the Ground Up

The Gerald Desmond Bridge Replacement Project includes an important support system made up of piles, pile caps and columns. Construction begins underground with 351 drilled piles at depths down to 175 feet. These piles are built in precise clusters to support columns and the two towers. The latest and safest construction techniques are being used to design and construct the bridge.

Connecting the Piles

Connecting most of the nearly 100 columns to their pile clusters requires construction of pile caps.

These large reinforced concrete slabs – some the size of small buildings – are built atop the pile cluster to evenly distribute the weight of a column into the piles. Pile cap construction begins with building a lower “rebar mat” placed through the rebar cages that extend up from the finished piles. Once the lower rebar mat is complete, crews carefully lift the first column rebar cage (or section) into place. Rebar cages for bridge columns are constructed nearby. A crane operator positions the rebar cage over the partially constructed pile cap rebar. With cage in position, an upper rebar mat is installed to join the pile cluster to the column

rebar cage and complete the reinforced pile cap frame. A concrete pour completes the pile cap resulting in a joined unit linking below-ground foundations with an above-ground column.

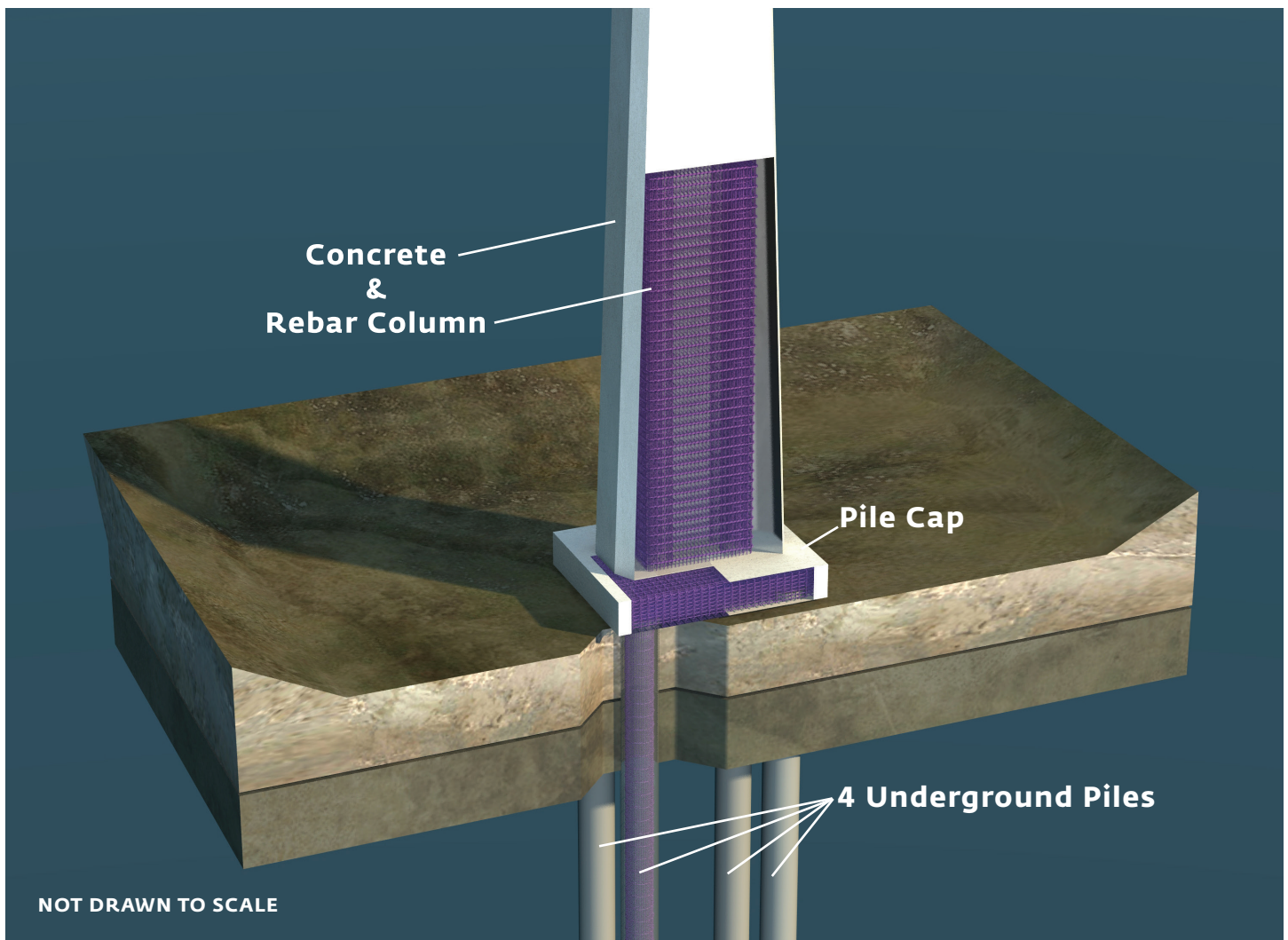
Column Construction

With a pile cap in place, crews can begin constructing the remainder of the column in segments. The new bridge will feature both solid and hollow columns. Solid columns will support the lower sections of the bridge’s east and west approaches, and on- and off-ramps. Hollow construction is used for the higher elevations.

The initial section of a steel-reinforced concrete hollow column is 60 feet tall on average. The rest of a column is built in 20-foot sections using custom-made forms on the inside and outside. Once concrete cures at a lower section, the next section begins with lifting the inside formwork, lowering a pre-made rebar cage into position, and connecting to the completed section below. Once the reinforcement is secure, the outer formwork is lifted into place and secured. Forms are “closed” into position for a concrete pour. When the concrete cures, the forms are moved upward into position for the next section.

QUICK FACTS:

- Each pile, pile cap and column is designed specifically for the unique soil conditions where it will be built. Soil borings were taken at each location to determine the foundation design.
- Pile caps for columns will range in size from 36 square feet across by 9 feet tall, to 48 square feet across and 14 feet tall.
- Approach structure columns are rectangular, with widths that range from about 8 to 12 feet. Widths grow with column height.
- Solid columns range in height from 23 feet to 75 feet. Hollow columns will range in height from 75 feet to 180 feet
- Pile caps for most columns will use at least 30 truckloads of concrete to build.
- Purple epoxy-coated rebar is used within the lower column sections to prevent rust.



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