



Gerald Desmond Bridge Replacement Project

Caltrans • Metro • Port of Long Beach • US Department of Transportation

FACT SHEET



Foundations of a New Icon

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.

Yet, one of the bridge's key features will be invisible – the underground foundations that support the entire structure.

Sound Engineering Technique

Bridge construction begins with a solid underground foundation. This new bridge will be supported by about 350 foundation piles constructed in the ground at depths down to 175 feet below the surface, with poured concrete and inserted steel rebar in pre-dug holes. This technique builds a “cast-in-drilled-hole” (CIDH) pile and is different than traditional pile driving, where the piles are constructed first and then pounded into the ground.

To dig the foundation holes, a large metal temporary casing is drilled into the ground with an oscillator. One-by-one, sections of steel casings are pushed down to the correct depth, as the soil is removed from inside the casing area. Next, a rebar cage is lowered into the hole and the hole is filled with concrete. The temporary steel casing is extracted as the hole is being filled with concrete. The pile is “cast” in place in the drilled hole.



A steel casing is removed from a pile during a concrete pour.

The final step is to inject grout under high pressure to the very bottom of the pile. This “tip grouting” strengthens the soil at the bottom of the shaft and prevents the possibility of settling.

A single pile may bisect alternating layers of clay, silt, sand and multiple aquifers. Construction crews will carefully monitor groundwater. The aquifers are under pressure and water will try to force its way up. During the pile construction, crews will maintain even pressure in the hole to ensure there is no upward movement of groundwater from the deeper layers.

Connecting the Piles

Each cluster of foundation piles will be connected by a pile cap, a thick concrete pad that rests atop several piles. Each pile cap will support one of the approximately 90 bridge columns. Pile caps distribute the heavy weight from the column equally across the piles.

Some of the larger pile caps for the bridge's approach columns will measure 48 feet wide and 14 feet tall, requiring nearly 1,200 cubic yards of concrete. The biggest pile caps for the two main

towers will require 3,150 cubic yards of concrete. A single cement truck usually holds about 10 cubic yards, so each tower pile cap will require more than 300 truckloads of concrete!

Once the piles and pile caps are constructed and tested, crews will then begin building the columns to support the two approaches.

QUICK FACTS:

- The bridge foundation piles will be constructed in the ground from 102 feet to nearly 175 feet in length.
- The pile widths range from 5, 6 or 8 feet in diameter.
- Each pile will be tested for strength upon completion using a sophisticated gamma-gamma logging test.
- Collectively, each cluster of piles, the pile cap and supporting column is known as a "bent."

- Each bent is designed specifically for the unique soil conditions in which it will be built. Soil borings were taken at each location to determine the foundation design.
- Most bent locations will have four piles. However, under each tower, there will be 12 piles.

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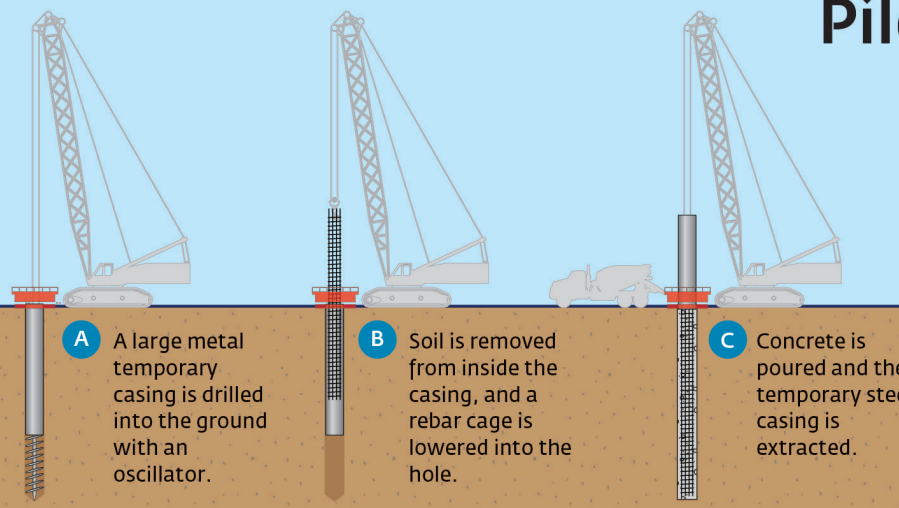
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Pile Preparation

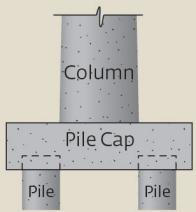
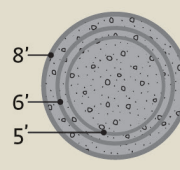
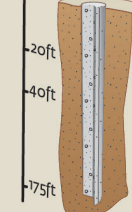


A A large metal temporary casing is drilled into the ground with an oscillator.

B Soil is removed from inside the casing, and a rebar cage is lowered into the hole.

C Concrete is poured and the temporary steel casing is extracted.

D The final step involves injecting grout under high pressure to the bottom of the pile. Ensuring there is no loose or partially compacted soil at the bottom of the shaft, preventing settling.

<h3>Bent</h3> <p>Each supporting column, pile cap and cluster of piles is known as a "bent."</p> 	<h3>Width</h3> <p>Piles have 5, 6, or 8 foot diameters.</p> 	<h3>Depth</h3> <p>About 350 piles will be constructed to depths of 102 ft. to 175 ft.</p> 
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