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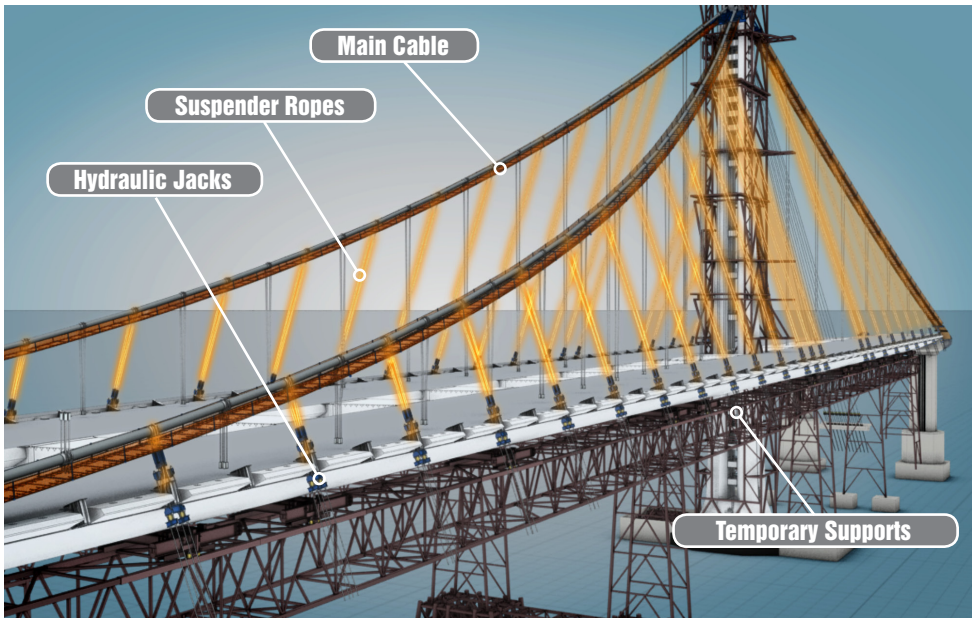
SELF-ANCHORED SUSPENSION SPAN (SAS)

LOAD TRANSFER COMPLETION

American Bridge/Fluor Enterprises: Contractor
T.Y. Lin International/Moffatt & Nichol: Bridge Designers



The Self-Anchored Suspension Span (SAS), the signature element of the new East Span, is the largest bridge of its kind in the world. With the successful completion of load transfer, the 2,047-foot span has raised the bridge building bar to new heights.

Traditional suspension bridges, such as the Bay Bridge's West Span and the Golden Gate Bridge, have towers with two main cables that tie into anchorages in the ground. After the suspender cables are attached to the main cable, the deck is hung from the cables.

The SAS is self-anchoring with one main cable that anchors to the decks, so the roadway must be built first. Building a different kind of suspension bridge such as the SAS required a different kind of construction strategy. With nothing to hold up the roadway, a temporary support structure was required—20,000 tons of steel to support the approximately 35,200-ton span during construction. With the temporary supports in place, crews first built the road-decks and tower, then anchored the cable into the roadways.

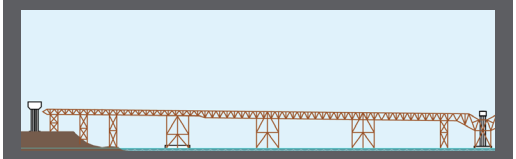
Once the road-decks, tower, main cable and suspender ropes were placed, construction crews began the time- and labor-intensive process of transferring the weight of the span from the temporary supports to the main cable, a process known as load transfer.

Two hundred steel wire suspender ropes, attached to 114 cable bands along the main cable, are gradually tensioned by hydraulic jacks (each exerting up to 400-tons of force) located along the outside of the road-decks. When 104 of the 200 ropes were tensioned, the decks began to compress and lift up from the temporary supports, becoming self-anchored and self-supporting. The remaining 96 ropes were attached to help distribute the weight among the ropes and main cable evenly.

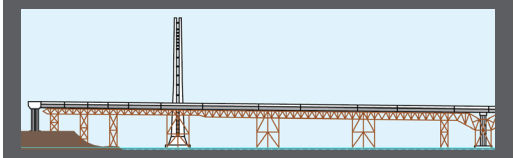
As the cable took the weight of the decks, the cable moved approximately 30 feet out and 16 feet down; the suspender ropes also stretched as they were tensioned.

As the superstructure compressed and lifted, workers were busy at the west end of the span and at the single, 525-foot-tall tower working to equalize tension on the main cable.

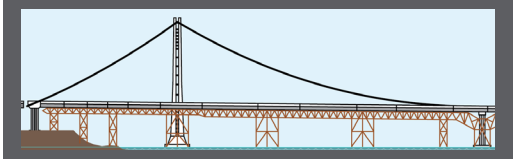
BUILDING A SELF-ANCHORED SUSPENSION SPAN



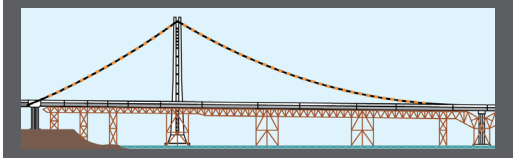
CONSTRUCT TEMPORARY SUPPORTS



ERECT DECK SEGMENTS ON TEMPORARY SUPPORTS AND CONSTRUCT TOWER



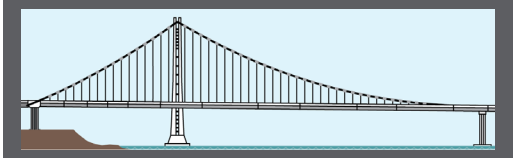
CONSTRUCT MAIN CABLE



INSTALL CABLE BANDS

HANG SUSPENDER ROPES

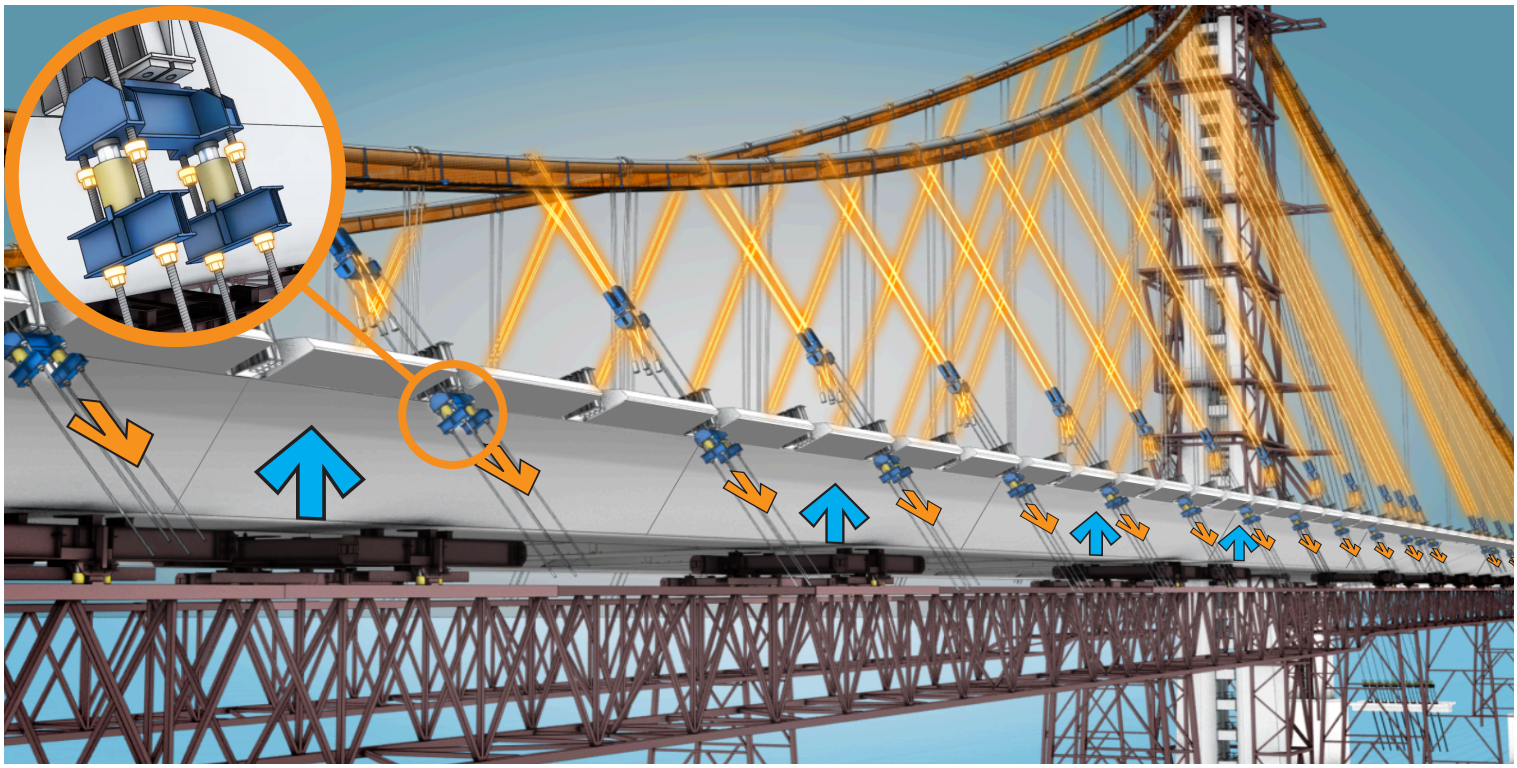
LOAD TRANSFER



REMOVE TEMPORARY SUPPORTS

SELF-ANCHORED SUSPENSION SPAN (SAS)

LOAD TRANSFER COMPLETION



As The Suspender Ropes Were Tensioned, The Decks Lifted Into Place

TENSION SUSPENDER ROPES

TRANSFER LOAD TO SUSPENDER ROPES AND MAIN CABLE

DECKS LIFT UP FROM TEMPORARY SUPPORTS

The tensioning of the suspender ropes exerted force on the main cable. A jacking saddle at the west end maintains balance on that part of the bridge. Hydraulic jacks exerting up to 4,800 tons of force pushed the cable west in small increments until equilibrium throughout the cable was achieved. Protective steel shrouds were then placed around the cable near the saddles.

Due to the bridge's asymmetrical design, the tower naturally leans eastward as it is loaded with the weight of the bridge decks so crews pulled the top of the tower 18 inches to the west, using temporary cables anchored into the bedrock of Yerba Buena Island. As the load transfer process took place, the tower was slowly released from the temporary anchorage, allowing it to return to its vertical position.

Now that load transfer has been successfully completed, crews will start to remove the bridge's temporary supports. Workers have begun coating the main cable with a zinc paste then wrapping the cable with interlocking steel strands, or S-wire. Crews are currently painting suspender ropes and, once the main cable is completely encased in S-wire, it will be painted as well.

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