Zeitschrift: IABSE structures = Constructions AIPC = IVBH Bauwerke

Band: 11 (1987)

Heft: C-42: Recent structures

Artikel: Sunshine Skyway Bridge across Tampa Bay, FL (USA)

Autor: Aeberhard, H.U.

DOI: https://doi.org/10.5169/seals-20386

7. Sunshine Skyway Bridge across Tampa Bay, FL (USA)

Owner:	*State of Florida, Department of Transportation*
Engineer:	*Figg & Muller Engineers, Inc., Tallahassee, Fla.*
Contractor:	*Paschen Contractors, Inc., Chicago, Ill.*
Stay Cables and Post-tensioning:	*VSL Corporation, Los Gatos, CA, USA*
Construction time:	*1983 – 1987*

Introduction

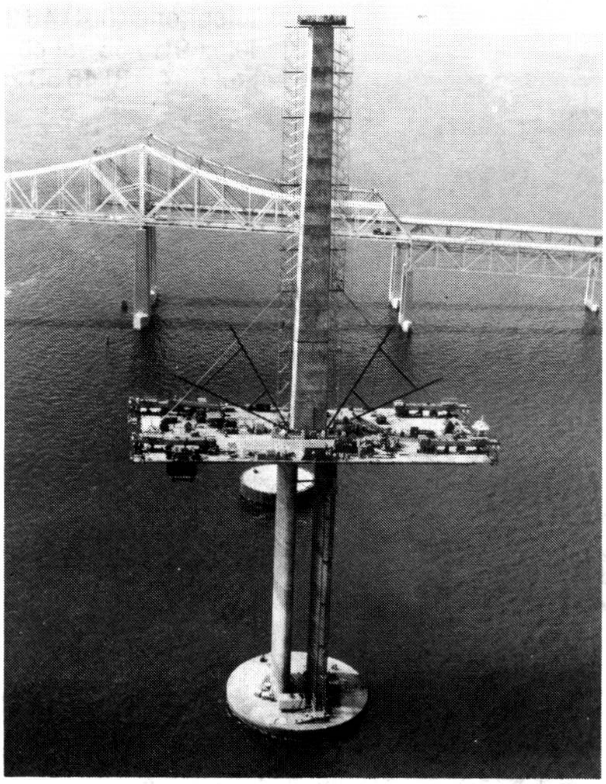
The new Sunshine Skyway Bridge replaces a 6.75 km long section of the original structure caused to collapse in May 1980 when a tanker rammed one of the main piers. The new bridge includes a cable-stayed part with spans of 164.59–365.76–164.59 m which provides a clear navigation opening of 304.80 × 53.34 m. Construction of the new section commenced in early 1983. The crossing was opened to traffic in April 1987 (Fig. 1).

Construction of the main spans

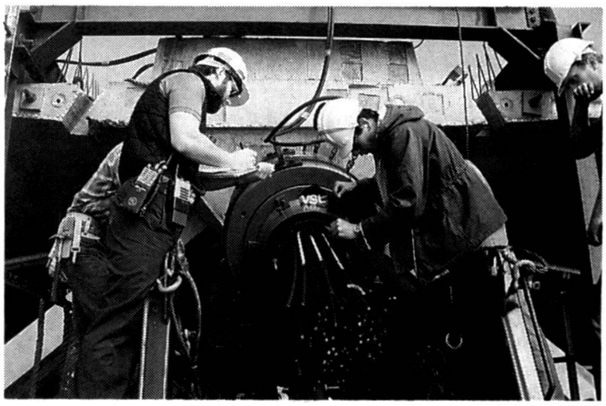
The first tower of the cable-stayed portion was completed in April 1985 and the second in July 1985. After completion of a main pier, a starting section of the superstructure was built from three precast segments joined together with in-situ concrete. On this section, two winching devices were erected, which hoisted the precast segments from the barge. An adhesive was then applied and the raised segments were finally pressed against the already built superstructure. Post-tensioning cables were subsequently installed and stressed.

After seven segments had been positioned on each side, the first stay cables wre installed (Fig. 2). This was done for the first time in July 1985. At each cantilever, two further segments were then fitted, after which the next stay cable was placed. This cycle continued until the thirty-fourth segment on each side had been placed. At this point, the free cantilever of the stayed side span met the cantilever from the shorter span, to which it was connected by in-situ concrete. Free cantilevering then continued in the central span to the forty-eighth segment. A forty-ninth segment was finally fitted on one cantilever and the cantilevers of the centre span were concreted together. This was accomplished in August 1986.

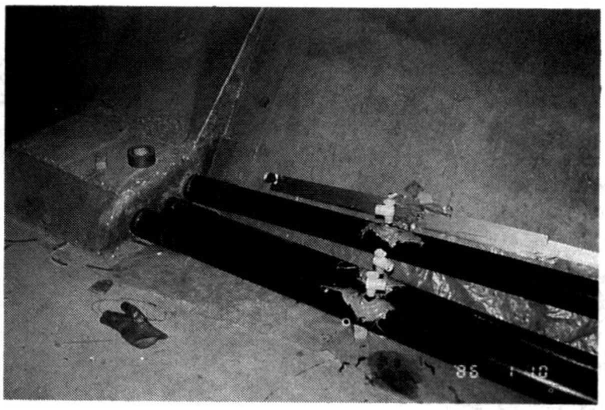
View during construction, clearly showing the various parts of the structure



View after installation of the first stay cable at a main pier



Stressing a VSL Stay Cable



VSL post-tensioning cables located inside the box of the superstructure

Fabrication and installation of the Stay Cables

The VSL Stay Cables were fabricated on the deck of the already completed approach spans. The yard was an unroofed area of approx. 10×400m, starting 50m behind the first stay cable anchorage and extending along the longitudinal bridge axis. The strands were pulled out from the dispensers by means of a truck and passed through a channel containing water-soluble oil. When the required number of strands had been extracted and cut, the strands were protected by capping the trough with wooden planks. To enable the cable to be pulled through, a hock device was fitted at both ends.

In parallel with the fabrication of the VSL Stay Cables, fabrication of the stay pipes was also carried out. The pipes were usually supplied in standard lengths of 10m. These were set on trestles, aligned, ajusted and then welded together. For erection, the stay pipe was prepared in three portions on each side of the tower. A special device consiting of a movable supporting system was used for erection of the stay pipe. The elements of this system, called «bicycles», were made of two congruent crosses of structural steel profiles. A winch system was used for moving the bicycles.

Once the whole stay pipe was assembled, it was pulled up to its final position. The messenger cable passing through the pipe was coupled to the one in the saddle pipe and the top end of the stay pipe was provisionally welded to the protruding saddle pipe. The messenger cable, thus running throughout the stay pipe, was then used for feeding in the main pulling cable. This pulling cable was used for pulling in the stay cable. A hold-back winch was also used. As soon as the main pulling cable had reached the anchorage at the back span side, the hold-back winch took over. When the frontend reached the anchorage at the main span side, the cable was drawn out to provide sufficient extra length for stressing.

Stressing the Stay Cables; Post-tensioning of the deck

The VSL Stay Cables were stressed at both ends simultaneously, which necessitated special coordination. For handling the 2.5 tonnes jacks, a manipulator was used on each cantilever side. The cable was stressed to an initial jacking force of approx. 20% of UTS. After the next two segments were placed, the stay cable was restressed by increasing the force to approx. 40% UTS. The longer stays were retensioned agin once the structure had been made continuous (Fig. 3).

The deck segments were provided with transverse and vertical VSL. Post-tensioning in the precasting yard. For the free cantilevered condition, before the stay cables were installed, a relatively small longitudinal prestress in the deck slab was sufficient. External cables were pulled through to provide for the live load moments, temperature gradients, creep and shrinkage (Fig. 4).

(H.U. Aeberhard)