

World's Longest Suspension Bridge

High-level bridge cable building and material technologies



A full-scale model of a main cable of the Akashi Kaikyo Bridge: The cable measures 1.12 meters in diameter and consists of 290 strands each having 127 galvanized high-strength steel wires

The Akashi Kaikyo Bridge, spanning the Akashi Strait (Akashi Kaikyo) in the Seto Inland Sea of Japan, opened to traffic on April 5, 1998. It is the world's longest suspension bridge with a center span of 1,991 m, far surpassing the heretofore longest span of 1,410 m of the Humber Bridge in England. Its towers rise 297 m above sea level — the world's tallest. The bridge is designed to withstand maximum wind velocity of 80 m/sec. and massive earthquakes of 8.5 in magnitude and a frequency of 150 years.

Because conventional technologies were inapplicable to such an unprecedentedly large bridge, pioneering bridge cable engineering and steel materials were called for, in which Nippon Steel was deeply involved.

Bridge Engineering

Among Nippon Steel's major contributions were the following three:

- **Pilot rope stringing** — The Akashi Strait is a heavily-trafficked sea route through which about 1,400 vessels pass each day. Because of the difficulties of pilot rope stringing from the sea accompanied by closure of the navigation routes, pilot ropes were strung by helicopter — the world's first attempt of this kind.

- **Catwalks** — In order to provide rigid and lightweight catwalks, 200 kgf/mm² high-strength galvanized steel wire was used in portions of the catwalk ropes. Further, newly-developed dampers were installed to secure catwalk safety.

- **Cable strand and hanger rope installation** — In order to install as many as 290 very long wire strands per side efficiently, two erection lines were installed per side, resulting in shortened cable erection time. For hanger ropes, NEW-PWS, shop-coated with polyethylene and developed by Nippon Steel, was adopted. NEW-PWS hanger rope does not require conventional on-site coating and is maintenance-free.

Newly-developed High-strength Steel Wire

For the main cables of the bridge, 180 kgf/mm² high-strength steel wire was developed. Application of this high-strength wire enabled the bridge to

be constructed with only a single cable per side. If conventional 160 kgf/mm² steel wire had been used, two cables per side — a total of four main cables — would have been required. Additional advantages gained from the adoption of a single cable per side were reduced mass of the cable anchorages and lower tower height, thus bringing about a substantial reduction in the amount of steel materials used, reduced construction term and a lowering of cost by 20% from the initially estimated total construction cost. From the aspect of environmental considerations, this high-strength wire can be highly assessed as a product conducive to environmental protection.

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