Cable Damper of Meiko-Nishi Cable-Stayed Bridge

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1. GENERAL

Meiko-Nishi Bridge, which is under construction in Nagoya Harbor, Japan, is a steel cable-stayed bridge with three spans of (175+405+175m) . The box-girder type with an orthotropic deck is a trapezoidal 3-cell box-sections with the depth of 2.8 m. Pylons are A-frame fixed to piers. The longitudinal cable configuration is the fan type of twelve stay cables. This bridge was closed on July 16, 1984, and will be completed on April, 1985.

2. EARTHQUAKE RESISTANCE DESIGN

The construction site which is located in the strong seismic zone is in rather poor geotechnical condition. In the earthquake resistance design, following earthquakes are considered. The one is expected to occur 2～3 times for 100 years with M=8.0 for the epicentral distance of 100 km, and the other is expected to occur 4～5 times with M=7.0 for the epicentral distance of 50 km, in which M is the magnitude. Therefore, the design of pylons and substructures needs special considerations to the longitudinal earthquake force. The degree of horizontal connection between pylon and girder is one of the most important influence factors against the earthquake response, because of the large mass of the stiffened girders. Meiko-Nishi Bridge has been installed horizontal cables, called cable dampers, in the connection of pylon and girder to reduce the horizontal forces to the pylon from the stiffened girders. The earthquake force will be reduced, because the cable dampers give lower natural frequency and larger system damping to the structure.

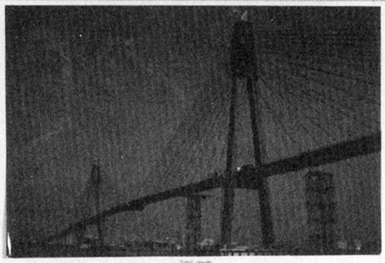
3. DIMENSION OF CABLE DAMPER

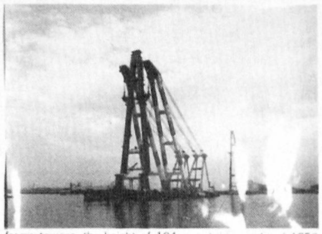
Material	2 bandles of 61 galvanized 7-wire strands
Length (L)	43.2m
Area (A)	$62.6\ cm^2 \times 2 = 125.2\ cm^2$
Modulus of Elasticity (E)	$1.9 \times 10^7 t/m^2$
EA/L	$5.5 \times 10^3 t/m$
Prestretching	Center Span ——— 440 t
	Side Span ——— 415 t

CABLE DAMPER OF MEIKO-NISHI CABLE STAYED BRIDGE

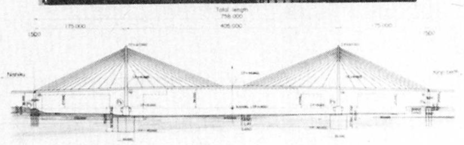
Meiko-Nishi Bridge, which is under construction in Nagoya Harbor, Japan, is a steel cable-stayed bridge with three spans of (175 + 405 + 175m). The box-girder type with an orthotropic deck is a trapezoidal 3-cell box-sections with the depth of 2.8 m. Pylons are A-frame fixed to piers. The longitudinal cable configuration is the fan type of twelve stay cables.

Meiko-Nishi Bridge has been installed horizontal cables (2 bandles of 61 galvanized 7-wire strands) with the length of 43.2 m, called cable dampers, in the connection of pylon and girder to reduce the horizontal forces to the pylon from the stiffened girders. The earthquake force will be reduced, because the cable dampers give lower natural frequency and larger system damping to the structure.

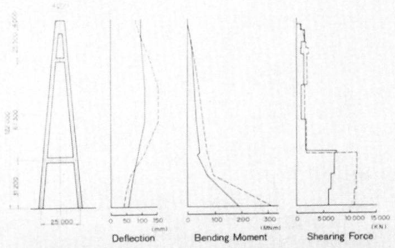




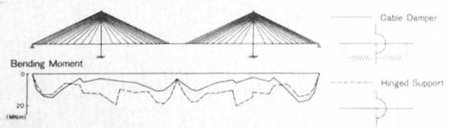
A-frame towers, the height of 104 m and the weight of 1250 ton, were hoisted into place by a 3000-ton floating crane in July, 1983



GENERAL VIEW

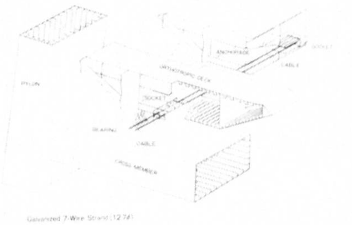


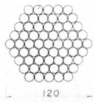
PYLON



GIRDER

DYNAMIC RESPONSES OF THE BRIDGE SYSTEM CONNECTED BETWEEN PYLON AND GIRDER BY CABLE DAMPER AND BY HINGED SUPPORT





SECTION OF CABLE DAMPER

DESIGN CONDITION OF CABLE DAMPER

Area		62.59 cm²
Length		43.2 m
Design Load	Temperature	3567 KN
	Earthquake	10664 KN
Ultimate Load		10858 KN