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Outline of Yoshima Bridge

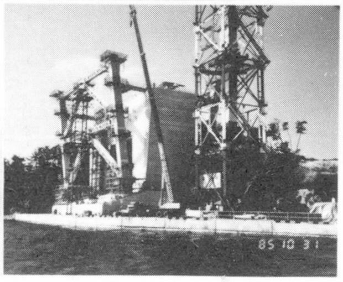
Weight	(Truss)	15,540 ton
	(Floor system)	5,510
	(Others)	4,050
	Total	25,100

CONSTRUCTION OF YOSHIMA BRIDGE

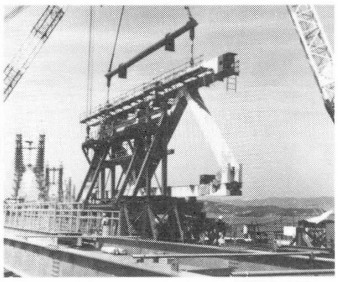
Honshu-Shikoku Bridge Authority

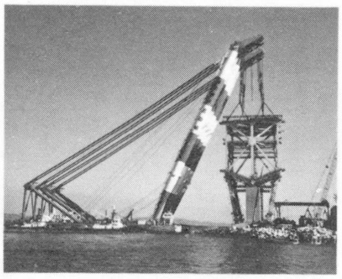
The main truss of Yoshima bridge was erected by two methods. For the 1st step, large block was erected using floating crane on the intermediate support.
Other members were erected by balanced cantilever method. These methods were adopted considering topographic condition and limitation of carrying capacity of floating crane.
As a result of this method, the fabrication error and erection error will be accumulated to the closing panel at the center of span.
Therefore,

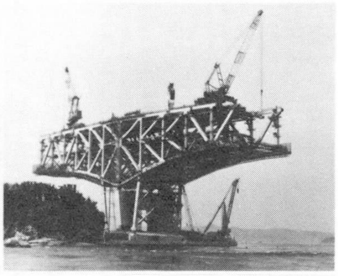
(1) The relative location of both end of erected truss will be adjusted by compulsive force.
And this force was taken into consideration in designed stress of the members.
(2) High accuracy of members was required in fabrication.
Especially the gap of splicing in lower chord members is specified to be within 1mm, and metal contacts for the members at the intermediate support.
(3) The bridge configuration and the axial force of temporary diaganal support were measured to confirm that erection work was carried out as planned.



Temporary support


Carrying of members


Erection of Large Block


Cantilever method

Construction of Truss Bridges in Honshu-Shikoku Bridge Project (The Yoshima Bridge)

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1. Bridge Description

The Yoshima Bridge (cf. Fig.1) is a continuous 3-span truss bridge with a total length of 585 m (175 m + 245 m + 165 m) for combined highway and railroad use, forming part of the Honshu-Shikoku Bridge Project. Due to the route alignment, an S-shaped transition curve is included in the bridge, which connects with suspension and cable-stayed bridges at both ends. This makes the design, fabrication and erection of this bridge particularly complicated because the main trusses should be knuckled at the intermediate piers and the main trusses of the side spans are not arranged parallel to the central span.

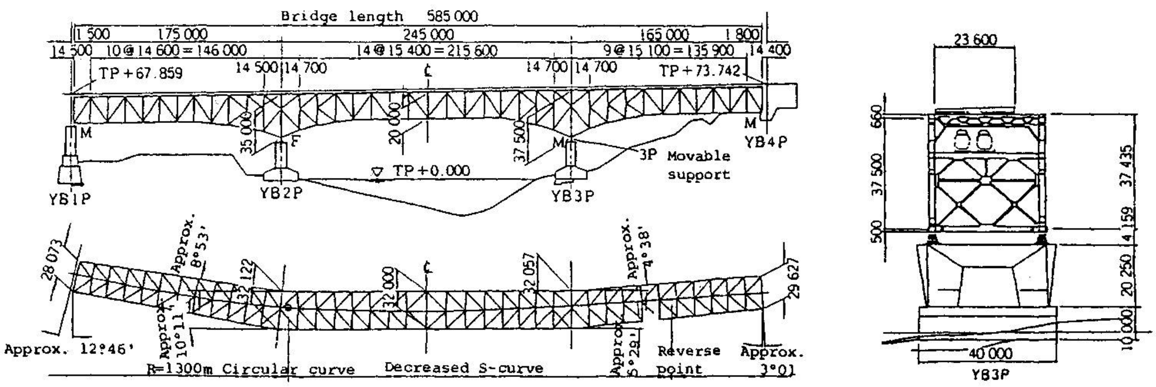

Fig. 1

Various loading combinations were considered in the design, and the safety of running trains was checked by simulation.

The live loads are vehicular loads (4-lane) and train loads (4-track) both of which are the dominant loads in the design. Also wind loads for a wind velocity of 68 m/sec and inertia forces due to earthquakes (magnitude of 8 in Richter scale) computed by dynamic analysis were applied.

High-tensile strength steels up to HT80 (breaking strength of 80 kg/mm^2f) are extensively used for the main structure. The standard chord section is 1.48 m x 1.4 m.

The bearings of this bridge are the largest in the project, to support the reaction of 11,000 tonf.

2. Accuracy control and measures against possible erection errors

The erection of the bridge was carried out by the procedure shown in Fig. 2.

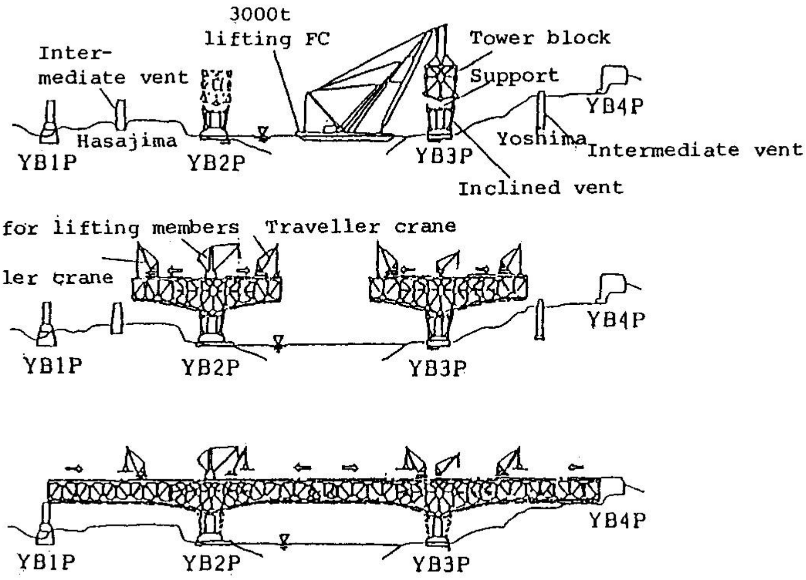

Fig. 2

Firstly, large two-panel, prefabricated blocks were installed on the middle piers by use of a 3,500 tonf lifting capacity floating crane, then each individual member was erected by the cantilever method, maintaining the balance on both sides.

Because of the complexity of the structure of the bridge, a higher precision was required for the fabrication, and measures against possible closure errors were considered in the design, some of which are described as follows.

1 The accuracy of the camber computation was greatly increased by an analysis using a 3-dimensional model which represented all members of the main trusses and laterals.

2 The fabrication precision for the two-panel blocks which govern the initial orientation of the successive single member erection was extremely accurately set, as the distance between the trusses was to be less than 5 mm.

3 The fabrication precision of chord members was accurately specified as each gap at the joint between lower chords had to be less than 1 mm.

4 Most members were fully assembled in the shop and base holes were used during the erection to ensure the accuracy.

5 Compulsory forces would be applied at the closure of the main truss.

In the design, the forced displacements in the horizontal, vertical and rotational directions were 50 mm.

The bridge was closed very successfully on the 13th September, 10 months after the first block was installed.