Asakegawa Bridge

The Asakegawa Bridge, in Yokkaichi City, Mie Prefecture, is a part of the Shin-Meishin Expressway Project. The expressway operator, Central Nippon Expressway Co., awarded a single contract for the design and construction of both the superstructure and sub-structure of the bridge.

Fig. 1 Overview of the Asakegawa Bridge

The bridge is a 325m-long three-span steel and pre-stressed concrete composite continuous box girder bridge stiffened with an arch rib. The overall design was dictated by site conditions: the bridge spans busy national Road No. 365 at the point where it crosses the Asakegawa River. The approach to the east of Abutment 1 is an embankment, while to the west of Pier 3 the bridge links to a viaduct. The center span is 225 m. The launch erection method was chosen for erecting the steel girder, since it could be accomplished during one night of full closure of national Road No. 365. To reduce the length of the span to be launched, a V-shaped structure was adopted for Pier 1. Further, a pre-stressed concrete box girder cantilevered over the road on the west bank of the river. The design is illustrated in Fig. 2.

A number of new techniques were employed in constructing this bridge. These are outlined in the text that follows.

High proof strength joints fabricated from checkered steel pipe were adopted for Pier 1 to reduce the thickness of the steel pipe sheet pile (Fig. 4).

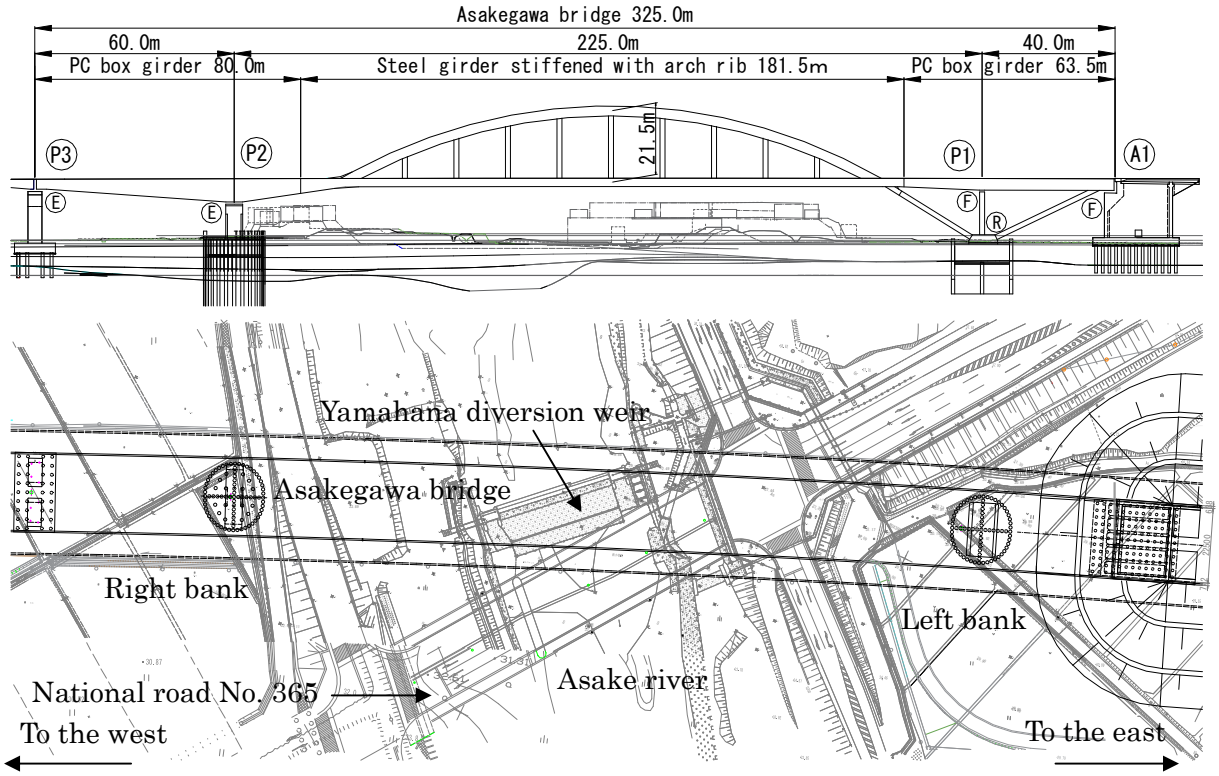

Fig. 2: General view of the bridge

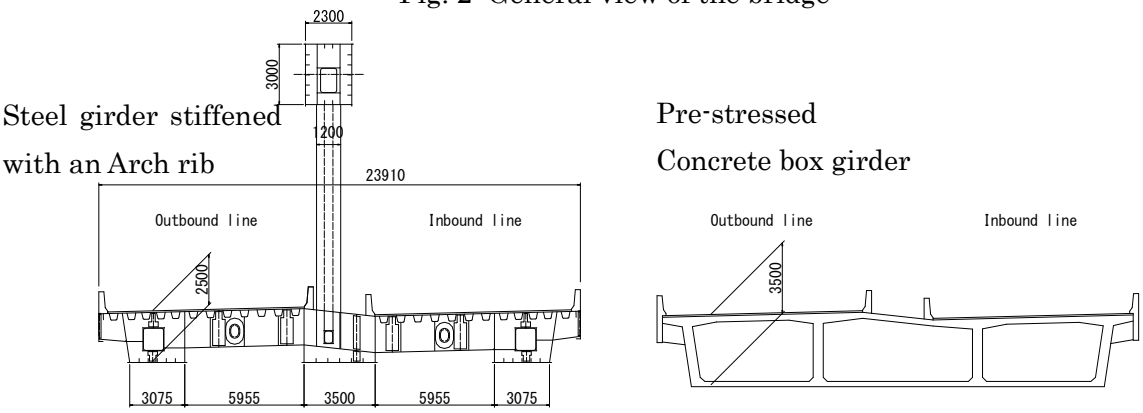

Fig. 3: Cross section of the bridge

Fig. 4: Pier 1 (left) and high proof strength joints (right)

The use of cast-in-place piles can lead to river-water contamination, so for environmental reasons screw steel pipe piles with toe wings were adopted at Pier 3 (Fig. 5), which also served to reduce construction noise.

Fig. 5: Screw steel pipe piles with toe wings

Seismic safety was confirmed using the design seismic waveform given in the Japanese specifications for highway bridges. It was also confirmed that the bridge would be safe against collapse in the case of the long-period ground motion associated with the Tonankai and Nankai earthquakes (which are anticipated within the next 100 years).

Fig. 7: The 'one-night' bent

The launched span was 134m long, with a launch nose of about 100m partially consisting of the steel box girder for a bridge to be constructed nearby (Fig. 6). This re-use of a girder meant less steel was used, with consequently lower CO_2 emissions. The mass of the launched span was 5,015tf in total, consisting of 4,508tf for the bridge itself, 544tf for the launching nose, 61tf for the launching equipment, and 102tf for the equipment used to set the girder down. To shorten the launching span, a temporary 'one-night' bent was prepared (Fig. 7). Located in the river bed (Fig. 8), this bent was able to take a maximum reaction force of 4,082tf and incorporated 12 endless sliders. The launch operation was the largest ever undertaken in Japan.

Fig. 8: Bent positioned in the river

Fig. 6: The launching nose