

Shin-Meishin Expressway Shimootowa River Bridge (PC Superstructure) Construction Project

Project Overview

2014.12.1

No.8

FUJI P.S. TECHNICAL REPORT

Bridge Overview

Bridge Name : Shimootowa River Bridge

Client : West Nippon Expressway Company Limited, Kansai Branch

Contractor : Fuji P.S Corporation - Kyokuto Kowa Corporation Joint Venture

Location : Ibaraki City, Osaka Prefecture

Bridge Length : L=347.0m (Inbound), 370.5m (Outbound), 106.0m (Shimootowa East Bridge)

Span Length : L=50.3+86.0+56.3m

Bridge Width : B=9.760m

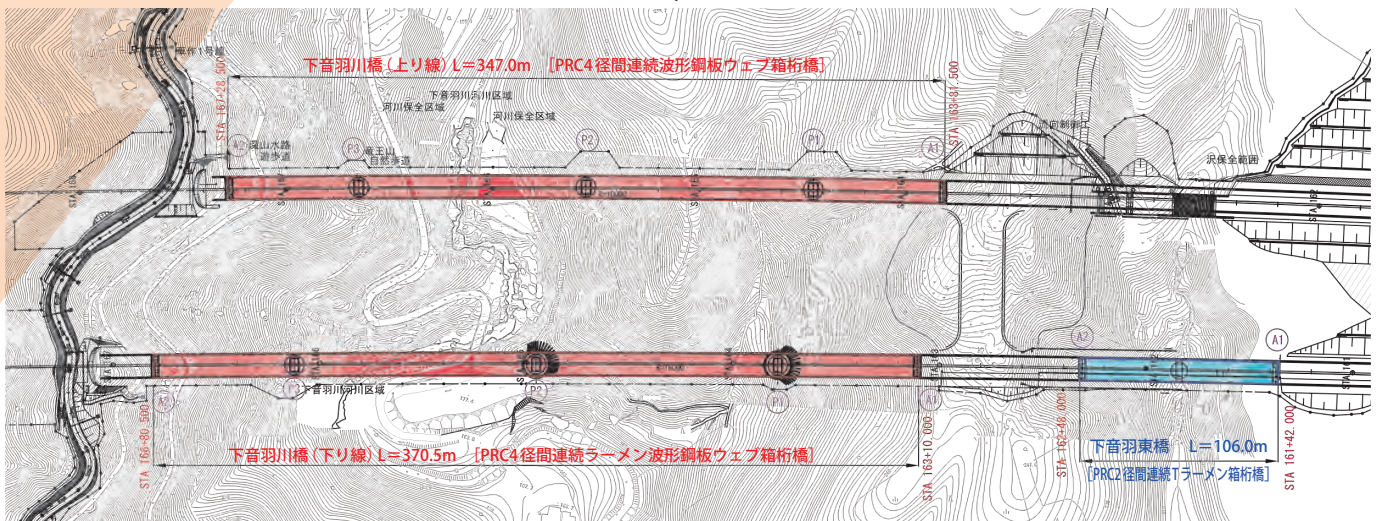
Bridge Type : PRC-4 span Continuous Corrugated Web Box Girder Bridge (Inbound)

PRC-4 span Continuous Rigid Frame Corrugated Web Box Girder Bridge (Outbound)

PRC-2 span Continuous Rigid Frame Box Girder Bridge (Shimootowa East Bridge)

Construction Period : December 4, 2011 - April 26, 2015

Overall plan view



Characteristics of corrugated web PC bridge

A corrugated web PC bridge is a concrete and metal composite structure that replaces corrugated web from PC box bridge. It is developed rational structure in France in the 1980s.

The following are the characteristics that this corrugated web PC bridge has.

- 1 Decrease girder weight
- 2 High Shear Buckling Stress
- 3 Improvement in prestressing efficiency through accordion effect
- 4 Labor saving, schedule reduction, and cost reduction

This project uses a corrugated web PC bridge structure as main proposal that is for decreasing girder weight and shortening the construction period.

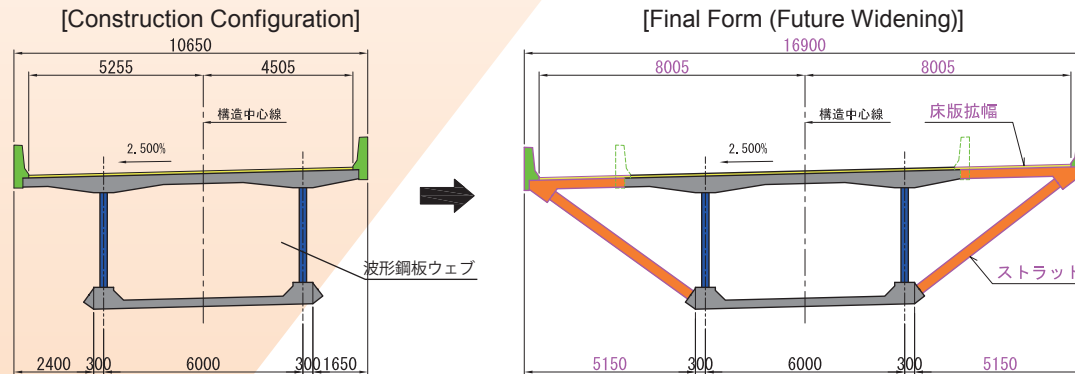


Photo-1 Corrugated web PC bridge Shimootowa River Bridge

Main Characteristics of the Shimo-Onna River Bridge (PC superstructure) Construction

1. Structural features

This bridge was built for two lanes. This bridge structure and cross sectional shape allow to widen to three lanes in the future.



2. Shortening of construction period

The construction period is shortened by reducing the number of overhanging blocks.

- Shimootowa River Bridge (Inbound) Initial: 13 blocks → Reduced number of days: 12 blocks Days Reduced = 13 days
- Shimootowa River Bridge (Outbound) Initial: 15 blocks → Reduced number of days: 13 blocks Days Reduced = 26 days

Main innovations in quality

Ingenuity is applied in various aspects at this construction site. The main qualities relating to ingenuity are indicated as follows.

1. Measures to improve the quality of concrete slabs

Expansion agent is added to the concrete of central closure and lateral transition parts. As a result, cracks caused by external restraints are prevented. During the deck slab concrete placement, highly water-retentive curing mats(photo-2) were used to maintain the placement surface in a constantly moist condition, enabling the construction of dense, high-quality concrete.

2. Measures to improve the quality of concrete for heads pillar

Pipe cooling is carried out to reduce the temperature difference between the inside and the outside of mass concrete. The concrete absorbs heat by cooling water in the pipe and air; as a result, the occurrence of temperature cracks is suppressed. At this construction site, improved piping workability, increased reliability and efficiency of water flow, and more efficient post-finishing work have been achieved by using specialized separators developed for pipe cooling.

(Patent Application Filed: Japanese Patent Application No.2014-178043 "Method for Placing Mass Concrete")

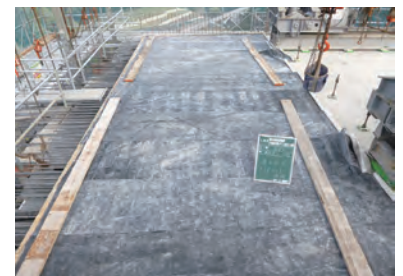


Photo-2 Concrete Curing Conditions

3. Measures to improve the quality of corrugated steel web and sub-bed joints

Corrugated steel sheets are plasma sprayed to improve corrosion protection. There are concerns about the deformation of painting and corrosion of corrugated web steel plates due to tendency for rainwater and condensation water to accumulate in the joints between the corrugated web steel plate to lower floor slab. Therefore, metallic coating by plasma spraying was chosen to provide long-lasting corrosion protection.

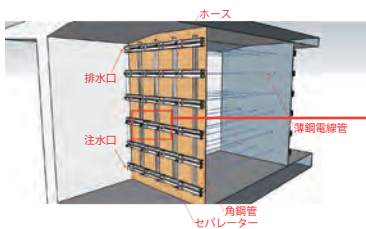


Figure-1 Pipe Cooling Status



Photo-3 Combined Separator and Cooling Water Inlet



Photo-4 Plasma Spraying Operation

