JPCI Award 2022

【JPCI Award for Outstanding Paper】

● **Research on High Durability of PC Structures Using Heat-Modified Fly Ash**

Yuichi KITANO, Kensuke MITO, Yoshitada AKIYOSHI, Hajime ITO
Journal of Prestressed Concrete, Japan, Vol. 64, No. 6

● **Chemical Analysis of the Concrete Cover of the PCT Girder 19 Years after Desalination**

Fumika NAKAMURA, Mamoru MASAKI, Akira NANASAWA, Shinichi MIYAZATO
The 31st Symposium on Developments in PRESTRESSED CONCRETE

【JPCI Award for Outstanding Structures】

—Civil Engineering Structures Category—

● **Yoshinogawa Sunrise Bridge**

Location : Tokushima City, Tokushima Prefecture
Outline of Structure :
YOSHINOGAWA SUNRISE BRIDGE, a continuous prestressed concrete (PC) box girder bridge with a total length of 1696.5m, is one of Japan's longest road bridges. It was designed and constructed carefully at the estuary of the Yoshino River, a home to a wide variety of species, so as not to disturb the natural balance in the ecosystem. The number of piers in the river was minimized to reduce environmental impact, and the length of the span in the river was stretched to 130 m. The cantilever length is one of the longest in the world for a PC box girder using precast segments.

Client : West Nippon Expressway Co., Ltd
Basic Design : Eight-Japan Engineering Consultants Inc.
Detailed Design : Joint Venture of KAJIMA Co., Ltd., Sumitomo Mitsui Construction Co., Ltd. And TOYO Construction Co., Ltd.
Construction : Joint Venture of KAJIMA Co., Ltd., Sumitomo Mitsui Construction Co., Ltd. And TOYO Construction Co., Ltd.

● **Iwagi Bridge**

(References: Bridge and Foundation Engineering, September 2019, Bridges and Foundation Engineering, February 2022)
Location : Iwagi Island ~ Ikina Island,
Kamijima Town, Ochi-gun, Ehime Prefecture
Outline of Structure :
The Iwagi Bridge connecting Iwagi Island and Ikina Island consists of PC composite approach bridge on both sides and the main bridge section of a 735-m-long, 5-span continuous mixed steel-concrete cable-stayed bridge, reaching a total length of 916m. The main bridge section is a mixed structure composed of concrete structure in the side spans and part of the center span; and a 315m steel structure in the middle of the 475m center span.
The main tower is a hollow-section RC structure with a height of over 130m connected by two horizontal members, and diagonal cables are suspended in a 15-level double arrangement mounted between the spans of each side of each main tower. It is one of the largest cable-stayed bridges in Japan, with the longest cable reaching 231 meters.

Client : Ehime Prefecture
Design : Chodai Co., Ltd.
Construction :
Kajima Corporation -MM Bridge Co., Ltd. -Fuji P.S Corporation Joint Venture,
Sumitomo Mitsui Construction Co., Ltd.-Sumitomo Mitsui Construction Steel Structures Engineering Co., Ltd.- Showa Concrete Industry Co., Ltd. Joint Venture,
Sumitomo Mitsui Construction Co., Ltd., Aikyo Co., Ltd.
Shikokutsuken Co.,Ltd., Idumo Corporation, Ogawa Construction Co., Ltd., Daiou Corporation,
Aien Industry Corporation, Oike Corporation

● Nishi Kyushu SHINKANSEN the 2nd Honmyou River Bridge

(Journal of the 28th Symposium on Developments in Prestressed Concrete, Journal of the 18th Railway Engineering Symposium, Bridge and Foundation Engineering, 2022.11.)

Location : Isahaya City, Nagasaki Prefecture

Outline of Structure :

This bridge is located between Shin-Omura Station and Isahaya Station on the Kyushu Shinkansen (between Takeo Onsen and Nagasaki), which opened in September 2022, and is a 3-span continuous PC box girder crossing over the first-class river Honmyou River in Isahaya City. Since this bridge crosses the river at a shallow angle, the central span is 115m which is the longest among similar bridges for the Shinkansen. Because the side span intersects the road with a low clearance due to topographical conditions, the height of the PC girder is limited, so it was necessary to address the girder deflection and to maintain riding comfort. Therefore, a verification method that approximates the actual live load conditions was developed, and its validity was verified by actual train running tests.

Client : Japan Railway Construction, Transport and Technology Agency, Kyushu Shinkansen Construction Bureau.
Design : Yachiyo Engineering Co., Ltd.
Construction : TEKKEN Corporation, Kyutetsu Corporation and HORIUCHI Construction Co., Ltd. JV

—Buildings Category—

● Kawaguchi City High School

(*Journal of Prestressed Concrete Japan Vol.65 No.1*)

Location : Kawaguchi City, Saitama Prefecture

Outline of Structure :

Kawaguchi city high school is a reorganization and integration of three high schools in Kawaguchi city, Saitama prefecture. The campus consists of a school building and two arena buildings centered on campus road. Based on site-specific conditions such as building height restrictions and other spatial configuration requirements, various prestressed concrete (PC) components such as precast prestressed concrete (PCaPC) columns, PCaPC slabs, and cast-in-place PC beams are used to achieve the high-quality educational environment required for each of the regular classrooms, special classrooms, and the arena. In addition, pretensioned spun high strength concrete (PHC) piles are used as geothermal piles. Geothermal heat is utilized for HVAC (heating, ventilation, and air conditioning) system in the teachers' room, which is also environmentally friendly.

Client : Kawaguchi City
Design : Kume Sekkei Co., Ltd.
Construction : Phase 1：Kawaguchi Construction Co., Ltd.
Phase 2：Kawaguchi Construction and Shinmei Construction Joint Venture
Construction (PC) : Phase 1 and 2：P.S. Mitsubishi Construction Co., Ltd.

● TOYOSU MiCHi NO EKI

(Journal of Prestressed Concrete Japan Vol.64 No.4, Japan Architect 2022.1, Structure No.163 2022.7)

Location : Koto City, Tokyo Prefecture

Outline of Structure :

This structure is a pedestrian deck that is directly connected to the station and a space that aims to create bustle in the city and interaction among people. The traffic plaza, which is located on ground floor below the deck, requires visibility and openness as a public space. The structure was realized by adopting 3-ways diagonally crossed prestressed concrete frames.

The post-tensioning cables and reinforcement bars intersecting from 3-directions were converted into digital data using a 3D modeling tool. Bar arrangement studies, which are difficult to develop with 2D drawings, were carried out by linking any structural elements with BIM from design phase to construction phase. As a result, we have realized an attractive new frame system that takes advantage of the characteristics of the prestressed concrete structure.

Client : Shimizu Corporation
Design : Shimizu Corporation
Construction : Shimizu Corporation

—Renovations Category—

● Deck slab renewal work of Tadeno No.2 Bridge (outbound line)

Location : Kanoashi-Gun, Shimane Prefecture
Outline of Structure :
In the deck slab renewal work of Tadeno No.2 Bridge, the ultra-high durable deck slab which completely eliminates the embedded elements in concrete slabs that cause corrosion deterioration, such as reinforcing bars or prestressing steel was used for the first time. The main materials were high-strength fiber reinforced concrete and aramid FRP rods as PC-tendon in two directions. The ultra-high durable deck slabs were connected by aramid FRP rods. Eliminating potentially corrosive steel members significantly improves the durability of concrete structures, reduces life-cycle cost, and prevents third party injuries due to concrete peeling. In the aspect of sustainability, it is also possible to reduce life-cycle CO2 emissions from the construction of structures to the operation and renewal of roads.

Client : West Nippon Expressway Co., Ltd.
Design : Sumitomo Mitsui Construction Co., Ltd.
Construction : Joint Venture of Sumitomo Mitsui Construction Co., Ltd and Nippon P.S Co., Ltd.

● Widening work of Tsumetadani bridge (outbound line)

(Bridge and Foundation Engineering (Vol.56, 2022.6,) The 31st Symposium on Developments in Prestressed Concrete, (2022.10))
Location : Koka City, Shiga Prefecture
Outline of Structure :
In the widening work of this bridge, the first attempt was made to replace the entire amount of natural sand with blast furnace slag fine aggregate (BFS) for PC girders to be added. By using BFS to reduce the creep and drying shrinkage of new PC girders, the half-year waiting period required for joining to the existing bridge was eliminated, and the process was shortened. In addition, the productivity of on-site work has been improved by using precast segment for the new girder. Furthermore, a rational structure was realized by adopting new technology for the PC steel material.

Client : West Nippon Expressway Company Limited
Design : P.S. Mitsubishi Construction Co., Ltd.
Construction : P.S. Mitsubishi Construction Co., Ltd.

【JPCI Award for Outstanding Accomplishments of Constructions】

● National Route 3 Chitose Bridge Repair Work

Location : Tosu City, Saga Prefecture
Outline of Structure :
The Chitose Bridge across National Route 3 is an RC 7-span Gerber T-girder bridge. In 1996, it was reinforced by the "continuous cable girder suspension method" using outer cables, which was the first method in Japan to reinforce the Gerber hinges.
Damage on the external cable was found in regular inspections, and prompt repair measures were required due to concerns about insufficient load bearing capacity.
Since there are no examples of the continuous cable girder suspension method, repair work was ordered by the ECI method, technical proposal/negotiation method, replacement of the external cable, system-type suspended scaffolding, etc. were proposed and adopted.
These proposals minimized the impact on current road traffic and significantly shortened the process.

Client : Ministry of Land, Infrastructure, Transport and Tourism
Kyushu Regional Development Bureau,
Saga National Highway Office
Design : Chuo Consultants Co., Ltd.
Construction : Fuji P.S. Co., Ltd.