

JPCI Award 2021

【JPCI Award for Outstanding Paper】

● Development of Estimation Method for Prestressing Force in Prestressed Concrete Beams Using Measurements of Strain and Crack-width on Concrete Surface

Mitsuyoshi TSUNEKUNI, Yoshitaka KATO, Kenichi ISHIZUKA, Toshihiko NAGATANI

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● Distribution of Expansive Strain and Mechanical Behavior of Chemically Pre-stressed Concrete (CPC)

Yukikazu TSUJI, Kentaro SUHARA, Chunhe LI, Hirohisa OTAKE

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【JPCI Award for Outstanding Structures】



● Bessodani Bridge

Location : Awa City, Tokushima Prefecture

Outline of Structure :

Bessodani Bridge is the world's first application to highways of a non-metallic bridge, which does not use any steel members. It was developed to regain the high durability originally possessed by concrete structures while keeping the superior properties of modern structures provided by prestressing. The main materials used were high-strength fiber reinforced concrete and aramid FRP rods. Eliminating potentially corrosive steel members significantly improves the durability of concrete structures, reduces life-cycle costs, 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 : Sumitomo Mitsui Construction Co., Ltd.



● Aso Ohashi Bridge

Location : Aso-gun, Kumamoto Prefecture

Outline of Structure :

During the Kumamoto earthquakes in April 2016, the old Aso Ohashi Bridge collapsed, cutting off traffic on major routes connecting Kumamoto to Oita and Miyazaki, and isolating local communities in Minamiaso Village. To achieve rehabilitation, a technical review committee of governmental staff and experts was set up, which studied the bridge structure and repositioning. As a result, a route running orthogonally the active fault roughly 600 m downstream from the previous location was selected to avoid the slope failure area, rehabilitate the communities, and allow traffic to flow as early as possible. During construction, thorough streamlining efforts were made using the large-scale incline, auto climbing formwork system (ACS) and super-large mobile work vehicles to speed up the rehabilitation. As a result of which, the work period was shortened by 1 year and 4 months from the standard work schedule.

Client : Ministry of Land, Infrastructure, Transport and Tourism,
Kyushu Regional Bureau, Kumamoto Reconstruction Project Office,
Design : Chodai Co., Ltd.
Construction : Joint Venture of Taisei Corporation, IHI Construction Service Co., Ltd and Happo Corporation

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● Hokuriku-Shinkansen Hosotsubo Bridge

Location : Kaga City, Ishikawa Prefecture

Outline of Structure :

Under construction on the Hokuriku Shinkansen line from Kanazawa to Tsuruga, Hosotsubo Bridge is a 3-span continuous PC extradosed bridge with a bridge length of 339m and a central span length of 155m, which is the longest span for a Japanese Shinkansen Bridge. The reason for which is that the bridge diagonally intersects (crossing angle about 30 degrees) the National Highway No. 8 in Kaga City, Ishikawa prefecture.

The main bridge is a landmark bridge of the Hokuriku Shinkansen from Kanazawa to Tsuruga because it has a distinctive shape consisting of a main tower and bevel cables, and the triangular protrusions placed on the outside of the girder are accented.

Client : Japan Railway Construction, Transport and Technology Agency, Hokuriku-Shinkansen Construction Bureau.

Design : Chiyoda Engineering Consultants Co., Ltd.

Construction : Kajima Corporation, Oriental Shiraishi Corporation, HONMA Corporation, Hokutogumi Co., Ltd, JV



● New Bridge Construction Project Over The Kelani River Package-2 : Extradosed Bridge Section

Location : Colombo City, Democratic Socialist Republic of Sri Lanka

Outline of Structure :

The New Kelani Bridge is a 3-span continuous PC extradosed bridge (380m) at the main bridge section and 4+5 span continuous southern approach bridge (365m), 6-span continuous northern approach bridge (260m) with 6 traffic lanes, located at northern of Colombo, the largest city in Sri Lanka. The total length of the bridge is 1,185m. The center span of main bridge is 180m with a standard total width of 30.4m. This PC extradosed bridge is the largest bridge and first PC extradosed bridge in Sri Lanka.

For the stay cable, non-grouting anchorage system is adopted that combined a quadruple anticorrosion cable by epoxy coated and filled strand, wax, polyethylene coat and outer sheath, that can be replaced for each strand in the future.

Client : Ministry of Higher Education and Highways, Road Development Authority

Design : Oriental Consultants Co., Ltd. & Katahira and Engineers International JV, Other 2 Local Companies

Construction : Sumitomo Mitsui Construction Co., Ltd. ▪ SANKEN JV

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Client : Iwakuni City
Design : Ishimoto Architectural and Engineering Firm, Inc and Kikushige Design Co., Ltd.
Construction : Kashiwabara Corporation and Shirata Construction Specified Construction Joint Enterprise
Construction (PC) : Oriental Shiraishi Co.,Ltd.

● Iwakuni City Higashi Elementary and Junior High School

Location : Iwakuni City, Yamaguchi Prefecture

Outline of Structure :

The significant feature of this building is the “Vierendeel Structure” of PCaPC in functioning as an environmental device. Small sized structural members are finely connected to ensure the overhead construction rigidity. This design has realized a new resource-saving method for uniqueness of PCaPC. For the purpose of enhancing the natural lighting effect on the classroom, the shape of the Vierendeel Truss was made into trapezoidal and the tip width was narrowed down to 15 mm.

To improve this ingenuity, the façade appearance looks more sharp shape and took away the images of concrete material “heaviness”. The design is the collaboration work of architectural, structural, and environmental method and greatly expanded the possibilities of environmental architecture by Pca fusing design.



Client : Japan Sport Council
Design : Taisei Corporation, Azusa Sekkei Co., Ltd. and Kengo Kuma and Associates Joint Venture.
Construction : Taisei Corporation

● National Stadium

Location : Shinjuku City, Tokyo Prefecture

Summary :

The National Stadium is a facility that was used in the Tokyo Olympic Games and the Paralympic Games in 2020. The structural design was proceeded on the themes of Japanese-style and world-class stadium, disaster-resilient stadium for improving the capacity of disaster prevention of the area, and so on. It is a stadium with structural features such as the roof frames coordinated with the surrounding environment, the simple structure for the limited construction period, adoption of precast and prefabricated products for ensuring both the limited construction period and high quality, the cantilever roof structure with the hybrid members using lumber and steel, and the seismic response controlled structure by Soft First Story Theory for high seismic performance.

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Client : Management Department,
Hanshin Expressway Co., Ltd.
Design : Kajima Corporation
Construction : Kajima Corporation

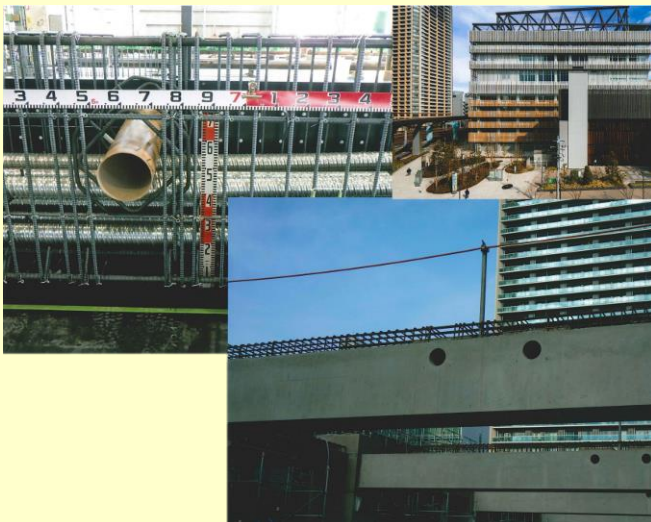
● Deck Slab Replacement of Hanshin Expressway No. 12 Moriguchi Line - Recovery and Improvement of Functions by Application of UFC Slabs

Location : Osaka City, Osaka Prefecture

Outline of Structure :

The first deck slab replacement on an urban highway mainline bridge was performed on the Hanshin Expressway No. 12 Moriguchi Line. The application of the flat UFC slab resulted in the following improvements: (1) Significantly improved fatigue resistance and durability of the deck slab. (2) The weight of the deck slab has been reduced by 20%, reducing the load on steel girders, piers, and foundations. The bending stiffness of the composite girder was improved, and the bending stress of the steel girder was reduced. (3) The durability of the joints was improved by using ultra-high-performance fiber reinforced cementitious composite as the filling material. The durability of the composite girder bridge was improved by adopting a structure that reduces the number of holes for dowels in the deck slab by half. (4) The durability of the entire viaduct has been improved by adopting a method of fixing accessories that does not require deck slab drilling when replacing expansion joints and other components.

【JPCI Award for Outstanding Engineering Innovations】



Development : Makoto Maruta,
PS Mitsubishi Construction Co., Ltd.,
Oriental Shiraishi Corporation, Ltd.,
KEN KEN Co., Ltd.,
Koryo Kenpan Co., Ltd.

● Development of Round Opening Reinforcement Method for Perforated PC Beams Using Ready-made Round Opening Reinforcement Fittings (Dialen PC Method)

Location : Minato City, Tokyo Prefecture

Outline of Structure :

Beams in building structures are sometimes provided with round openings for various piping. Prestressed concrete (PC) beams with such round openings have conventionally been designed for round opening reinforcement in accordance with the "Perforated PC Beam Design and Construction Guidelines" of the PC Contractors Association. However, in many cases, the diameter, location, and number of round openings were not determined during the design stage, hence, detailed consideration of hole locations is not always possible. This method was developed to optimize the design of round opening reinforcement and to reduce labor required in construction by applying ready-made opening reinforcement fittings, generally used for reinforcement of reinforced concrete beams, to PC beams as well.

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【JPCI Award for Outstanding Accomplishments of Constructions】



● Nakajima Viaduct of New Tomei Expressway

Location : Sunto-Gun, Shizuoka Prefecture

Outline of Structure :

Nakajima Viaduct, which is a seven-span continuous PC box girder bridge 500m long, is located between Shin-Hatano IC and Shin-Gotemba IC of the New Tomei Expressway.

In this project, to reduce the number of the labors and shorten the construction period was required because of the recent shortage of construction workers and the busy period due to the 2020 Tokyo Olympics.

Thus, two measures have been taken in this project. The 1st is to apply the rational construction method for the pier segments of which length is minimized. The second is to use the new anti-corrosion reinforcing steels for the concrete barriers. These enabled shortening the process and saving labor in construction.

Client : Central Nippon Expressway Co.,Ltd. –
Tokyo Branch Office
Design : Obayashi Corporation
Construction : Obayashi Corporation