

# JPCI NEWSLETTER

No.14, March 2023

**Japan Prestressed Concrete Institute**

## *JPCI AWARD*

### **Award for Outstanding Structures - Civil Engineering Structures Category -**



#### **Bessodani Bridge**

**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.

**Location :** Awa-city, Tokushima

**Client :** West Nippon Expressway Co., Ltd.,

**Design :** Sumitomo Mitsui Construction Co., Ltd.

**Construction :** Sumitomo Mitsui Construction Co., Ltd.



#### **Aso Ohashi Bridge**

**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, autoclimbing 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.

**Location :** Aso-gun, Kumamoto

**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



### Hokuriku-Shinkansen Hosotsubo Bridge

**Outline of Structure :** On Hokuriku Shinkansen from Kanazawa to Tsuruga under construction, Hosotsubo Bridge is 3-span continuous PC extradosed bridge, with a bridge length of 339m and a central span length of 155m, which is the longest span Japanese Shinkansen Bridge. The reason is the bridge that diagonal intersects (crossing angle about 30 degrees) National Highway No. 8 in the sky in Kaga City, Ishikawa prefecture. The main bridge is a landmark bridge of the Hokuriku Shinkansen from Kanazawa to Tsuruga because it has a characteristic shape consisting of a main tower and bevel cables, and the triangular protrusions placed on the outside of the girder are accented.

**Location :** Kaga-city, Ishikawa

**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.



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

**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.

**Location :** Democratic Socialist Republic of Sri Lanka, Colombo

**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

## Award for Outstanding Structures - Buildings Category -



### IWAKUNI City Higashi Elementary and Junior High School

**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.

**Location :** Iwakuni-city, Yamaguchi

**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, Oriental Shiroishi Corporation (PC construction)



### National Stadium

**Outline of Structure :** The National Stadium is a facility that was used as 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.

**Location :** Shinjuku-ku, Tokyo

**Client :** Japan Sport Council

**Design :** Taisei Corporation, Azusa Sekkei Co., Ltd. and Kengo Kuma and Associates Joint Venture.

**Construction :** Taisei Corporation

## Award for Outstanding Structures - Renovations Category -



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

**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.

**Location :** Osaka-city, Osaka

**Client :** Management Department, Hanshin Expressway Co., Ltd.

## Award for Outstanding Engineering Innovations



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

**Development Summary :** Beams in building structures are sometimes provided with round openings for various piping. Prestressed concrete (PC) beams with such open holes have conventionally been designed for open-hole 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 hole reinforcement fittings, generally used for reinforcement of reinforced concrete beams, to PC beams as well.

**Location :** Minato-ku, Tokyo

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

## Award for Outstanding Accomplishments of Constructions



### Nakajima Viaduct of New Tomei Expressway

**Outline of Structure :** Nakajima Viaduct which is seven continuous PC box girders with ca. 500m bridge 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.

**Location :** Sunto-gun, Shizuoka

**Client :** Central Nippon Expressway Co.,Ltd. Tokyo Branch Office

**Design :** Obayashi Corporation

**Construction :** Obayashi Corporation

## EVENTS

### *Annual Symposium* *- The coming symposium -*

*The 32nd Symposium on Developments in Prestressed Concrete*

26<sup>th</sup> - 27<sup>th</sup> October 2023

<http://www.jpici.or.jp/eng-index.htm>

The 32nd Symposium on Developments in Prestressed Concrete will take place on October 26 and 27, 2023 in Fukushima. The venue is Big Palette Fukushima. The objective of the symposium is to further develop prestressed concrete technology by sharing valuable knowledge obtained from research and practices. In the symposium, special lectures will be given as usual. There will be two speakers, one from Japan and the other from overseas.

### *- The last symposium -*

The last symposium, “the 31st Symposium on Developments in Prestressed Concrete”, was held on 20th and 21st October 2022 at the Kunibiki Messe (Shimane Prefectural Convention Center) in Matsue. The purpose of the symposium is to attain further development of prestressed concrete technology by sharing valuable information among researchers.

Previous to the symposium, the Workshop was held. Mr. Masaru Wakabayashi, Nippon Expressway Research Institute Co., Ltd, chairman of the committee, reported activities of the Committee on Design Guidelines for Joints of Prestressed Concrete Continuous U Shaped Girder Composite Bridges. Then two speakers presented the 20th anniversary project of the 1st fib Congress Osaka 2002. Dr. Minehiro Nishiyama, professor of the Kyoto University presented the significance and achievements of the event. Mr. Soshi Oshiro, West Nippon Expressway Co.,



*Venue, Kunibiki Messe*



*Opening ceremony*



*Mr. Masatomo Adachi*



*Prof. Abdeldjelil Belarbi*

Ltd. presented the past 20 years of PC technology and future prospects.

In the Opening Ceremony Dr. Hikaru Nakamura, professor of the Nagoya University, the chairman of the Executive Committee of the symposium, gave an opening address. History and outline of the symposium were introduced. Significance of holding in a gathering type as an opportunity to go to post-COVID-19 was stated. Dr. Masayuki Awano, professor of the Kindai University, president of the JPCI gave an opening speech. Then, Mr. Tastuo Arakawa, deputy director of the Chugoku Regional Bureau, Ministry of Land, Infrastructure, Transport and Tourism and Mr. Tsuyoshi Hirabayashi, deputy mayor of Matsue City, gave speech of greeting.

Mr. Mastomo Adachi, Chairman of the Shimane Association of Architects & Building Engineers, and Prof. Abdeldjelil Belarbi, the University of Houston, U.S.A., were invited and gave special lectures.

Mr. Mastomo Adachi presented “The establishment of Matsue Castle Town and Matsue Castle”. Matsue was built as a castle town after the battle of Sekigahara, and until then it was a wetland dotted with fisherman towns. It is Mr. Horio who cut out this wetland and created Matsue in the castle town. The construction of Matsue Castle began in 1607 and was completed to 1611. In the Meiji era, Matsue Castle was returned to the prefecture after being seized by the Army at one time, and the prefecture also auctioned Matsue Castle. At one time, it was cornered to the verge of dismantling, but was returned by a citizen volunteer just before, and was also used as a venue for the expo. Matsue Castle was opened to the citizens as a park, repeatedly repaired, and was designated as a national treasure in 2015.

Prof. Abdeldjelil Belarbi presented “Advances in Prestressing Techniques for concrete Girders with Corrosion-Resistant Reinforcements”. Maintenance and rehabilitation of concrete bridges to maintain their serviceability and safety are required but costly. The use of non-corrosive reinforcement, such as fiber-reinforced polymers (FRP), has increased within the last few decades. FRPs are becoming potentially viable alternatives to conventional carbon steel strands in corrosive environments and they are used in a broader range of precast and prestress industry. More recently, high-strength stainless steel (HSSS) strands were introduced as another corrosion-resistant solution. An overview of recent advances in bridge design using these corrosion-resistant materials was presented. Examples of the application and usage status of precast concrete in the United States, were also introduced in the lecture.



*Technical exhibition*



*Parallel session*

In order to exchange information concerning activities, researches and original technologies 36 groups participated in the technical exhibition. Companies and organizations displayed their current information in the booths provided for the Technical Exhibition. Presentations were made by exhibitors and active discussions for each presentation were made in the exhibition hall.

In the last symposium, 37 contributed papers, 93 reports were presented in 16 sessions. The participants were 625. From each session, the most excellent presenters were chosen and were given “Award of Excellent Presentation”. Prize winners are as follows.

- Session 1: *Seiya Nitta*, Sumitomo Mitsui Construction Co., Ltd.
- Session 2: *Ryuhei Yanagida*, Kanazawa University
- Session 3: *Ryou Maeda*, IHI Construction Service Co., Ltd.
- Session 4: *Yoriharu Nakada*, Taisei Corporation
- Session 5: *Masataka Nakamura*, Sumitomo Mitsui Construction Co., Ltd.
- Session 6: *Masaya Kawane*, Sumitomo Mitsui Construction Co., Ltd.
- Session 7: *Taku Ito*, DPS Bridge Works Co., Ltd.
- Session 8: *Mizuki Ito*, Nippon P.S Co.,Ltd.
- Session 9: *Kentaro Ono*, Tokyo Metropolitan University
- Session 10: *Daiki Nakai*, Nippon P.S Co.,Ltd.
- Session 11: *Toshiyuki Aoyama*, P.S. Mitsubishi Construction Co., Ltd.
- Session 12: *Yuya Koyachi*, Central Nippon Expressway Co., Ltd.
- Session 13: *Takafumi Mihara*, Br. Holdings Corporation
- Session 14: *Junpei Saito*, Nihon University
- Session 15: *Michikazu Tawara*, Oriental Shiraishi Corporation
- Session 16: *None*



*Workshop*



*Award of excellent presentation*

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- This newsletter contents current information on the activities and topics of JPCI.
  - If you have any comments and suggestions, please contact us by sending e-mail to: [kaiinka24@jpci.or.jp](mailto:kaiinka24@jpci.or.jp)

*Internationalization Subcommittee  
International Committee  
Japan Prestressed Concrete Institute  
Dai-san-Miyako Building, 4-6, Tsukudo-cho  
Shinjyuku-ku, Tokyo  
162-0821, JAPAN  
<http://www.jpci.or.jp/>*