JSCE AWARD 2023

Award Winners from the Concrete Engineering Field

Selection Policy for various JSCE Awards

CLICK HERE FOR MORE DETAILS.

List of Award Winners

(To view detailed information, click on the name of award winner.)

Achievement Award
- Hidetaka Umehara (Central Nippon Highway Engineering Nagoya Co., LTD.)
- Akinori Nakajima (HRC Research Institute Co., LTD.)

Technical Award [Group I]
- Penta-Ocean Construction Co., LTD. et al.
- Ikushumbetsu-River Dam Construction Office, Sapporo Development and Construction Department, Hokkaido Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism et al.

Technical Award [Group II]
- Nagoya Regional Head Office, Central Nippon Expressway Co., LTD. et al.
- Hanshin Expressway Co., LTD. et al.

Research Paper Award
- Eiji Yoshida (Public Works Research Institute) et al.

Incentive Paper Award
- Naoto Yokozawa (Public Works Research Institute)
- Nozomu Someya (Nakabohtec Corrosion Protecting CO., LTD.)

Yoshida Award

[Research Paper]
- Kyoko Takeda (Oriental Shiraishi Corporation) et al.
- Yoshiki Ayano (Okayama University) et al.
- Ken Watanabe (Railway Technical Research Institute) et al.

[Research Encouragement]
- Hayato Takahashi (Tokyo University of Science)

Tanaka Award

[Achievement]
- Masamichi Tezuka (Sun Environment Planning Co., LTD.)

[Bridge Design and Construction]
- New Kuzuryu Bridge Construction
- Large-Scale Renewal of Yotomi Viaduct Out-Bound Line, Higashi-Meihan Expressway

Innovative Technique Award
- Ryota Kasakura (Tokyu Construction Co., LTD.) et al.
- Kenichi Horiguchi (Taisei Corporation) et al.
- Akira Hosoda (Yokohama National University) et al.
- Yuji Goryogono (Shimizu Corporation) et al.

Selection Policy for various JSCE Awards

Back to TOP Page

Achievement Award

Achievement Award is given to members who have made outstanding contributions to the advancement of civil engineering, the development of civil engineering projects, and the administration of JSCE.

Technical Award

Technical Award is given to members who have made significant contributions to the development of civil engineering technology in the areas of planning, design, and construction of civil engineering projects.

Environmental Award

Environmental Award is given to epoch-making achievements in the development and operation of civil engineering technologies and systems that reduce the burden on the environment and contribute to the preservation of a good environment and the creation of a more affluent environment, as well as to epoch-making projects that contribute to the preservation of the environment and creation of an environment in which humans and nature can coexist.

- In Group I, selection will be made for advanced civil engineering research that has contributed to the development of new technologies, concept formation, theory building, etc., that contribute to the conservation, improvement, and creation of an environment in which humans and nature can coexist.
- In Group II, the selection is based on groundbreaking projects that have contributed to the conservation and creation of an environment in which humans and nature can coexist through the development and operation of civil engineering technologies and systems.

Research Achievement Award

Research Achievement Award is given to individuals who have made outstanding contributions to the advancement and systematization of science and technology in civil engineering through a series of papers and other achievements in research, planning, design, construction, engineering design, or maintenance management.

Research Paper Award

Research Paper Award is given to the author of a paper on research, planning, design, construction, engineering design, or maintenance management that has made a significant contribution to the advancement and systematization of civil engineering science and technology.

Back to TOP Page

Incentive Paper Award

Incentive Paper Award is given to a person under 40 years of age who has made a major contribution to the advancement and development of science and technology in civil engineering and is recognized as highly original and promising in his or her research, planning, design, construction, engineering design, or maintenance management papers published in the field of civil engineering.

Yoshida Award

Yoshida Award was established to commemorate the achievements of the late Dr. Tokujiro Yoshida.

- In the Research Achievement Category, those who are recognized as having made significant achievements in the advancement and development of technology related to concrete are eligible for selection.
- In the Research Paper Category, the award is given to a single paper or report on concrete published in a JSCE publication that has made a significant contribution to the development of concrete engineering.
- In the Research Encouragement Category, the recipients of the award are those who are engaged in research related to concrete engineering, are under 40 years of age and who are recognized as having particular originality and potential.

Tanaka Award

Tanaka Award was established to commemorate the achievements of the late Dr. Yutaka Tanaka.

- In the Achievement Category, those who are recognized as having made outstanding achievements in the advancement and development of bridge engineering are eligible for selection.
- In the Research Paper Category, papers that have made a significant contribution to the development of bridge engineering are eligible for selection.
- In Bridge Design and Construction Category, papers that have made a significant contribution to the development of bridge engineering are selected.
- In the Technical Category, excellent or innovative technologies applied to bridges or similar structures that are unique in terms of planning, design, fabrication/construction, maintenance, renewal, rehabilitation, demolition, and removal are eligible for selection.

Innovative Technique Award

Innovative Technique Award is given to individuals or teams that have developed and put into practical use technologies that are recognized as highly original and ingenious in planning, design, construction, or maintenance, and that have contributed to society through the development of civil engineering technology.

Back to TOP Page

Publication Culture Award

Publication Culture Award is given to "the author of a publication related to civil engineering that contributes to the development of civil engineering or civil technology, or is recognized as being part of civil engineering cultural activities by impressing readers".

International Lifetime Contribution Award

International Lifetime Contribution Award is given to individuals who have contributed to the progress and development of civil engineering or social infrastructure development in the international community, including Japan, through exchange and cooperation between Japan and other countries, and whose activities have been highly evaluated.

International Outstanding Collaboration Award

International Outstanding Collaboration Award is given to individuals under 50 years of age who have contributed to the progress and development of civil engineering or the improvement of social infrastructure in Japan and other countries through exchange and cooperation between Japan and other countries, and who are expected to continue to make significant contributions in the future.

Technical Achievement Award

The Technical Achievement Award is "awarded to those who for many years have made diligent contributions to the advancement of civil engineering or the development of civil engineering projects." People in the following fields are eligible for selection.

(1) Education, research, and awareness-raising
(2) Research and planning
(3) Design and supervision
(4) Site and compensation
(5) Construction and inspection
(6) Management, operation, disaster prevention and conservation

Achievement Award

Back to TOP Page

Dr. Hidetaka Umehara

Technical Advisor,
Central Nippon Highway Engineering Nagoya Co., LTD.

Reasons for the Award

Dr. Hidetoshi Umehara made significant contributions to the advancement of concrete engineering by establishing analytical methods that consider ground conditions for seismic performance of concrete structures as well as proposing methods for calculating thermal stresses that consider creep for concrete durability.

In JSCE, he played a pivotal role as the secretary general and a standing member of the Concrete Committee, driving research activities forward. Additionally, he contributed to the society's administration as the secretary general of the President's Special Committee and the chairperson of the Yoshida Award Selection Committee. He also actively participated as a secretary in the establishment of the JSCE Engineer Qualification System, especially focusing on promoting the qualification of Level 2 engineers, aimed at university graduates, in his roles as the secretary general and chairperson of the Level 2 Engineer Qualification Committee.

For these reasons, he was recognized as a worthy recipient of the Achievement Award.

Achievement Award

Back to TOP Page

Dr. Akinori Nakajima

Technical advisor, HRC Research Institute Co., LTD.
Emeritus professor, Utsunomiya University

Reasons for the Award

Dr. Akinori Nakajima has made significant contributions to the field of structural engineering, particularly in the areas of seismic performance and dynamic behavior of steel structures, as well as in the study on mechanical properties of shear connectors and the structural behavior of steel-concrete hybrid structures. His research has also extended to the corrosion behavior at the steel-concrete interface. These findings have provided valuable insights into the design and maintenance of civil engineering structures and have been incorporated into design codes and various guidelines, benefiting both practitioners and researchers, and thereby contributing to the advancement of civil engineering.

In JSCE, he played a key role in the establishment of the Committee on Hybrid Structures, serving as its first vice chairperson and later as its second chairperson. During the committee's formative years, he actively promoted research activities. Additionally, as chairperson of the Subcommittee for the Standard Specifications for Hybrid Structures, he contributed to the publication of these standards. He was also instrumental in the initial publication of the Seismic Design Part of the Standard Specifications for Steel and Hybrid Structures in the Steel Structures Committee. Furthermore, he served as chairperson of the Editorial Subcommittee for the JSCE Journal Series A1 and the Journal of Structural Engineering, significantly contributing to the development of the fields.

For these reasons, he was recognized as a worthy recipient of the Achievement Award.

Technical Award (Group I)

Back to TOP Page

Rapid Construction Technology for Piers Using Extra-Large Blocks at Japan's Largest Raw Salt Terminal

Penta-Ocean Construction Co., LTD.
Port and Airport Research Institute, National Institute of Maritime, Port and Aviation Technology
Tokyo Institute of Technology

Reasons for the Award

This project involved the rapid construction of the third pier at Mitsugojima Wharf, Japan's largest raw salt terminal, to accommodate the increasing size of cargo ships and ensure a stable supply of raw salt. The pier was constructed in a deep-water area with a C.D.L. of -18 meters, allowing docking of cargo ships up to 200,000 D.W.T., all while keeping the existing facilities in operation.

Typically, steel jacket-type piers, commonly used in deep-water applications, allow for rapid construction but are cost-prohibitive compared to traditional reinforced concrete (RC) piers, making it challenging to ensure project profitability.

To address this, construction technology was developed using RC hollow-core extra-large blocks. The superstructure employed a flat slab design, which shortened the manufacturing timeline, and its interior was hollowed out to reduce weight. Additionally, taking advantage of the slab's uniform thickness and minimal eccentricity, a construction method was devised that used a 2,200-ton lifting crane without a lifting frame. The weight saved from not using a lifting frame (approximately 150 tons) was redistributed to the block weight, resulting in unprecedentedly large precast blocks (approximately 20 meters in length, 30 meters in width, and 1,600 tons per block). Furthermore, innovative joining techniques were developed for the precast blocks: the sheath pipe method was applied at the pile head connections, and the double square joint was used for inter-block connections. Through structural experiments and numerical analysis, a practical design methodology was established, and its implementation in this project demonstrated superior constructability in marine environments.

This technology not only enhanced quality and safety but also achieved rapid construction comparable to steel jacket-type piers while addressing the challenge of reducing construction costs associated with precast construction. It has been recognized as a technology that meets the growing demand for pier renovations, driven by the aging of port facilities and the increasing size of ships, and was recognized as worthy of the Technical Award.

Technical Award (Group I)

Back to TOP Page

Concrete Dam Rehabilitation Technology through Coaxial Raising in Snowy Cold Regions

Ikushumbetsu-River Dam Construction Office, Sapporo Development and Construction Department, Hokkaido Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism
Shin-Katsurazawa Dam Project Office, Kajima-Iwatachizaki-Ito Joint Venture

Reasons for the Award

The Shin-katsurazawa Dam, located in Mikasa City, Hokkaido, is the first redevelopment dam in Japan to raise the embankment height by 11.9 meters, maintaining the same dam axis as the existing structure. This project presented numerous technical challenges, including the need to ensure the integration of new and old concrete—a critical requirement for a coaxial raising dam—while working under harsh weather conditions typical of snowy cold regions, and while keeping the existing dam operational during construction.

One of the most difficult aspects of constructing the dam while the existing structure was still in use was the partial demolition of the existing dam. To achieve this, the project employed a "wedge-shaped special chisel splitting method," which involved inserting wedge-shaped chisels into pre-drilled holes and applying impact forces toward free surfaces to fracture the target material. This method minimized the impact of vibrations on the existing dam, allowing for precise demolition without disrupting the project schedule.

For the integration of new and old concrete, particularly at the wintering surface where the impact is most significant, the project was the first in civil engineering field to adopt a new vacuum insulation material for curing. The use of the new material improved the insulation of the concrete during the winter months, reducing shrinkage due to temperature drops and thereby achieving the desired integration between the new and old concrete.

Through these innovations, the project successfully overcame the technical challenges associated with constructing a coaxial raising dam in a snowy cold region. The accomplishments of this project have been highly regarded for their significant contribution to the future development of dam rehabilitation, a field expected to see increasing demand, and were recognized as worthy of the Technical Award.

Technical Award (Group II)

Back to TOP Page

Chuo Expressway Nakatsugawa IC to Sonohara IC Bridge Renewal Project

Nagoya Regional Head Office, Central Nippon Expressway Co., LTD.
Obayashi Corporation
Obayashi-JFE Engineering Special Project Joint Venture

Reasons for the Award

This project involved the renewal of eight bridges located in the mountainous region of the Chuo Expressway. After approximately 50 years of service, the bridge slabs had significantly deteriorated due to the increased volume of heavy vehicle traffic and the application of deicing agents. The primary focus of the renewal project was the replacement of the reinforced concrete (RC) slabs with prestressed concrete (PC) slabs, all while maintaining traffic flow through a two-way traffic restriction. In addition to the slab replacement, the project also included the reinforcement of various main girders to accommodate increased live loads, replacement of bearings to prepare for large-scale earthquakes, and the renewal of various bridge accessories.

Given the mountainous terrain, the project had to address a wide variety of existing bridge types, including steel plate girder bridges, PC composite girder bridges, steel truss bridges, and steel arch bridges. The detailed design and execution of the construction plan, combined with the application of various new technologies and construction methods—centered around precast technology—enabled labor-saving and rapid construction for the slab replacement works.

Moreover, to minimize the social impact of the traffic restrictions, the project was carefully planned with optimal sequencing and combinations of work during two periods each year (spring and autumn), under traffic restrictions extending up to 4 km in length. The project included the simultaneous replacement of slabs on up to three bridges and was completed over six years with a total of seven traffic restriction phases, covering all eight bridges with a total length of approximately 1.5 km.

This project has been recognized for its contribution to the advancement of civil engineering technology in bridge renewal and infrastructure development, making it be recognized as worthy of the Technical Award.

Back to TOP Page

Technical Award (Group II)

Slab Replacement Project on Hanshin Expressway Route 3 Kobe Line Using HSPJ Slabs

Hanshin Expressway Co., LTD.
Shimizu Corporation

Reasons for the Award

The Hanshin Expressway Route 3 Kobe Line has been in service for over 50 years, and with increasing traffic volumes and larger vehicles, the concrete slabs have experienced significant deterioration. As a result, a complete closure of the 4.2 km section between Kyobashi and Maya was implemented for 19 days from May to June 2023 to carry out comprehensive renewal work, including the replacement of two concrete slabs, full pavement repairs, and the renewal of expansion joints and slab connections.

This project focused on the slab replacement of a steel simple composite three-girder bridge (bridge length of 21 meters). The replacement required addressing several key challenges: (1) ensuring long-term durability, (2) maintaining the slab weight equivalent to the existing one to minimize the impact on the substructure, (3) completing the work within the renewal project timeline, and (4) executing the construction in a constrained space where large cranes could not be deployed due to the bridge intersecting with a rigid-frame bridge.

To overcome these challenges, a prestressed joint slab was developed, which eliminated the need for cast-in-place joints by integrating the slabs using prestressing. Additionally, a lightweight slab installing machine compatible with composite girders was developed, and crane size was reduced to address the spatial constraints.

This section of the expressway is particularly busy, with an average weekday traffic volume of 93,300 vehicles (as of May 2019), making traffic impact a major concern. To mitigate potential congestion and its effects on the regional economy and environment, noise reduction measures were implemented using paper-based soundproofing devices to minimize environmental impact on the surrounding area.

The successful completion of the renewal work within the scheduled period, while ensuring quality through the application of the technologies, was recognized as worthy of the Technical Award.

Research Paper Award

Back to TOP Page

Consideration of Failure Process of PC Superstructures of Real Bridges by Loading Tests and Development of a Simplified Analysis Method for Evaluation of the Entire Superstructure

Journal of Japan Society of Civil Engineers, Ser. E2 (Materials and Concrete Structures), Vol. 78, No. 4, pp. 244-263, 2022. (Access to this paper)


Eiji Yoshida
Public Works Research Institute


Yoshinobu Oshima
Nakano Corporation


Yuichi Kitano
Kawada Construction CO., LTD.


Masahiro Ishida
Public Works Research Institute


Takashi Yamamoto
Kyoto University


Yoshikazu Takahashi
Kyoto University

Reasons for the Award

In this study, the superstructure of a prestressed concrete (PC) bridge, which was in-service state was subjected to load testing up to its maximum bearing capacity. The findings revealed that even when the shear capacity of the main girder members was reached, shear failure did not occur. Instead, stress redistribution allowed the superstructure to maintain its deformation capacity. Additionally, it was observed on the actual structure that when torsional cracking occurred in the outer girder, what is known as "deformation-compatible torsion" was achieved, leading to further stress redistribution. The research also established an analytical model consistent with the experimental results up to failure, based on the lattice model, which underpins design load models. This analytical model can account for design loads of new structures and consider deterioration factors, such as the rupture of PC cables, enabling a load-bearing capacity evaluation of existing structures that are comparable to new designs. This makes the model highly valuable for the future maintenance and management of PC bridges.

The paper focuses on a real deteriorated PC bridge, experimentally verifying the behavior and failure characteristics of the main girders near the ultimate state during static load testing. It demonstrates that the deteriorated bridge retains load-bearing capacity and redundancy. This study

provides valuable insights into the failure mechanisms of PC bridges and the establishment of management thresholds for maintenance. Furthermore, it proposes a new analytical model that extends the commonly used linear framework model in design practice, allowing for a more accurate evaluation of the load-bearing performance of PC superstructures. For these reasons, the paper was recognized as worthy of the Research Paper Award.

Incentive Paper Award

Back to TOP Page

Loading Test on RC Column with Strength-Stratifying Rebar for Implementing Collapse Scenario Design

Journal of Japan Society of Civil Engineers, Ser. A1
(Structural Engineering & Earthquake Engineering),
Vol. 78, No. 4, pp. 206-218, 2022. (Access to this paper)

Naoto Yokozawa
Public Works Research Institute

Reasons for the Award

This paper presents a seismic design method for reinforced concrete (RC) bridge piers using strength-stratifying rebars, which has been highly praised for its novelty and originality. The proposed method ensures performance equivalent to the current seismic design under design-level ground motions. Additionally, by incorporating strength-stratifying rebars at the base of RC bridge piers, which only activates under seismic forces exceeding the design values, the method significantly enhances the pier's horizontal load-bearing capacity, resulting in a substantial improvement in seismic performance. The paper experimentally and analytically demonstrates that this highly unique new structure behaves according to the intended collapse scenario, validating its effectiveness. Given its substantial contribution to the advancement of seismic and earthquake engineering and its promising future potential, this paper was recognized as worthy of the Incentive Paper Award.

Incentive Paper Award

Back to TOP Page

Proposal of Evaluation Method for Corrosion Rate of Steel in Concrete by Cathodic Protection under the Moist Environment

Journal of Japan Society of Civil Engineers, Ser. E2 (Materials and Concrete Structures), Vol. 78, No. 2, pp. 168-178, 2022. (Access to this paper)

Nozomu Someya
Nakabohtec Corrosion Protecting CO., LTD.

Reasons for the Award

This paper addresses the issue of overestimated corrosion rates in wet environments when using the method of evaluating corrosion rates based on the anodic polarization curve of steel, as previously proposed in the literature. The study identifies the influences of the electric double layer, the oxidation current of rust, and the changes in Tafel slope during the measurement of the anodic polarization curve. Furthermore, the paper proposes a method that accurately corrects the corrosion rate in wet environments. The proposed method allows for the high-precision evaluation of the corrosion rate of steel reinforcement within concrete in wet conditions. Given its potential for advancing the prediction of deterioration in concrete structures affected by steel corrosion, the paper was recognized as worthy of the Incentive Paper Award.

Yoshida Award
Research Paper Category

Back to TOP Page

Proposal for Fatigue Life Prediction Method for Concrete Slabs Subjected to Cyclic Wheel-Type Loads

Japanese Journal of JSCE
Vol. 79, No. 12, 23-00078, 2023. (Access to this paper)

Kyoko Takeda
Oriental Shiraishi Corporation

Yasuhiko Sato
Waseda University

Reasons for the Award

Since the recognition of the fatigue deterioration issues that concrete spalling occurs due to repeated loads from traffic vehicles on road bridge concrete slabs, experimental and analytical studies on the fatigue failure of concrete slabs have been conducted from the 1970s to the present. Despite numerous experimental investigations using wheel load running tests, a unified method for evaluating fatigue life that can explain all experimental results has not been established.

This paper points out that there are multiple failure modes for reinforced concrete (RC) slabs and that fatigue life evaluation methods tailored to these failure modes are required. In particular, focusing on the shear-compression failure mode observed in RC slabs after beam-like behavior under wheel load running tests, this study elucidates the shear resistance mechanisms and fatigue failure mechanisms of RC beam members through analytical and experimental investigations. Based on these findings, a residual shear strength degradation model is developed, and a fatigue life evaluation method for RC slabs is proposed, demonstrating high applicability through comparison with experimental data from previous wheel load running tests. Additionally, a step incremental loading evaluation method based on the residual shear strength degradation model is established, successfully predicting the fatigue life of RC and prestressed concrete slabs under moving wheel loads. These achievements are expected to significantly contribute to the advancement of concrete structure design and maintenance management.

For these reasons, this paper was recognized as worthy of the Yoshida Award in Research Paper Category.

Yoshida Award
Research Paper Category

Back to TOP Page

Freeze-thaw Resistance of Concrete Using Ground Granulated Blast Furnace Slag and Blast Furnace Slag Sand in Salt Water

Japanese Journal of JSCE
Vol. 79, No. 12, 23-00042, 2023. (Access to this paper)

Toshiki Ayano
Okayama University

Takashi Fujii
Okayama University

Kanako Okazaki
Okayama University

Reasons for the Award

This paper demonstrates the mechanism of concrete deterioration due to freezing-thawing effect in snowy cold regions where de-icing agents like sodium chloride are applied during winter, with a focus on the dissolution of calcium hydroxide in the concrete. It compiles valuable research results relevant to mitigating the issue of concrete deterioration observed in expressway slabs and similar structures. Traditionally, concrete was considered to deteriorate due to repeated freezing-thawing cycles. However, this study reveals that even without repeated freezing-thawing cycles, concrete can fail solely due to freezing in a salt-rich environment. In concrete made with conventional aggregate, interfacial transition zone forms around aggregates due to cement hydration reaction. Calcium hydroxide, the main component of the interfacial transition zone, is more easily dissolved at lower temperatures and higher salt concentrations. When saltwater enters the transition zone, it dissolves the calcium hydroxide, and the freshwater that accumulates in the voids can freeze, generating expansion pressure and causing cracks. As freshwater freezes, the salt concentration of the saltwater increases, leading to further dissolution of calcium hydroxide and widening of the voids. To improve freezing thawing resistance of concrete in such saline environments, the study shows that using blast furnace slag fine powder to reduce calcium hydroxide formation and employing blast furnace slag fine aggregate to eliminate the transition zone at the aggregate interface are effective measures.

For these reasons, this paper was recognized as worthy of the Yoshida Award in Research Paper Category.

Yoshida Award
Research Paper Category

Back to TOP Page

Prediction Equation for Shrinkage Strain of Concrete Considering the Effect of Mixed Cement and Supplied Water

Journal of Japan Society of Civil Engineers, Ser. E2 (Materials and Concrete Structures), Vol. 78, No. 1, pp. 105-120, 2022. (Access to this paper)

Ken Watanabe
Railway Technical Research Institute

Mami Nakamura
Railway Technical Research Institute

Tetsuya Ishida
The University of Tokyo

Tadatomo Watanabe
HRC Research Institute Co., LTD.

Reasons for the Award

In the design of concrete structures, phenomena such as bridge deflections and bearing deformations due to shrinkage or creep can lead to major repairs once they occur, highlighting the need for rational design methods to mitigate these issues. This is particularly important given the challenges of changing weather conditions and the difficulty of obtaining high-quality aggregates in construction practices in Japan, necessitating methods that accurately predict the effects of concrete shrinkage over the service life of structures.

This paper presents a prediction formula for concrete shrinkage strain, essential for forecasting structural displacements and deformations. The formula accommodates concrete incorporating fly ash and blast furnace slag and allows for the inclusion of regional information such as rain precipitation and aggregate shrinkage strains. The validity of the proposed formula is confirmed through comparison with actual measurements from prestressed concrete (PC) girders in service, providing clarity for practitioners. Additionally, the paper examines shrinkage strain over a 100-year period, including concrete members with large thicknesses, using the three-dimensional material-structure coupled response analysis system, DuCOM-COM3. The analysis considers cement hydration and water supply, ensuring that data is impartially discussed and offering academic insights into the long-term behavior of concrete.

For these reasons, this paper was recognized as worthy of the Yoshida Award in Research Paper Category.

Yoshida Award
Research Encouragement Category

Back to TOP Page

Microscopic Elucidation of Anisotropic Expansion Mechanisms of Alkali-silica Reaction Using Advanced Image Analysis Techniques

Hayato Takahashi (Tokyo University of Science)

Tanaka Award
Achievement Category

Back to TOP Page

Clarifying the Role of PC Structures in Enhancing Durability of PC Bridges Towards Sustainable Society

Masamichi Tezuka
Head of Quality Management Department, Sun Environment Planning Co., LTD.
(Original Affiliation and Title: Managing Executive Officer, Oriental Shiraishi Corporation)

Reasons for the Award

Masamichi Tezuka joined Oriental Concrete Co., LTD. (now Oriental Shiraishi Co., LTD.) in 1977 and has achieved outstanding results in research and development related to prestressed concrete (PC) bridges. At that time, even PC bridges, known for their high durability, were beginning to show signs of deterioration such as chloride-caused damage. Tezuka was among the first to engage in research and development aimed at improving the durability and advanced maintenance of PC bridges. As the use of continuous fiber reinforcement materials for bridges started in Japan, he focused on aramid fibers, conducting research and applying them to actual structures. In addition to his work in research and development, he was also involved in the construction of PC bridges, including the Kiso River Bridge on the Ise Bay Expressway.

Tezuka has also contributed to the advancement of PC bridges in academic societies. In JSCE, he served as a standing member of the Concrete Committee, dedicating efforts to evaluating the environmental performance of PC bridges and addressing issues. At the Japan Prestressed Concrete Engineering Association, he served as a director and vice president, working on the standardization of durability improvement and maintenance of PC bridges, clarifying the role of PC structures in sustainable society, and archiving PC technology. At the Prestressed Concrete Construction Association, he served as the chairperson of the Environmental Impact Reduction Committee, contributing to the evaluation of concrete durability and efforts towards low-carbon society.

Through these activities, Tezuka's contributions to the advancement of bridge technology in Japan are recognized as significant, making him worthy of the Tanaka Award in Achievement Category.

Tanaka Award
Bridge Design and Construction Category

Back to TOP Page

New Kuzuryu River Bridge Construction

Contractee	Hokuriku Shinkansen Construction Bureau of Japan Railway Construction, Transport and Technology Agency Fukui Civil Engineering Office, Fukui Prefecture
Designer	Yachiyo Engineering Co., LTD. Kozo Sekkei Institute Co., LTD.
Constructor	Tekken-Abe Nikko-Shimizugumi Hokuriku Shinkansen Kuzuryu River Bridge Project Joint Venture Nippon P.S Co., LTD.

Reasons for the Award

The bridge is the first combined-use bridge on the Shinkansen network, integrating railway and road components in its substructure. It serves both rail and road traffic, enhancing scenic views and providing a new landmark where all users—railway passengers, road users, and pedestrians—can enjoy picturesque landscapes.

The seismic design of the integrated substructure meets the standards of both railway design guidelines and road bridge design specifications. The bearings for the railway girders use rubber bearings combined with damper stoppers, while the road girders employ seismic isolation bearings. The behavior of these different types of girders under seismic conditions was validated through time-history response analysis to ensure that they do not collide. Additionally, the safety of Shinkansen operations during Level 1 earthquakes was verified by assessing the angular displacement and vibrational displacement relative to adjacent structures.

The integration of the substructure resulted in significant cost reductions and a shortened overall construction schedule. It also minimized environmental impact by preventing scour through the construction of adjacent single piers. During construction, temporary bridges and scaffolding were used in the river for construction roads, and cantilever erection was employed for the girders, eliminating the need for river diversion and demonstrating consideration for river environment conservation.

In terms of durability and maintenance, measures were taken to address chloride attack from de-icing agents for the railway girders. The durability was confirmed by testing the grouting properties of prestressed concrete (PC) and maintaining the manageability of Shinkansen tracks by using general-purpose fastening devices with a girder gap of 250 mm or less.

Overall, the collaborative efforts of different fields in reducing costs, shortening schedules, considering environmental factors in design and construction, and ensuring seismic performance and maintenance have made this bridge a significant contribution to future bridge construction. This achievement was deemed worthy of the Tanaka Award.

Tanaka Award
Bridge Design and Construction Category

Back to TOP Page

Large-Scale Renewal of Yotomi Viaduct Outbound Line, Higashi-Meihan Expressway

Contractee	Nagoya Regional Head Office, Central Nippon Expressway Co., LTD.
Designer	Obayashi-Honma-Kato Construction Higashi-Meihan Expressway Yotomi Viaduct Slab Replacement Project Joint Venture
Constructor	Obayashi-Honma-Kato Construction Higashi-Meihan Expressway Yotomi Viaduct Slab Replacement Project Joint Venture

Reasons for the Award

This bridge on the heavily traffic Tomei-Hanshin Expressway adopted a width-directional segmented construction method (half-section construction), which is relatively uncommon in Japan, to replace approximately 1.6 km of bridge slabs in a short period while minimizing social impacts such as traffic congestion. The project also included the widening of the road.

During construction, the half-section method was applied to replace the slabs one lane at a time without closing the road. To ensure the availability of traffic lanes during the replacement of the outbound lanes and future inbound lanes, road widening was carried out simultaneously. For the widening, the bridge piers and beams were reinforced with prestressed concrete (PC) external cables and carbon fiber sheets, avoiding the need for additional pier construction or foundation reinforcement and minimizing impacts on local roads.

Additionally, for this bridge with an S-curve road alignment, a new joint structure using ultra-high-strength fiber-reinforced concrete (UFC) that accommodates fine adjustments in the alignment of the precast PC slab segments was introduced. This method was aimed at improving construction efficiency and achieving rapid construction.

To prevent traffic congestion and accidents with general vehicles, the transportation of the slabs was carried out without using the expressway. Three lifting devices were installed on the side roads, and a rail system set up on the bridge surface was utilized to transport the slabs to the construction site using self-propelled carts. This approach successfully avoided the inflow and outflow of construction vehicles on the main expressway.

By minimizing the impact on highway traffic while achieving efficient and rapid construction, this project is recognized as a significant contribution to future bridge maintenance works, making it worthy of the Tanaka Award.

Innovative Technique Award

Back to TOP Page

Development of a Box Culvert Construction Method Using Partial Precast Components (PPCa Box Culvert)


Ryota Kasakura
Tokyu Construction Co., LTD.


Koichiro Orita
Tokyu Construction Co., LTD.


Wataru Nakayama
Tokyu Construction Co., LTD.


Hideki Kishi
Asahi Concrete Works Co., LTD.


Syun Fukuda
Asahi Concrete Works Co., LTD.

Reasons for the Award

Recently, initiatives aimed at improving productivity at construction sites have been promoted, with a focus on factory-produced components such as precast products in concrete work. Traditional box culverts have used precast products for structural construction, primarily applied to box culverts with internal cross-sections of around 12 m^2 or less, due to transportation and handling conditions of precast products.

The developed "PPCa Box Culvert" method targets large box culverts by replacing parts of the sidewalls and top slabs with precast components. These precast components are integrated with cast-in-situ concrete to construct the culvert. This partial pre-casting allows for the pre-casting of large box culverts, resulting in reduced labor for rebar work and formwork, thus improving on-site efficiency. Additionally, this technology ensures flexibility in the positioning of precast component joints, allowing for the adaptable design of precast components according to site constraints. Moreover, this technology is highly compatible with 3D simulations, contributing to the efficiency of the construction production process through 3D model extension and multi-dimensional analysis, as well as front-loading techniques.

Therefore, this technology is valuable for improving productivity at construction sites and advancing construction production systems, making it worthy of the Innovative Technique Award.

Innovative Technique Award

Back to TOP Page

Development and Practical Application of Concrete Crack Image Analysis Technology (t.WAVE)


Kenichi Horiguchi
Taisei Corporation


Masami Honzawa
Taisei Corporation


Kai Nomura
Taisei Corporation


Yuta Uemura
Taisei Corporation

Reasons for the Award

Inspection of concrete structures typically involves checking for cracks and recording their location, length, and width. Traditionally, this inspection has been performed through close visual examination by personnel, which can lead to variability in results depending on the inspector's skill and characteristics. Additionally, inspections often occur in high or confined spaces, posing safety and discomfort challenges. Recent advancements in digital technologies, such as AI and ICT, have led to the development of methods for evaluating concrete cracks from digital images.

This technology combines automatic crack detection using AI with an image analysis technique known as wavelet transformation for automatic crack width measurement. It excels in the accuracy of crack detection and width calculation. Particularly, the proprietary wavelet transformation method for crack width measurement is less affected by variations in concrete color or brightness, making it versatile enough to work with various imaging equipment, including drone-mounted cameras and digital single-lens reflex (DSLR) cameras.

By leveraging these features, this technology has already been successfully applied to numerous concrete structure inspections. It contributes to reducing variability in inspection results, minimizing high-altitude work, and improving inspection efficiency. Additionally, it is recognized as a valuable tool for advancing the digital transformation (DX) of inspection data.

Therefore, this technology was deemed worthy of the Innovative Technique Award.

Innovative Technique Award

Back to TOP Page

Development of a Lightweight, Reusable Concrete Curing Method Without Using Water (Ad-Balloon Method)


Akira Hosoda
Yokohama National University


Masaya Kawataba
Yokohama National University


Takeshi Ibi
Daika Co., LTD.


Takayuki Masuo
Daika Co., LTD.


Takayoshi Shiina
Nishimatsu Construction Co., LTD.


Daisuke Yamaki
Nishimatsu Construction Co., LTD.

Reasons for the Award

Instances of deterioration in tunnel linings have been reported, highlighting the need for improved quality in lining concrete and leading to various proposed curing methods. However, conventional curing methods often involve large-scale assembly of steel structures or the application of curing sheets, which requires custom fabrication for each site and generates significant waste after project completion. Additionally, when there are cross-sectional variations in tunnels, such as general and widened sections, multiple curing systems are needed for each section, and water-based curing methods require the management and operation of complex water supply systems, presenting challenges for improvement.

The Ad-Balloon Method involves inflating small-diameter (15 cm) tube-shaped balloons to create an upright position. These balloons press curing sheets against the tunnel lining surface to form a sealed space that maintains temperature and humidity for curing. The length of the balloons can be adjusted to accommodate variations in tunnel cross-sections, such as widened sections, and the method is adaptable to different tunnel cross-sectional shapes across various sites, making it reusable. This method establishes a curing system that maintains moisture using only the concrete's inherent water, eliminating the need for water supply. Additionally, the entire system is lightweight, facilitating safe and easy movement and installation within the tunnel.

Results from applying this method at multiple sites have confirmed its excellent workability and improved curing quality, proving to be more effective than traditional curing systems. The reusability of this method offers significant benefits for achieving zero-emission construction, and it is anticipated that further examples will demonstrate its advantages. Thus, this technology was recognized worthy of the Innovative Technique Award.

Innovative Technique Award

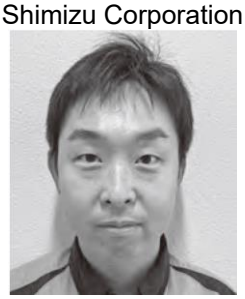
Back to TOP Page

Development of an Ultra-Delayed and Thickening Joint Treatment Agent for Improving Quality and Productivity


Yuji Goryogono
Shimizu Corporation


Hiroshi Nemoto
Shimizu Corporation


Keiji Yukita
Shimizu Corporation


Kenta Oda
Sika Japan LTD.


Katsuya Yoshida
Sika Japan LTD.


Minoru Yaguchi
Sika Japan LTD.

Reasons for the Award

Ensuring proper joint treatment and maintaining the quality of construction joints are critically important for the integrity of concrete structures.

To address the challenges of conventional joint treatment methods, the recipients have developed a joint treatment agent that reacts to the alkalinity of concrete to increase its viscosity. This agent maintains its effectiveness without being washed away by bleeding water or flow gradients, and it can be foamed to enhance visibility and achieve even application. Additionally, they have developed an ultra-delayed joint treatment agent by adjusting its delay components, allowing joint treatment even across extended breaks, such as holidays. This technology enables both improved joint quality and promotes a shift in working practices on construction sites.

This technology clarifies the mechanism of existing joint treatment agents through experimental research and provides a clear explanation of the development process for the newly developed joint treatment agents. It also elucidates the phenomenon of setting delay caused by the joint treatment agent through chemical analysis and offers a deep exploration of the mechanism behind the ultra-delay properties. Furthermore, the developed joint treatment agent has been applied in real construction practices, validating its effectiveness in improving quality and productivity. The technology is noted for its high originality, novelty, and potential for future development.

Given its significant contribution to ensuring the quality of critical construction joints and achieving productivity improvements, this technology is highly valuable for advancing concrete construction techniques. Therefore, it was deemed worthy of the Technology Development Award.