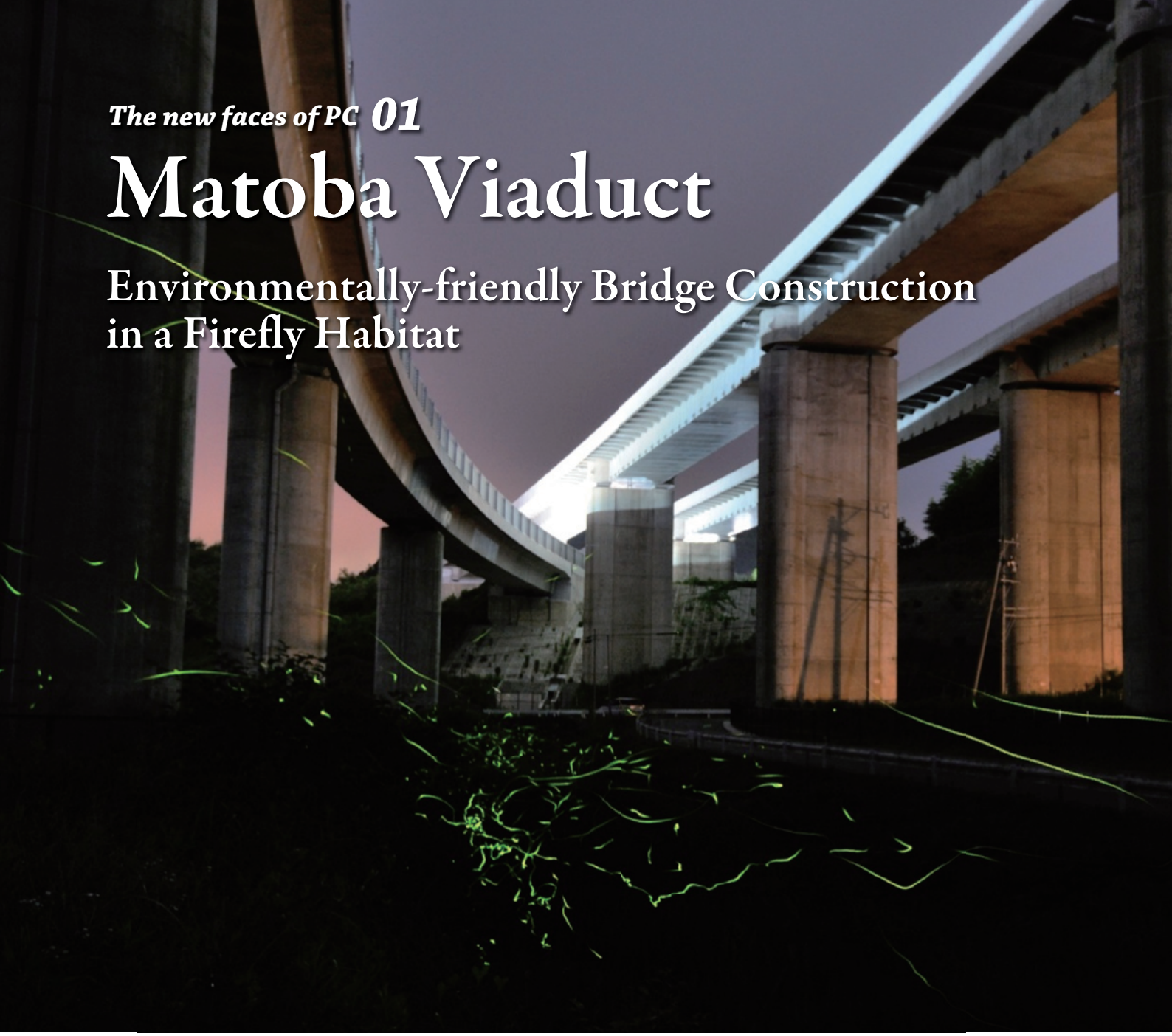


The new faces of PC ***01***

Matoba Viaduct

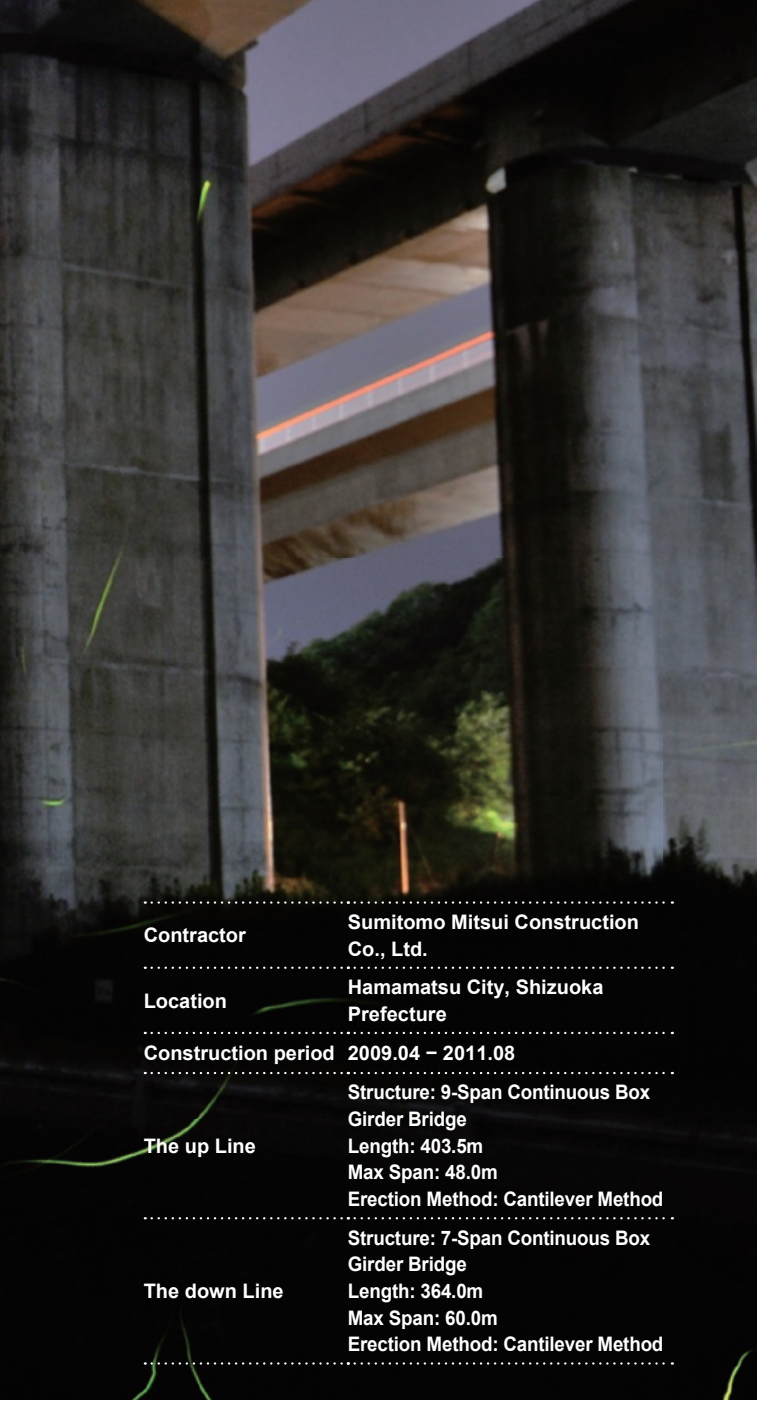
Environmentally-friendly Bridge Construction in a Firefly Habitat

Outline

The Matoba Viaduct is constructed over a mountain village and surrounded by lush forest and clear stream. The Matobagawa River flows through the area and is well-known for its firefly watching. However, as a result of recent development and river construction improvement projects, there has been growing concern that places suitable for firefly's egg-laying and growth are rapidly decreasing.

Changing from "a Cast-in-Place Method" to "a Precast Cantilever Method"

In order to protect the natural environment near the construction, the viaduct construction method was changed from a cast-in-place method to a precast segment cantilever method. With this construction method, precast segments of bridge girders are prefabricated at a fabrication facility set up near the site in advance, and the segments are connected to extend toward both sides from upper tower like a balancing toy. This method allows the viaduct to be constructed entirely from above, and eliminates the need to erect temporary support structures called falsework between bridge supports. This also eliminates damage and destruction of firefly habitats that thrive underneath the bridge girders. Adoption of the segment construction method realized preservation of the natural firefly's habitats around the river virtually as it has been.



Contractor	Sumitomo Mitsui Construction Co., Ltd.
Location	Hamamatsu City, Shizuoka Prefecture
Construction period	2009.04 – 2011.08
The up Line	Structure: 9-Span Continuous Box Girder Bridge Length: 403.5m Max Span: 48.0m Erection Method: Cantilever Method
The down Line	Structure: 7-Span Continuous Box Girder Bridge Length: 364.0m Max Span: 60.0m Erection Method: Cantilever Method

Segment Manufacture

Segment Erection

After Completion

Inherit a Rich Natural Environment

The innovation to preserve the natural environment not only comprises the construction method, but also the implementation of the segment method created spaces directly under the bridge and this space was allocated as a biotope for firefly's egg-laying. Taking the firefly's lifetime behavior into consideration in various respect, the segment construction method by its nature aimed not only at the preservation of their habitat environment but even at vitalization of it as well by creating such biotope.

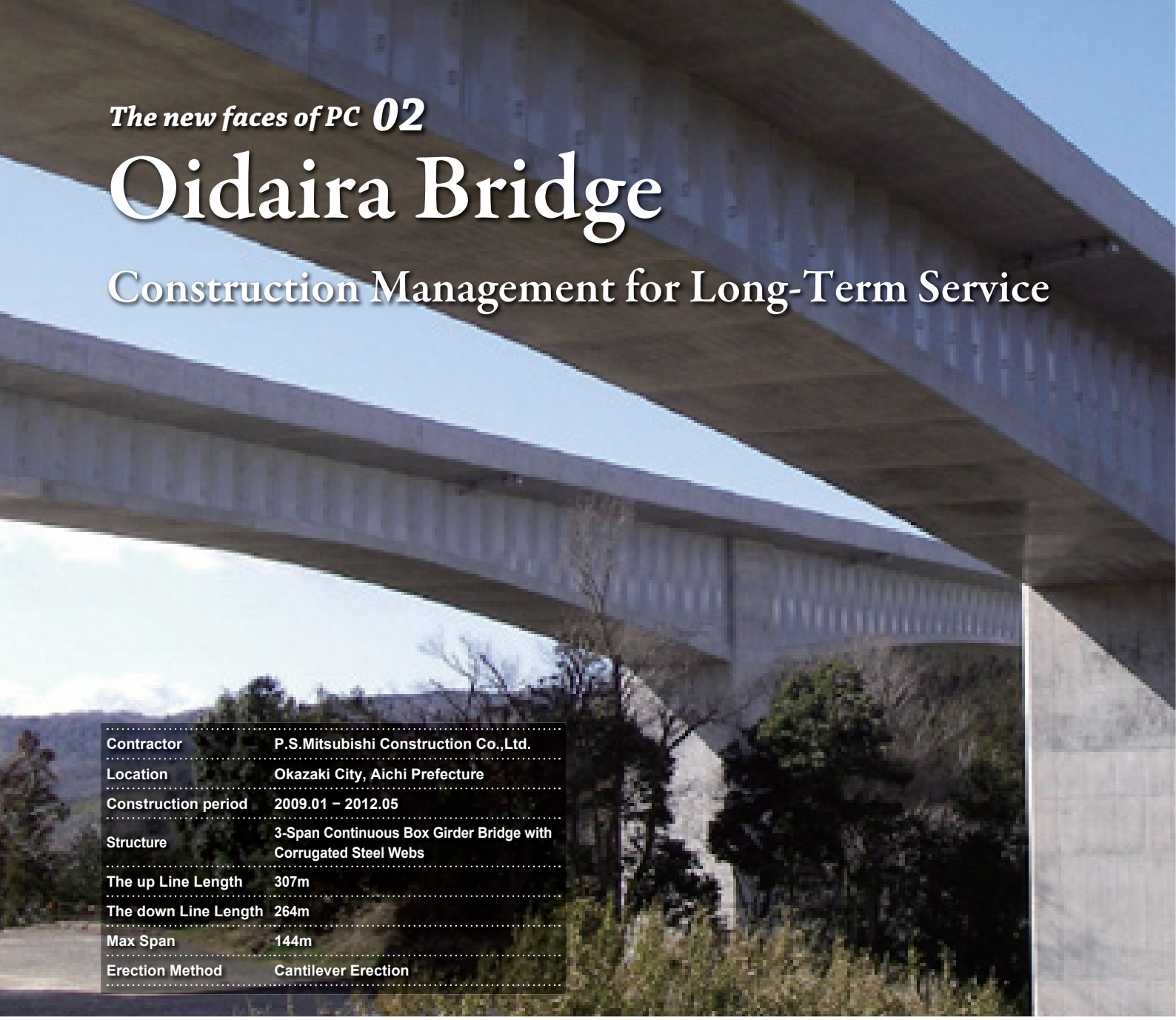
Local society's cooperation and increased awareness was required to conserve the environment. Various activities have been also carried out for the purpose of handing over the rich natural environment to the next generation, such as a firefly watching event in June and support for children's nature work-study activity support for children in cooperation with the local society.

Through these activities, local community associations have established a new non-profit organization in an effort to conserve and improve the habitat environment where the firefly flies around by utilizing the biotope, and the future development of such organization is greatly expected in the near future.

The new faces of PC **02**

Oidaira Bridge

Construction Management for Long-Term Service



Contractor	P.S.Mitsubishi Construction Co.,Ltd.
Location	Okazaki City, Aichi Prefecture
Construction period	2009.01 – 2012.05
Structure	3-Span Continuous Box Girder Bridge with Corrugated Steel Webs
The up Line Length	307m
The down Line Length	264m
Max Span	144m
Erection Method	Cantilever Erection

Outline

Oidaira Bridge is a main line bridge on the SHIN-TOMEI EXPRESSWAY located in Oidairacho, Okazaki City, Aichi Prefecture. This is a long span bridge of 3 spans with a total bridge length of 571m and a maximum span length of 144m due to land form of the construction site and intersecting routes and river. Construction of the bridge adopted a corrugated steel web structure by cantilever construction which can reduce self-weight and therefore is excellent in structural performance and economic efficiency.

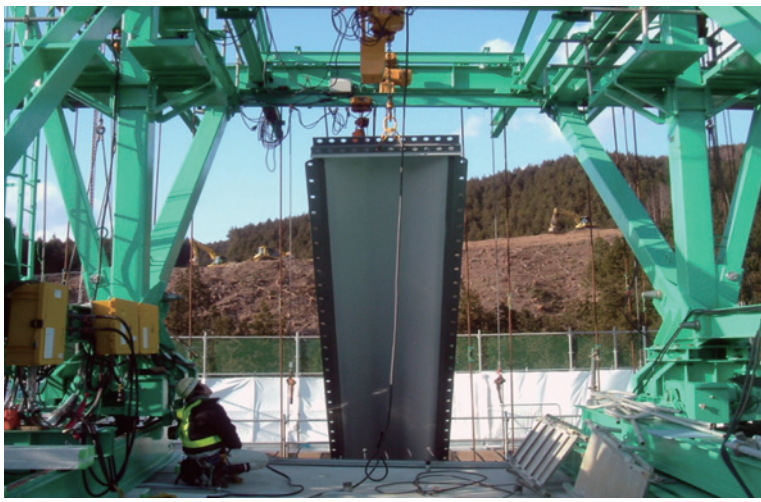
Quality and durability have been taken into consideration so that users can feel secure over long-term use in view of minimum maintenance, and importance has been particularly focused on construction management of corrugated steel web and concrete.

Construction Method

For construction of corrugated steel web, steel plates which were segmentalized into blocks were aligned to the predetermined position in height and direction in 1mm units and welded, and then integrated. Welded locations easily suffer fatigue-breakdown due to long-term vehicle traffic weight, therefore, flaws which are not visible to the naked eye are investigated by a flaw detection test. In addition, steel plates were double-coated seven times for protection in consideration of reduction in operation and maintenance costs.

For concrete placement, because the concrete pressure feed distance was relatively long with a vertical pipe of 40m and horizontal pipe of 70m, there was a concern that the pressure feed pipe might be blocked when concrete was poured. When the pipe becomes blocked, an initial

Cantilever Method



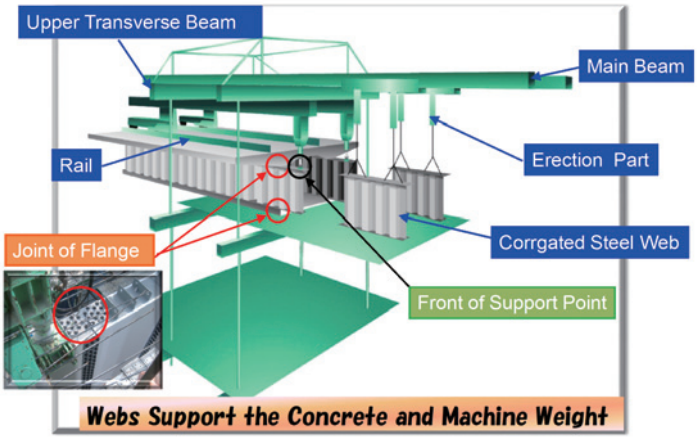
Corrugated Steel Web Installation

defect occurs such as cold joints or a honeycomb flow develops because a concrete feed is ceased. In particular, during summer, a pressure feed pipe is exposed to direct sunlight and becomes hot. This could cause concrete to clog. As a countermeasure, mats are laid as shown in the photo to cure with watering to inhibit a temperature rise.

Okazaki City

Okazaki City, where this bridge is located, is nationally-known as a production region of "Hacho-style" (soy bean and rice) miso paste. Originally made in Hatcho Village (present day Hatcho in Okazaki City) and hence the name, this miso paste is created from soy beans cultivated along the Yahahigawa River in Okazaki City and salt produced in Aiba on the Chita Peninsula. Famous dishes using this miso paste ingredient include miso cutlets, miso noodles cooked in miso broth, and grilled tofu with miso.

In addition, Okazaki City is also a production area of good quality granite. Manufacturing techniques for gravestones, stone lanterns and images of Buddha are of excellent quality in Okazaki City. And Okazaki City is one of the three major production areas of stone products in Japan. With the completion and opening of the SHIN-TOMEI EXPRESSWAY, traffic between Tokyo and Nagoya will flow smoothly, and people in the Okazaki City area look forward to expand people's knowledge of Hatcho miso paste and stone products of Okazaki City.



Improvement of Cantilever Machine

Complete View

Outline

Otogawa Bridge is one of the bridges located in the SHIN-TOMEI EXPRESSWAY at Aichi Prefecture. This bridge is situated under a severe terrain condition where the Oto-River and the Prefectural Route cross with mountains immediately on both sides. Tunnels were constructed on both sides of the bridge at the same time of construction of the bridge and this site was also a severe construction condition. After completion, a request was made to hand over the bridge as soon as possible as it was intended to be used as a construction route for the transport of soil.

Construction View on Spring

Construction View from Oto-River on Autumn

The new faces of PC **03**

Otogawa Bridge

Feel the Four Season in Oto-River

Contractor	Oriental Shiraishi Co., Ltd.
Location	Okazaki City, Aichi Prefecture
Construction period	2007.09 – 2012.07
Erection Method	Cantilever Erection
The up line	Structure: 5-span Continuous Rigid Frame Box Girder Bridge with Corrugated Steel Webs Length: 519.5m Maximum Span: 135.0m
The down line	Structure: 5-span Continuous Rigid Frame Box Girder Bridge with Corrugated Steel Webs Length: 524.5m Maximum Span: 137.0m

Feature of Construction Method

The superstructure of the bridge made from prestressed concrete was constructed by a construction method called a cantilever construction method. Otogawa Bridge was provided with a special equipment for pouring concrete and corrugated steel webs which were side parts of the bridge were devised (as shown in the drawing, a design where both flanges on the upper and lower sides of the web are joined in advance, then the front part of the equipment is placed on the integrated web). This design allowed the additionally pouring concrete length to be extended up to 5.6m, and it successfully shorten the construction period by significantly decreased the number of pouring times.

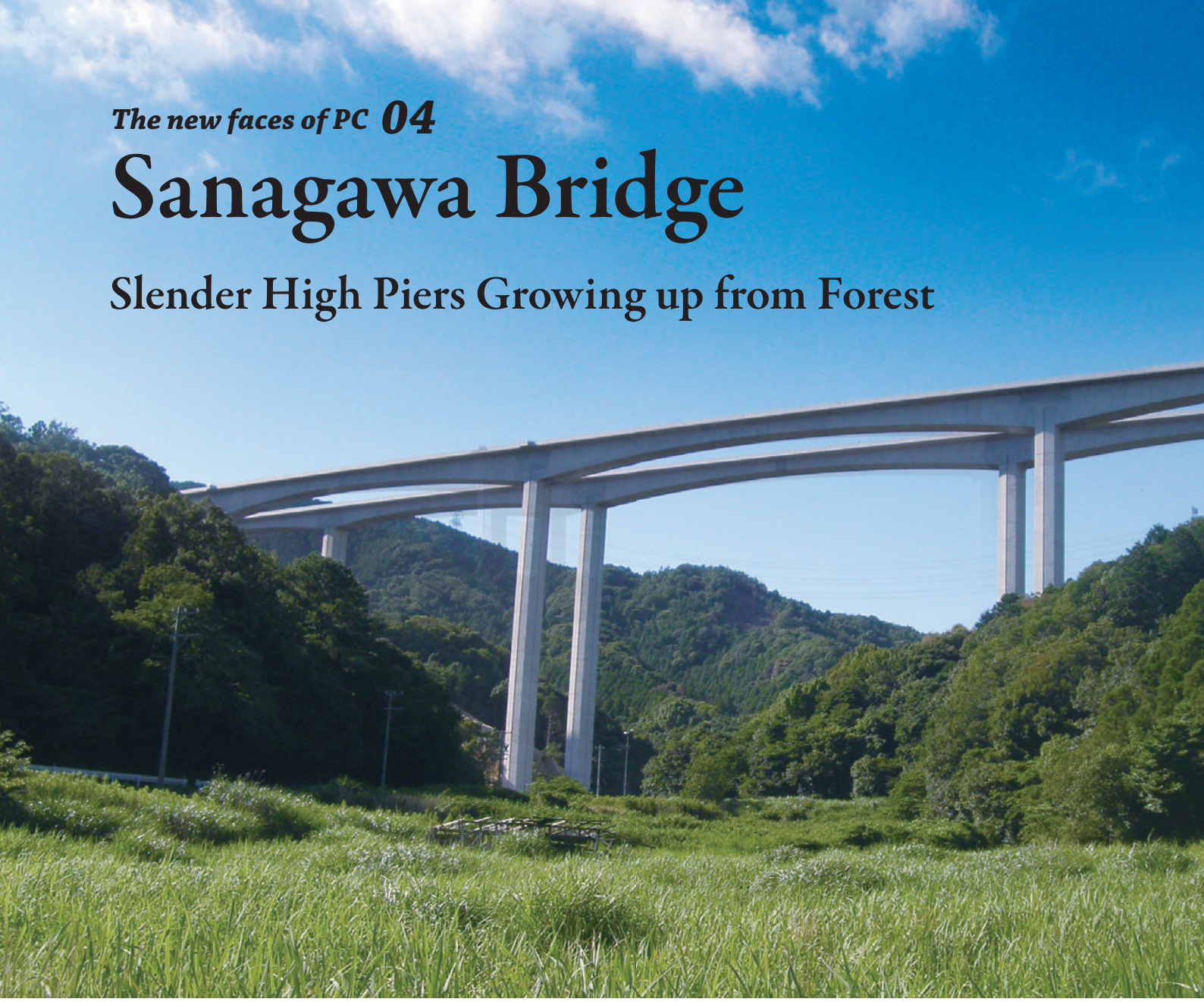
Enviroment of Construction Site

The Oto-River which the bridge crosses is known familiarly as a habitat of girefly which is called Gengi-hotaru. In the summer, these Japanese fireflies emerge from the riverside and flicker in the in night sky. The Oto-River is where an abundance of sweet fish run and the popular fishing spot is just along the downstream side of the bridge. Anglers can always be seen from the end of June when a season of fishing sweet fish opens. A seasonal dish at a restaurant near the site, sweet fish can also be seen swimming in the river from the tables of the restaurant's center garden while fresh sweet fish dishes are served. In spring, cherry blossoms are in full bloom along the Oto-River, and local people and passers enjoy the scenes. In winter, this area is often covered with snow, and the Oto-River enhances the color and beauty of the four seasons. The SHIN-TOMEI EXPRESSWAY is scheduled for completion and opening in 2014, and many travelers look forward to travel on the road. What about a leisurely drive on the crossing the route while viewing many spectacular bridges including Otogawa bridge on the SHIN-TOMEI EXPRESSWAY from below the bridge and savoring the seasonal dishes before the complete opening of the SHIN-TOMEI EXPRESSWAY.

The new faces of PC **04**

Sanagawa Bridge

Slender High Piers Growing up from Forest



Super-RC Structure

The Sanagawa Bridge is one of the bridges along SHIN-TOMEI EXPRESSWAY. The Sanagawa Bridge was built in Toyokawa City, Aichi Prefecture. The superstructure work and substructure work of this bridge were ordered as one contract. In addition, the design and construction were collectively ordered (design-build agreement). The greatest feature of the Sanagawa Bridge is the tallest pier column at 89m among bridges through the SHIN-TOMEI EXPRESSWAY. This is the fourth tallest pier column (at the time of construction) as a highway bridge in Japan. The Super-RC structure, which was developed by KAJIMA, was adopted for this pier column. The Super-RC structure combines high strength concrete and high strength rebar. This combination makes pier column slender and therefore enhances structural performance and economic efficiency. Furthermore, its long natural period enhances seismic performance. In addition, the elegance of the slender pier columns is emphasized especially in the Sanagawa Bridge by adopting an octagonal cross section with vertical slits at the corners.

Consideration of Natural Environment

The Sanagawa Bridge is in abundant natural environment. Many protected species live around the bridge. Fluvial eight-barbel loaches live in the tributaries of the Sana-River. Raptors such as Butastur indicus hunt and live around the river. With this in mind, meticulous attention to detail and care was taken to protect the local ecosystem for building the bridge. In order to protect the fluvial eight-barbel loach ecosystem, the position of pier columns was determined with a certain distance from the tributaries. Furthermore, measures were taken so as to avoid flowing turbid water and sediment into the tributaries during construction.

As a result of these measures, there was no change in the

Secure Space for the Raptors

Slender High Piers (89m)

Minimize Modification of Land Features

Bamboo-cut Method

number of fluvial eight-barbel loaches counted by surveys carried out before and after the construction. In addition, it was also confirmed that the number of individuals increased in some survey locations. Then in order to protect the ecosystem of the raptors, inhabitation areas and migration paths for prey animals such as frogs were ensured. Rice field locations on the east side of the main stream of the Sana-River where prey animals live were maintained and roads for construction over the rice field were not built as embankments but piers. In addition, in order to secure space for the raptors' circular fly, the span between P3 and P4 above the rice fields is expanded. In addition to this, a vertical excavation method, so-called bamboo-cut method, was adopted for the eight pier columns to limit the deforestation range to construction road areas and some construction yards and to minimize modification of land features associated with construction of the bridge. As a result, it is sometimes said that "the pier columns seem to grow out from the forest" after completion of the bridge.

Through efforts on the above design and construction, the entire superstructure and substructure including accessories and installation and removal of temporary facilities was completed within three years from the start of temporary work in October 2009. The section of SHIN-TOMEI EXPRESSWAY including this bridge is scheduled to open in 2014.

Contractor	Kajima Corporation
Location	Aichi Prefecture
Construction period	2009.02 − 2012.10
Structure	6-Span Prestressed Reinforced Concrete Rigid Frame Box Girder Bridge
Length	Up-bound direction: 636m Down-bound direction: 699m
Max Span	142m
Erection Method	Cantilever Erection

The new faces of PC **05**

Hokkan Jintsugawa Bridge

Aiming to be Beloved Landmark

Contractor	Taisei Corporation/Daiho Corporation/ Nihonkaikenko Corporation Joint Venture
Location	Toyama City, Toyama Prefecture
Construction period	2008.09 – 2012.10
Structure	4-Span Continuous Extradozed Box Girder
Length	428m
Max Span	128m
Erection Method	Cantilever Erection

Outline

Jintsugawa Bridge is four span continuous PC extradosed bridge, of which length is 428m, and located on the west side of JR Toyama Station, of Hokuriku Shinkansen in the middle of construction. The maximum span length is 128m and this bridge is the second longest in Japan as an extradosed bridge for railway.

Hard Execution Condition

This bridge was built by cantilever method constructed while balancing the right and left. As this bridge was constructed directly alongside already-existing steel bridges on which the JR Takayama main line and Hokuriku main line pass, tightly scheduled construction work was carried out every day so as to eliminate the potential for trouble in operation of trains.

In addition, construction was also carried out in the waterways of the Jintsu-River and construction work was suspended due to a rise in water level during at the rainy season. On the other hand, during the winter season snow had to be removed often due to heavy snowfall. In particular, as for snowfall winter of 2012, snow fell heavily with 80cm even within Toyama City for the first time in 26 years. During that winter, snow fell so often that on occasion removal had to occur twice a day for consecutive days.

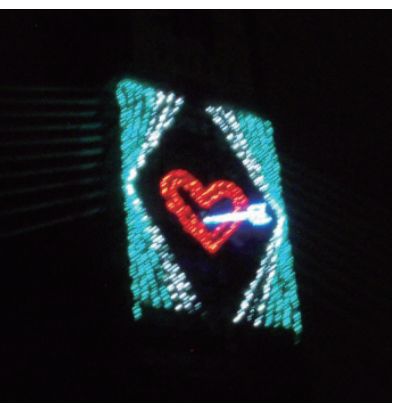
Bridge Illumination for Loved Landmark

Despite several hardships during construction, a sense of spirit and vigor prevailed and illumination of 8,000 LED bulbs were rigged to the scaffolding of the three main towers approximately 15m height supporting the cable wires. In order to attract residents near the site who experienced transportation troubles and to also grow fond of the bridge and further promote the Hokuriku Shinkansen, Christmas tree and star illuminations were presented in December, Kagami-mochi at the beginning of the year, and hearts were presented in illumination in tribute to Valentine's Day in February.

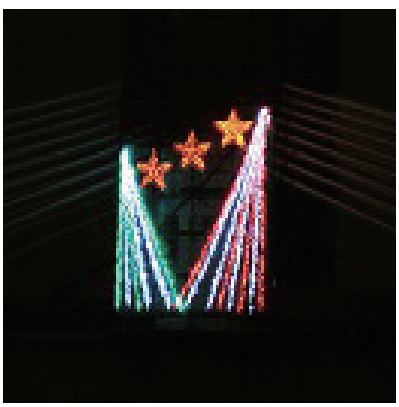
Construction work started in September 2008 and was successfully completed at the end of October 2012. Appreciation is expressed to the persons involved in this construction and it is expected that the Jintsugawa Bridge which we built will be loved for a long time to come as a landmark of Toyama Prefecture.

Removal of Heavy Snow

Cantilever Method



Christmas Illumination



New Year Illumination

Alongside Existing Line on Steel Bridge

Local Children

Bridge Checker

Bridge Face

Overview

Contractor	NIPPON P.S CO.,LTD.
Location	Fukui Prefecture
Construction period	2011.03 – 2013.01
Structure	3-Span Continuous Rigid Frame Box Girder Bridge
Length	181.5m
Max Span	75.8m
Erection Method	Cantilever Erection

“Dream for the Future of our Children”

Out Line & Construction Method

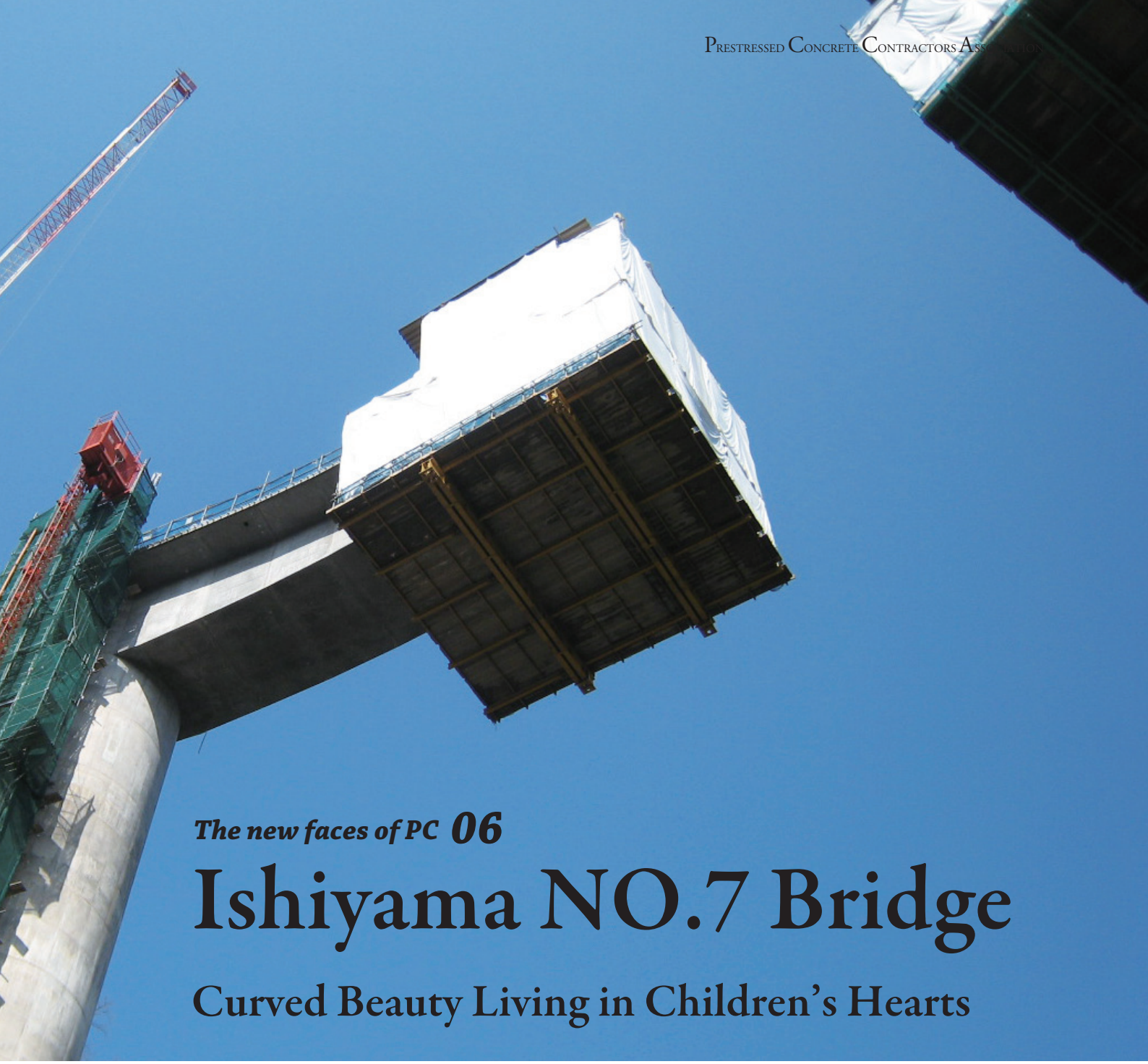
A beautiful bridge with beautiful curved lines circling while overlooking deep passes was completed in the westernmost area of the Hokuriku district. It is called the “Ishiyama No.7 Bridge.”

Formerly, an old mountain road that was narrow and continuously sharp curved and steeply sloped crossed through the passes. Furthermore, the old road had poor visibility, and it was difficult for vehicles to pass each other. Especially during winter, it became difficult for vehicles to travel due to fallen snow. For these reasons, the old road was very inconvenient for local people and visitors alike.

As a result, started to improve the main local road 3.6km section from 2003.

The site had a great difference in height, and in order to minimize the steep slopes, construction of a loop bridge was required with a curvature radius of 90m which is rare in Japan.

This bridge was built by extending while balancing on the right and left like a balancing toy, however, how to balance in this manner was particularly difficult for a loop bridge with a sharp curve. Therefore, it was very difficult to make adjustments with mobile working vehicles and formwork and detailed measurements to build beautiful curved lines during the construction.



The new faces of PC **06**

Ishiyama NO.7 Bridge

Curved Beauty Living in Children's Hearts

Interest In Public Works

Through all the intensity of the work, there was a joyous occasion when 27 childrens from local Elementary School arrived on a fieldtrip to view the connected bridge.

This site tour was planned by Prefectures so that local children would raise their interest in public works projects. They were given an explanation about the construction and construction method, then actually rode in an inspection vehicle from the bridge face and experienced the world from a ground height of 50m. At that time, impressions such as "I can see many houses, but it is hard to get on this and work" were heard, and they were allowed to enter the box girder and write their dreams and hopes for the future. Their dreams and hopes such as "I want to run a flower shop" and "I want to keep my friends forever" instantaneously warmed the cool peripheral concrete atmosphere.

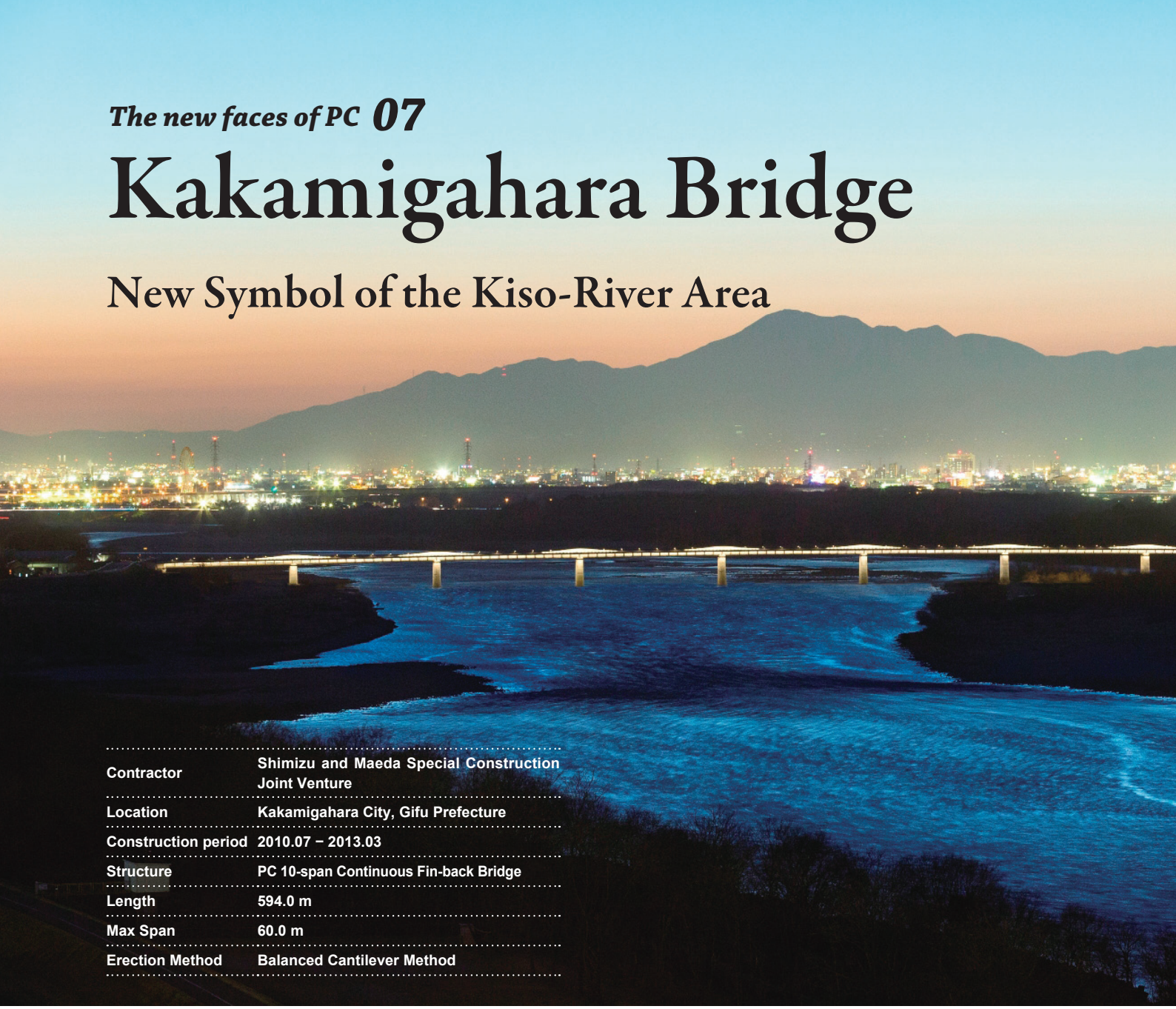
When the children grow and pass along this bridge, they will remember their dreams and hopes they recorded on this bridge.

If this beautifully curved bridge improves local life and they are interested in public works projects just a little, that will be the ultimate reward.

The new faces of PC **07**

Kakamigahara Bridge

New Symbol of the Kiso-River Area



Contractor	Shimizu and Maeda Special Construction Joint Venture
Location	Kakamigahara City, Gifu Prefecture
Construction period	2010.07 – 2013.03
Structure	PC 10-span Continuous Fin-back Bridge
Length	594.0 m
Max Span	60.0 m
Erection Method	Balanced Cantilever Method

Outline

The Kakamigahara bridge is located in the place that can enjoy scenery of nature representing the Nobi planes such as "the range of Mino Mountains" and "grandeur flow of Kiso-River".

The Kakamigahara Bridge is a PC 10 span continuous fin-back bridge with the length of 594m crossing the Kiso River. The bridge opened to traffic this spring (superstructure constructed by Shimizu and Maeda special construction joint venture).

This bridge serves to relieve traffic congestion and ensure emergency transportation means etc., as traffic infrastructure crossing the Kiso-River.

Fin-back Bridge - Shape like Dorsal Fin -

This bridge has characteristic oval bridge supports, semi-oval bridge girders and wavy walls projecting toward the bridge face called fin-back. The design and structural type were selected by a review committee of experts after an open presentation for citizen was held. A fin-back type bridge having a gently curved silhouette was adopted as a new symbol of Kakamigahara City aiming to be a park city.

A fin-back bridge is a bridge with walls of fish fin-back shapes on the bridge girders seen by passengers as they drive over the bridge. These walls run in a wavy shape seen from the road site. The fin-back having a thickness of 40cm located between the carriageway and footway of the bridge also serve not only as a design but also to support the bridge. The fin-back bridge appeals due to its symbolic representation, however, the thickness of the bridge girders and road plan height can be suppressed which contributes to a reduction in total project cost.

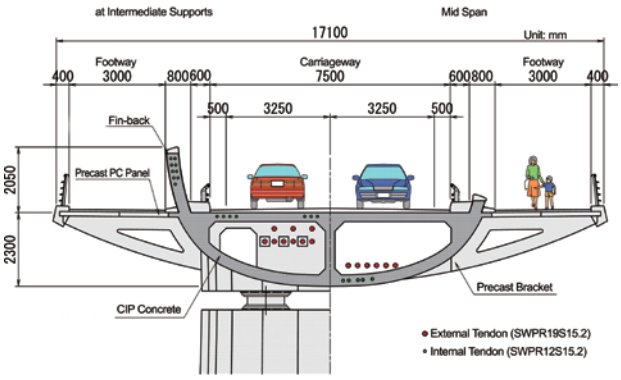
PC Technology for Fin-back Bridge

The Narusegawa Bridge and Himekawa Bridge, both are railway bridges, are known as representative bridges of this type in Japan. The Kakamigahara Bridge is the longest as a road bridge of this type in Japan.

In addition, this bridge girder cross section which reduces member thickness most commonly uses the technology of prestressed concrete (PC). PC steel materials are commonly used in the inner cable placed in the concrete area of the semi-oval bridge girder cross-section and external cable placed in the hollow area.

As the erecting method, a cantilever erection method by mobile erection girder was adopted. Mold forms are suspended from the mobile erection girders installed on the bridge girders, and the bridge girders are extended to both sides of the bridge supports like a balancing toy. This method allows for transportation of materials and equipment and travel of construction-related persons through the completed bridge girders and mobile erection girders. As a result, construction can continue even in the summer when river water levels rise.

PC technology has created one more beautiful bridge which harmonizes the mountain range of the Mino Mountains. The Kakamigahara Bridge does not only serve as transportation infrastructure but also has gained widespread popularity from local residents as a place where citizens can relax.



Standard Cross Section

Fluent Curve of Fin-back

General View

The new faces of PC **08**

Shikanohana Bridge

Curved Bridge Built over Sea of Remote Island

Change of Master Plan to Protect the Habitat of a Precious Coral Reef

Island "Tsushima" on a national boundary is located in the northeast of Nagasaki Prefecture. Construction of Shikanohana Bridge was planned as part of the Izuhara Port route project linking Izuhara Port route project to secure traffic to the port.

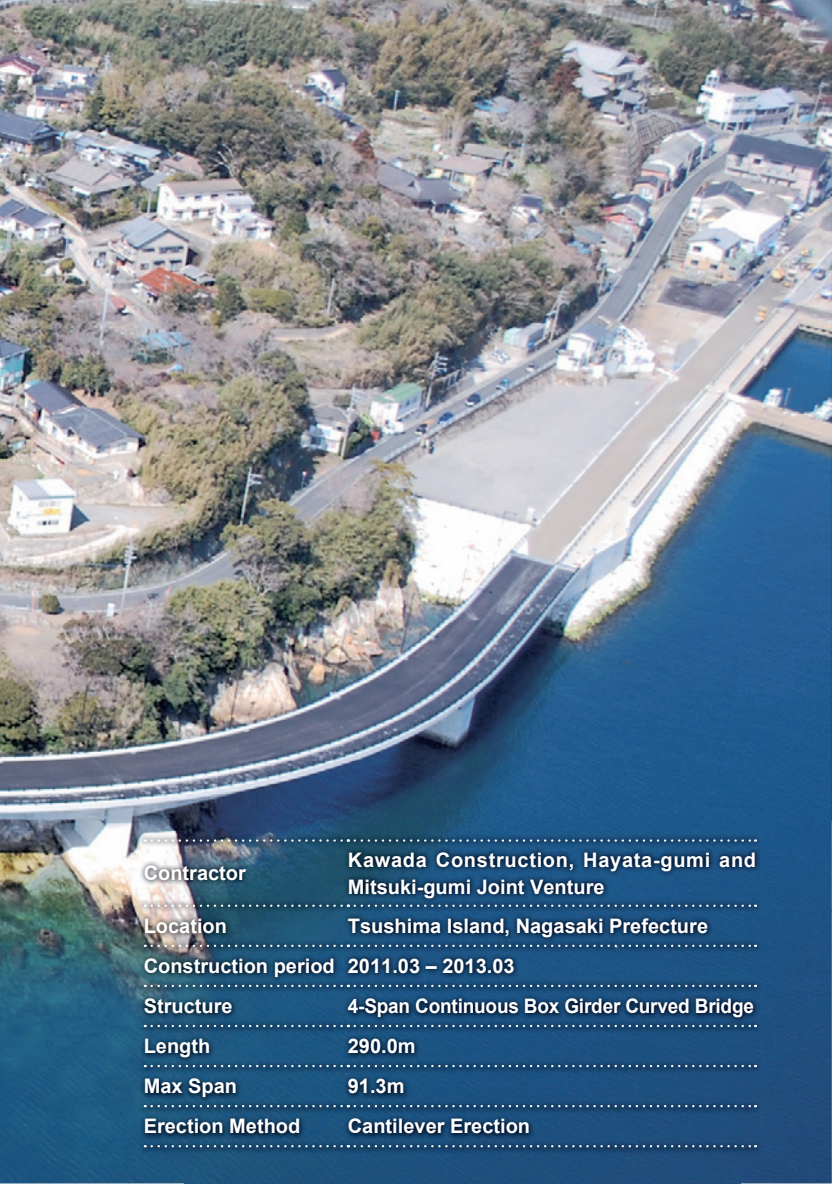
Originally, the master plan was to construct the road by embankments. However, the plan was changed to construct an overpass by piers for reasons to protect the habitat of the precious coral reef and the seawall scenery of the construction area.

When the site was seen for the first time, it was not easily understood in which direction the bridge would be constructed unless it was checked with the drawing because the bridge supports and abutments were erected in various directions in the beautiful sea.

Struggle against Waves and Refugee from Typhoon

Construction materials and equipment were carried in and out mainly by crane barge. It was considered that the crane barge could be set in any location on the sea. However, because of the coral reef, the barge was located somewhat separate from the construction site. Furthermore, although waves were expected to be of little influence as the construction was carried out in a bay area, the waves often came into the bay and the crane barge swayed regularly, then the lifted load swung, often obstructed the construction work.

When a typhoon approached, the Izuhara Port captain would issue an evacuation order and all work ships would evacuate to Aso Bay. To move to Aso Bay, work ships would move through the artificial canal "Manzekiseto" excavated by the Imperial Navy during the Japanese-Russo War. Manzeki Bridge connecting Kamijima Island and Shimojima Island of Tsushima Island was built in 1900 for the first time, and rebuilt a second time in 1956, and then a third time in 1996 on the Manzekiseto, a famous sightseeing spot on Tsushima Island.



Contractor	Kawada Construction, Hayata-gumi and Mitsuki-gumi Joint Venture
Location	Tsushima Island, Nagasaki Prefecture
Construction period	2011.03 – 2013.03
Structure	4-Span Continuous Box Girder Curved Bridge
Length	290.0m
Max Span	91.3m
Erection Method	Cantilever Erection

Friendship Promotion with Local Society

"A Day of Civil Engineering in Tsushima 2012" was held on November 18, 2012 and citizens were invited to hold a site tour. Since the middle section was also completely closed, they were guided onto the bridge by microbus.

The participants were asked to directly touch the coated reinforcing bars which were actually used on the site. Many of the participants did not usually get to see the inside of a bridge, some of them were surprised by the fact that the inside of the bridge girder was hollow, and were convinced by a reply that "if the bridge were completely built up with a concrete mass, the weight of the bridge would increase, and that is why the inside is hollow."

Fireworks explode in front of Shikanohana Bridge at an annual fireworks event of the Izuhara Port festival held for two days on the first Saturday and Sunday in August. The bridge will offer the best viewing spot and spectators will gather over the course of two days.

With all the effort and trouble that went into completing construction of this bridge, it would be great if the Shikanohana Bridge became the symbol of Tsushima Izuhara Port.

Crane barge lifting materials

"Manzekiseto" and "Manzeki Bridge"

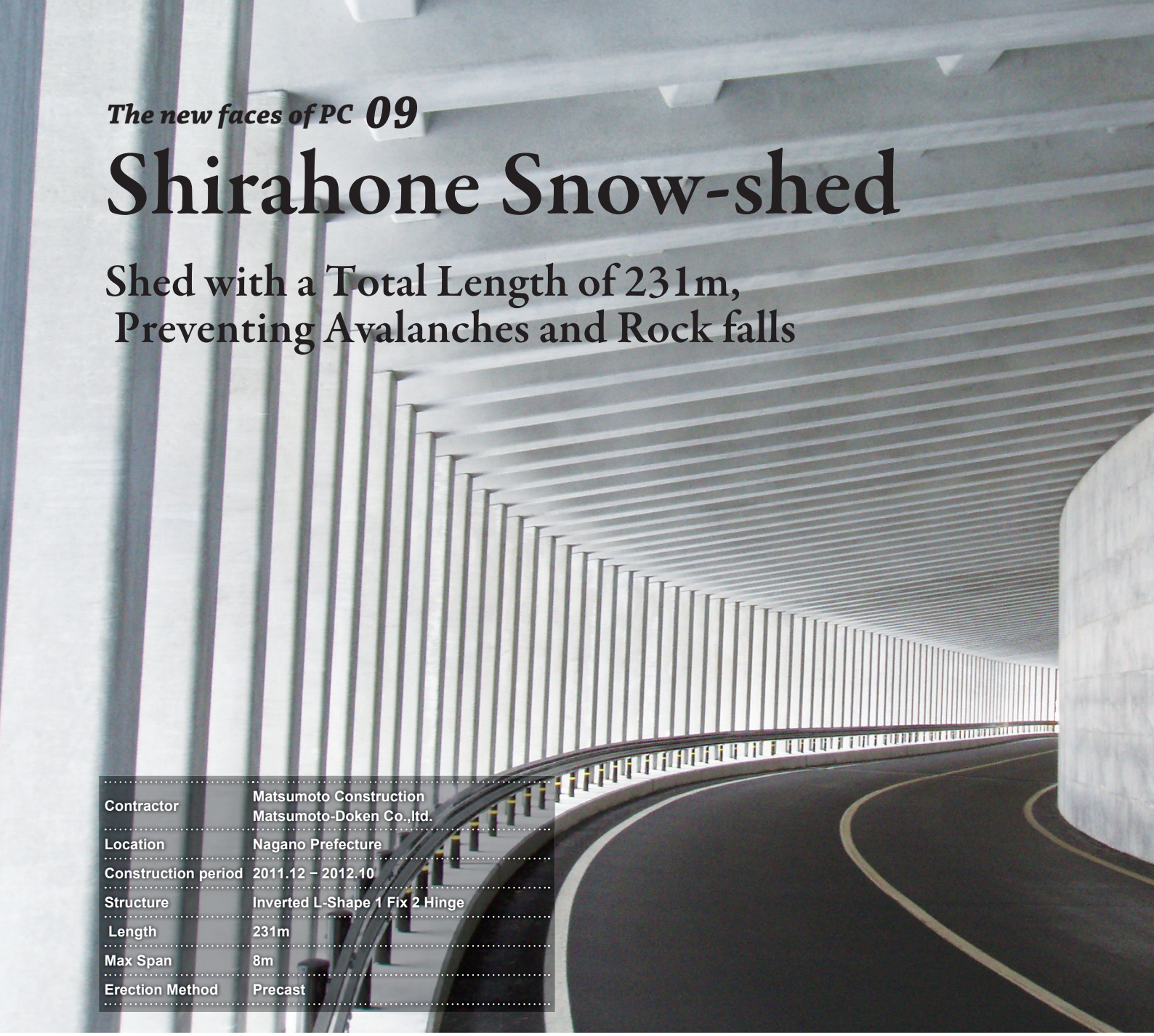
Scene from Izuhara Port Festival

Scene from the "Day of Civil Engineering in Tsushima 2012"

The new faces of PC **09**

Shirahone Snow-shed

Shed with a Total Length of 231m, Preventing Avalanches and Rock falls



Contractor	Matsumoto Construction Matsumoto-Doken Co.,ltd.
Location	Nagano Prefecture
Construction period	2011.12 – 2012.10
Structure	Inverted L-Shape 1 Fix 2 Hinge
Length	231m
Max Span	8m
Erection Method	Precast

Contrivance

In order to open as early as possible, a construction method was adopted to fabricate prestressed concrete members at a factory and assemble them on-site. Generally, a level difference unavoidably occurs between the members under such a severe linear condition. However, if there are some irregularities on the attached facilities along the sightseeing route, this will degrade the attractive appeal of the area. Then how to reduce the level difference between the members and maintain an attractive finish was one of themes of this project. Then advance measurement was carefully carried out and the dimensions of the members were finely adjusted for fabrication so as to fit the present condition of the foundation work as much as possible. For construction, fine adjustment was repeated daily in such a manner that the level difference was uniformly distributed in a block. Through effort and hard work difficulties were overcome but we can take great satisfaction in the final aesthetic appearance.

Site Environment

As an aside, Japanese serows and Japanese monkeys were often seen on the slopes on the opposite shore during the construction. And it was surprising that yellow hornets built a great nest in a space under the eaves of the shed over the course of several days during weekend off. A firsthand account of an Asiatic black bear was heard, and we had a gut feeling that this construction is a route leading to a little-known hot spring.

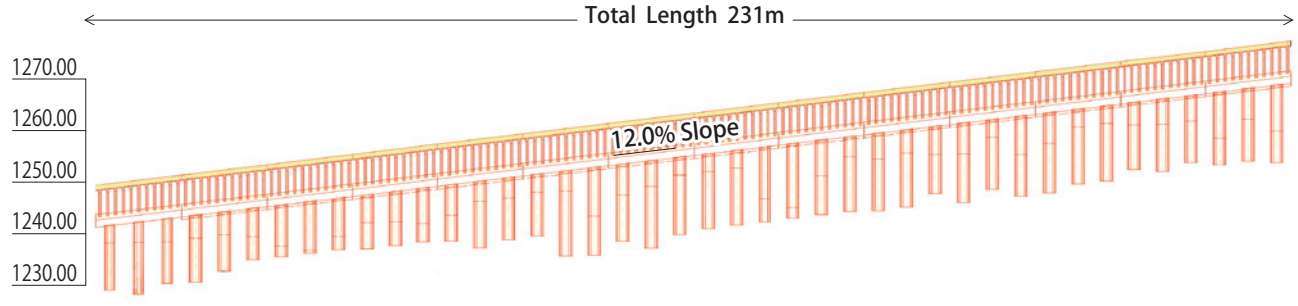
Outline

This facility was built in 2012 on Prefectural Route Shirahone Onsen , which is one of the gateway to the Northern Alps, and connecting famous Shirahone hot spring. The Shirahone Onsen Line is a mountain route with a total bridge length of approximately 4km, has a narrow width in spots, and is a steep route with the risk of avalanches and rock falls. Therefore, the route was regularly closed in winter season, and there was no detour but through Kamikochi-Norikura Super Forest Route. Thus, Nagano Prefecture started work such as expansion of route width and road heating to prevent freezing with the aim of year-around traffic on the Shirahone Onsen Line from 2009, and this facility was a part of this project.. Year-around traffic opened on the Shirahone Onsen Line from December 1, 2012.

A shed is a facility to protect a road from avalanches and rock falls. The Shirohone snow-shed is of total a 231m long, which is specially long for this type of facility. The curvature of this road is 45m minimum radius and the longitudinal slope is 12%, which is a steep slope hardly experienced on general roads. There is a difference in height of approximately 30m between the entrance and exit of the snow-shed (comparable with a ten-story condominium!), and even walking the route is very tiring.

Erection Work

Entrance View



Side Plan

Welcome to Shirahone Hot Spring

When visiting the Shirahone hot spring, fully enjoy the magnificent nature and also turn your attention to the snow-shed. It protects all who visit from avalanches and rock falls during all four seasons.

PC Tank, A Highly Durable Concrete Structure, Survived the Great East Japan Earthquake in 2011

The first PC tank in Japan was made as a container of 85m3 for simple waterworks in Gifu Prefecture in 1957. More than fifty years have passed since then, the number currently exceeds 8,000 units.

PC tank can be compared to a barrel. Concrete side wall is a "plate" and PC steel material in a circumferential direction is a "truss hoop." A highly durable concrete container leaking no water can be made by tightening concrete in a circumferential direction with PC steel materials. The Great East Japan Earthquake which occurred on March 11, 2011 caused unprecedented damage, however, the majority of PC tanks remained still and held water.

In recent years, in order to decrease the burden on the side walls and base structure of PC tanks, light weight and rugged aluminum doom roofs have been adopted, and one hundred or more units have been completed in Japan.

Kumano-town, which is located at the western part of Hiroshima Prefecture, is a town with a population of approximately 25,000, 11km southeast from Hiroshima City. It has historic relevance as many ancient relics remain from the Jomon Period and Yayoi Period.

Land of Origin of "Kumano Brush" for Worldwide Cosmetic Use

Kumano-town is a production area of Kumano brushes presented to "Nadeshiko Japan," Japan's women's soccer World Cup representatives. Brush production in Kumano-town has been passed down through generations over the last 180 years. Today, eighty percent of brushes made nation-wide are made in Kumano-town and the majority of the world's production for high grade cosmetic brushes is dominated by Kumano-town.

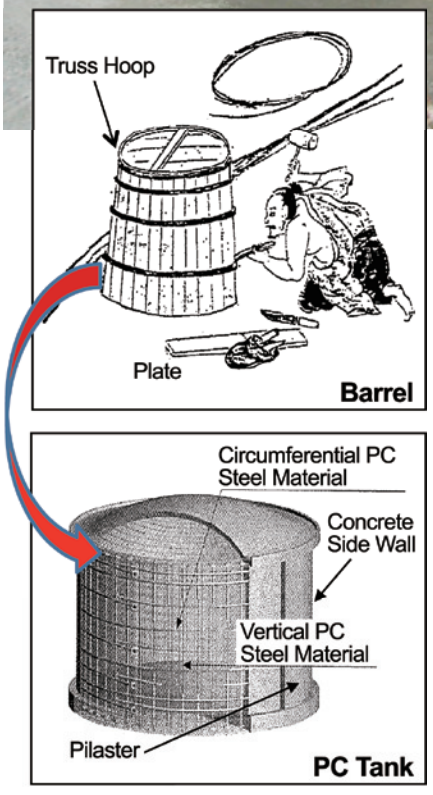
PC Tank with a Capacity of 7,000m^3

A PC tank with a capacity of 7,000m3 was added to the existing Kumano balancing reservoir site as a part of a water supply project for Hiroshima Waterworks in order to respond to a lack of capacity due to an increase in water supply amount. For the base of this PC tank, ground was improved by cement solidification using a mobile soil improvement machine of approximately 13,000m3 (depth of 5m to 10m).

Incidentally, on one occasion it rained heavily during this construction period, and a storage reservoir larger than the PC tank was made. There was a great amount of difficulty in completing construction but upon seeing the completion of the tank those hard times are fondly recalled.

PC Tanks for Countries Demanding Safe and Healthy Water Supply

Data from the Health, Labor and Welfare Ministry in 2011 say that water supply system coverage in Japan is 97.6% and we can drink water anywhere in the country by turning on a tap or spigot. As this shows, while the coverage of water supply exceeds 90% mostly in advanced countries, it is less than 50% in Asian, African, Central and South American countries and many people in those countries presently drink muddy water. It is our dream that water supply will also be established and high durability PC tanks "protecting the water of life" will be increasingly used in those countries in the future.



Structure of Barrel and PC Tank

The new faces of PC **10**

Kumano Balancing Reservoir

PC Tank Protecting Water of Life
City of Ink Brush Brush Dances with Wind of Heart

Contractor	Abe Nikko Kogyo Co., Ltd.
Location	Hiroshima Prefecture
Construction period	2010.12 – 2013.01
Frame Structure Diameter	42.3m
Height	13.0m
Capacity	7,000m^3
Construction Method	Cast-in-place Construction

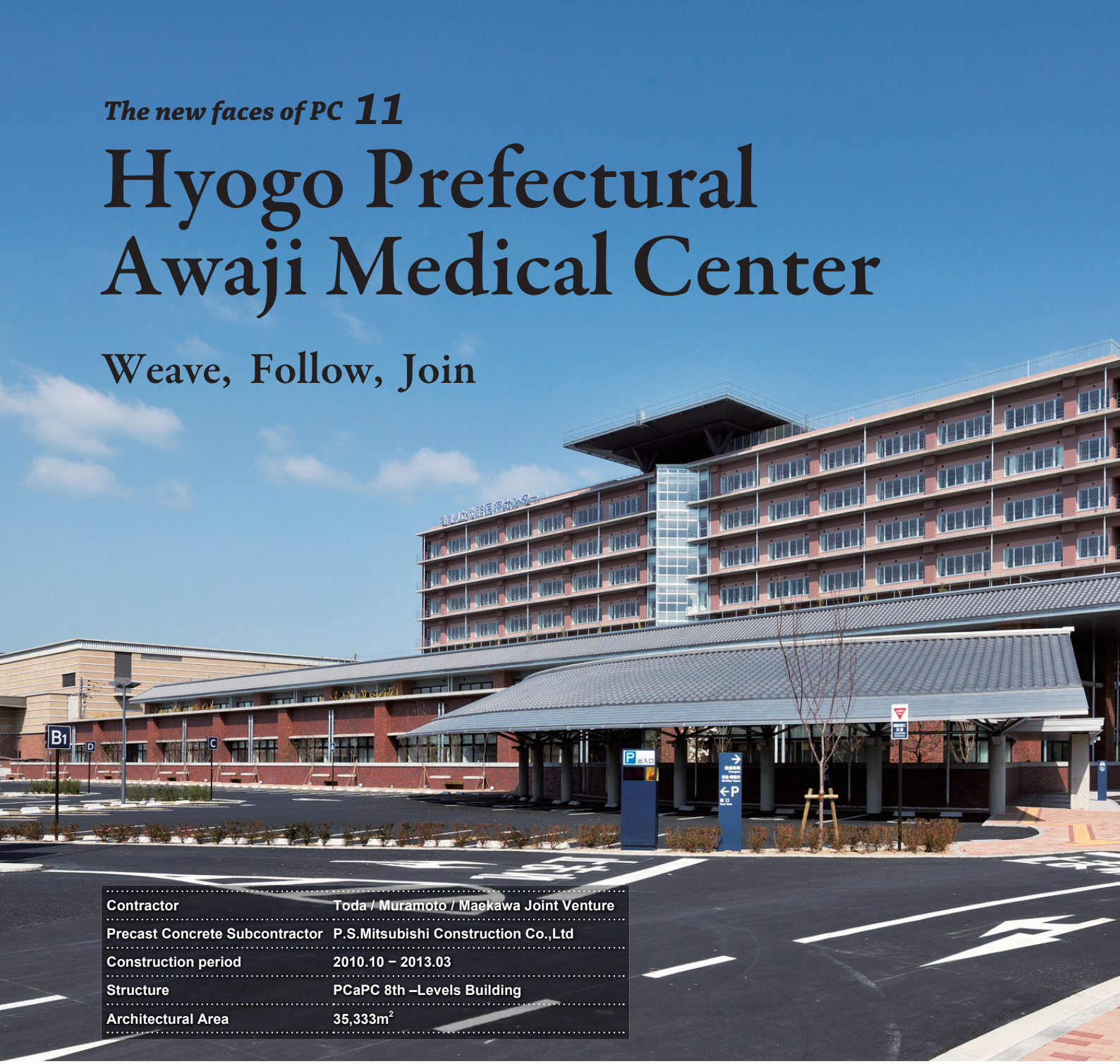
Large Scale Aluminum Dome Roof Structure

Ground Excavation for PC Tank Foundation

The new faces of PC **11**

Hyogo Prefectural Awaji Medical Center

Weave, Follow, Join



Contractor	Toda / Muramoto / Maekawa Joint Venture
Precast Concrete Subcontractor	P.S.Mitsubishi Construction Co.,Ltd
Construction period	2010.10 – 2013.03
Structure	PCaPC 8th –Levels Building
Architectural Area	35,333m^2

Outline

The planning area is in the center along the east coast of Awaji Island, and in the center area of Sumoto City facing Sumoto Port toward Osaka Bay. The area is in a part where Kanebo factories flourished for the spinning industry, and those factories were buildings using red bricks, therefore, the city library and culture gymnasium around the area were built using these red bricks, and the entire area is overwhelmingly a scene based on bricks.

In such an historic regional environment, the Hyogo Prefectural Awaji Medical Center has inherited such a scenery, and at the same time, is a core hospital in Awaji district in Hyogo Prefecture providing highly advanced medical care, and further, is required to play an important role as a disaster base hospital.

Thus, in order to secure seismic capacity which allows for use without impairing building function even after an impact from a large earthquake, consider salt damage resistance under a coastal environment and further reduce environmental load on the construction site, seismic isolation structures and precast and prestressed concrete structures were combined as a solution. In general, this combination works well and advantages synergistically activate each other. There are many results of design and construction.

As planned at the time, the plane area of the lower levels (three levels) on which the inspection and medical

Precast Column Installation

Precast Beam Installation

care departments are located would be approximately 100m×100m and hospital wards of five levels would be built thereon. Furthermore, in order to secure flexibility for the plane plan, the base span was determined to be 12.6m×9.0m, and a rigid-frame structure was established by a pressure boning method.

East Japan Earthquake

The Great East Japan Earthquake occurred five months after the start of construction. Building of a disaster resistance hospital was continued immediately after the Great East japan Earthquake strengthening measures against occurrences of an earthquake and tsunami and was completed on March 25, 2013.

An earthquake with a lower maximum intensity 6 centered in Awaji Island occurred on April 13, and a lower intensity 5 was observed in Sumoto City. There was no damage to the building, and determination from the earthquake isolation layer was as the designed value from the trace of mark-off.

Relocation to the Awaji Medical Center was completed with no drawbacks on May 1, and medical services have been launched at the site. A sincere expression of appreciation is extended to Hyogo Prefecture, hospital and medical care related personal who supported us and persons involved in construction of this facility.

The new faces of PC **12**

Reinforcement of Hamana Bridge

Countermeasures for Long Life of the Bridge which is Proud of World Class Scale

Seaside Park

Outline

Hamana Bridge which the scenery can also be enjoyed from the windows of the SHINKANSEN is a magnificent and beautiful bridge crossing a point of connecting Hamana Lake and sea. Hamana Bridge which was completed in 1976 is the largest of its kind in the world and is a center hinge rigid-frame bridge with a maximum span length of 240m, and still exhibits its impressive figure to sightseers visiting Hamana Lake. Hamana Lake is famous for cultivation of eels and Chinese soft-shell turtles. There is a sand hill facing rough sea near the bridge, and marine turtles come and spawn there. Taking charge of the bridge repair work which is well-known brought a deep sense of mission and motivated all to focus on completion of the task.

Reinforcement Condition and Design

Hamana Bridge located at a part of the National Route 1 bypass is a PC continuous rigid-frame box girder structure of 5 spans. The bridge presented a number of issues in consideration of its 37 years of age, an increased volume of traffic by the elimination of bridge pass fee and use by heavier vehicles. In addition, large scale repair was required for the purpose of enhancing the seismic capacity and improving traveling performance. When the reinforcement method was selected, the high elevation (31m above the sea) of work site, the impact from strong

Contractor	Kyokutou Kouwa Co., Ltd.
Construction period	2014.02 − 2014.11
Rehabilitation Length	163.0m
Reinforcement method	Connection of the Central Hinge by Using PC Steels and Out Cable Method Reinforcement of Main Girders by Carbon Sheet

Center Hinge at Inside of Boxgirder

Regulation of the National Route 1 Bypass

Construction Condition

For this construction work, it was required to regulate the bypass road on which traffic volume per day was up to 44,000 vehicles over approximately 3km. There were some vehicles which stalled or ran out of gas and construction-related staffs were required to move these vehicles during the road regulation. And during the construction, a typhoon struck directly and a large volume of sand was scattered on to the bridge surface from a neighboring sandy beach by the strong wind. Construction person including the site supervisor and staff of the contractor removed the sand with painstaking effort. It was said that the site supervisor remembered these scenes and was moved to tears when the construction was completed.

Many bridges which were built in the high growth period of Japan will reach 50 years of age and will need repair work in the near future. With this construction, PC technology was utilized for large scale repair with a significant landmark bridge. We have reconfirmed to actively challenge difficult works, continue to improve technology and contribute to society with technologies which have been accumulated over many years.

The new faces of PC **13**

Kugeta Junior High School Seismic Strengthening

Seismic Strengthening from Outside of Building by Prestress

Outline

Seismic strengthening work for Moka Municipal Kugeta Junior High School which is located in Tochigi Prefecture was carried out for two months in October and November 2012. This area is close to the railway station and highway, therefore, it has developed as a commuter town. Thus, the number of students at the junior high school has been increasing.

Construction with Continuing the School Lessons

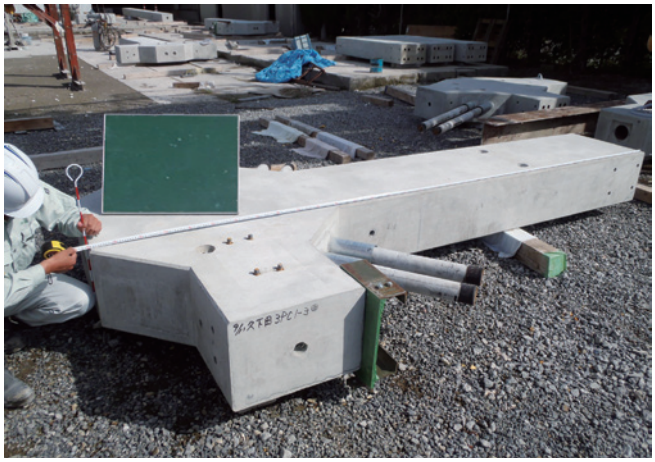
The external strengthening of the building which would allow school lessons to be continued was adopted as a result of comparing and considering internal and external strengthening for seismic strengthening of the school building.

For the seismic strengthening work, the footing on which reinforcements are placed, and foundation beams are constructed first. The precast columns and beam members are fabricated in a factory during construction of the footing, and the members are assembled after the base construction is completed.

After the strengthening members are assembled, skew brace materials (PC steel bars) are crossed to carry out tightening work, and the existing building and strengthening members are finally jointed to integrate them.

View from Inside

Tensioned the Skew Brace Materials



Fabricate the Precast Member

Build the Precast Member

Contractor	Tsurumi/ Masuyama Joint Venture
Construction period	2012.07 − 2012.11
Location	Moka City, Tochigi Prefecture
Structure	Parallel System

Generation of Noise and Vibration is Decreased

Because the strengthening materials and brace materials are fabricated during construction of the base, it was possible to complete the work in two months. In addition, for the joining method, a balcony use environment was devised so as not to change the original balcony structure before strengthening by installing the strengthening members to the top end of the balcony.

The precast method has the advantage of reducing dust and waste. Moreover, generation of noise and vibration is decreased to half or less in comparison with conventional methods because joining surfaces with existing building structures are beam surfaces.

After strengthening, it became possible to secure sufficient daylighting capability without the need to add illumination in rooms because the PC steel bars of the brace material is of up to a diameter φ40.

Parallel system construction work could be carried out to reduce the inconvenience on students and teachers during construction by making full use of the above method and its features.

At the time of the Great East Japan Earthquake, there were many schools and buildings which were strengthened by the parallel system in the catastrophic areas, however, as a result of investigation, no remarkable damage was found on the main structures, and it is considered that this system sufficiently contributed to safety of the buildings. We will also make efforts on seismic strengthening so as to contribute to safety for people who use buildings in the future.

The new faces of PC **14**

Loop 3 in Hanoi City

Courage and Hope in Overseas Construction, Obtained thorough Half Construction Period Work

Traffic Congestion in Hanoi

Contractor	Sumitomo Mitsui Construction Co., Ltd
Construction period	2011.07 – 2012.10
Location	Hanoi, Vietnam
Structure	
Main Line	Length: 2,070.0m, Max Span Length: 38.0m, Erection Method: Arch Crane
Lamp Line	Length: 447.6m, Max Span Length: 38.0m, Erection Method: Track Crane

Outline

When you hear Vietnam, what comes to mind? The list goes on and on, for example, slender beautiful women in ao dai, low calorie and healthy Vietnamese dishes such as fresh spring roll and pho, streets in which houses like match-boxes are lined, Ha Long bay, a World Heritage site. Traffic congestion is surprisingly little known. In Vietnam, the main means of transportation is the motorcycle, and motorcycles frequently cause traffic congestion. In addition, the number of automobiles has rapidly increased by recent rapid economic development, and the traffic situation has increasingly worsened. As a result, the infrastructure is required to be urgently improvement as soon as possible.

Barriers Against Construction

This construction of an elevated bridge only for automobiles on Loop 3 in Hanoi City was also intended to ease traffic congestion. The construction site was an area called the new city center district in Hanoi and the bilateral road sides of the construction site have the highest traffic volume in Hanoi, and are jammed with automobiles and motorcycles all day and the night. For construction in such a city, it is most critical to prevent accidents involving citizens, not to interrupt traffic flow during construction and complete the bridge for putting it into service as soon as possible.

Construction for Super Structure

Scaffolding Falsework and Mold Form

Innovative Labor Saving Method

For this reason, the construction method was completely changed and labor savings were implemented in all operations. More specifically temporary work such as scaffolding falsework, mold form and reinforcing bars necessary for construction work were also made up to larger scale in advance.

The problem for a large assembly is a procurement of lifting machine which can freely handle the assembly, however, large-sized gantry cranes of beyond Japanese scale were locally manufactured. As a background which allows such large scale construction, it is first listed among many advantages that day and night work is allowed, nearby residents easily understood and cooperated, and further the on-site manufacturing cost of large equipment is significantly cheaper in comparison to Japan. In addition, in order to follow the fast construction speed at the site, a site steam curing system for the main girder of bridge was adopted for the first time in Vietnam to reduce the normal fabrication cycle by half.

These construction facilities by devises and improvements were thought out to the maximum extent possible and did not interrupt traffic flow around the small working area, allowed relatively inexperienced workers to handle easily, and realized advancement of operations safely and comfortably at the highest speed. As a result, the contracted construction period of 30 months which was originally set up as a goal could be reduced by half to 15 months, and the entire line of 9km was successfully opened to traffic earlier than scheduled 15 months.

Great Achievement of the Project

The economic effect brought by this early opening was calculated to be some billions of yen, and a large impact was given to the construction industry in Vietnam where 90% of the ordered construction is reported to fall behind construction schedules. The largest factor of success in this construction is harmony and communication among people. A fact that engineers and operators in Japan and Vietnam moved as one to make efforts toward a great goal gave great joy, courage and hope for the future in engagement of construction overseas.