

Domestic Construction Business



In our domestic construction business, we are primarily involved in life-extending works and seismic retrofitting of infrastructure, including bridges, tunnels, and port facilities. Most of the infrastructure in Japan was built during the country's high economic growth period, and its aging has become a serious issue. Measures are also needed to address future large-scale earthquakes originating in the Nankai Trough and other areas. Against this backdrop, Japan is currently proceeding with initiatives such as the Expressway Renewal Project and the National Resilience Plan. Moreover, as maintenance needs increase not only in the roads sector but also in adjacent areas such as railways, water supply and sewer systems, and private-sector facilities, we will contribute to solving Japan's various infrastructure issues.

Takayasu Shimada
 Director of Construction Management, SHO-BOND Holdings Co., Ltd.
 Managing Director and General Manager of Marketing and Sales Division, SHO-BOND CORPORATION

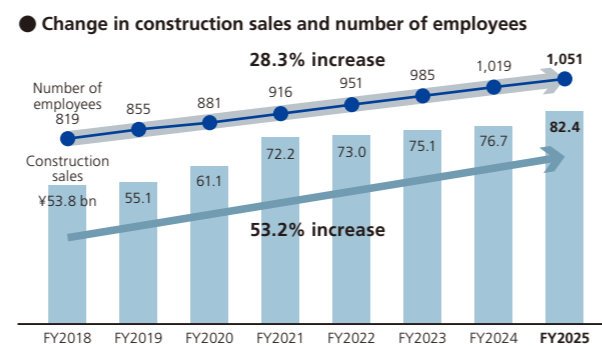
Strengths	Risk factors	Opportunities
<ul style="list-style-type: none"> Comprehensive infrastructure maintenance capabilities from a broad range of perspectives Accomplishments as a specialist in the field of infrastructure maintenance Construction skills and technologies capable of providing the best construction methods Technological development capabilities centered on the Technical Research Institute A team of engineers capable of earning profits from even small projects Partner companies with experienced people covering a diverse array of construction skills 	<ul style="list-style-type: none"> Shortage of construction workers due to Japan's declining population Risk involving accidents and other aspects of safety Quality management risk involving defects and other problems Intense competition for orders in the Expressway Renewal Project 	<ul style="list-style-type: none"> Growing demand for life-extending works due to accelerated measures to address aging infrastructure Growing demand for reinforcement works due to greater severity and frequency of natural disasters Increasing importance of preventive infrastructure maintenance technologies

Overview of Domestic Construction Business

Construction sales in FY2025 posted a 7.5% year-on-year increase to reach 82.4 billion yen. Considering the 6.1% annual growth rate over the three-year period of the previous Medium-term Business Plan (FY2021 to FY2024), we recognize that achieving this significant increase in sales is the result of our efforts over the past several years to develop our workforce and refine our strategy for securing project contracts.

Meanwhile, construction orders decreased 20.2% year on year to 73.9 billion yen. Although our Group remained highly competitive in securing project contracts, the key reason for this decline was a decrease in large-scale project orders from expressway companies. Going forward, we recognize that it is becoming increasingly important not only to continue our ongoing efforts in developing talent and maintaining our competitiveness in securing project contracts, but also to further promote optimal allocation of human capital in response to changes in the business environment and

to strengthen our ability to generate revenue in areas other than expressways.



Review of FY2025 and Future Initiatives

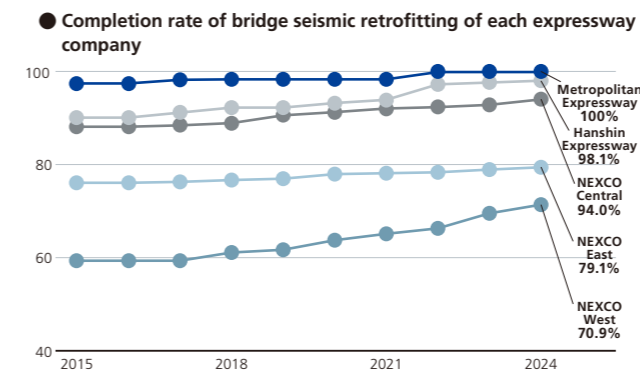
Group-wide strategy for order receiving conscious of order backlog

In FY2025, we recorded a decrease in the volume of our large-scale expressway construction orders centered around East Nippon Expressway Co., Ltd. We are aware that planned construction orders have been temporarily postponed due to recent inflation-driven increases in material costs and rising interest rates. Although we have secured a long-term volume of work due to the large number of structures that still require construction, the annual order volume is expected to continue fluctuating due to the short-term budgetary

situation of each expressway company. The "Expressway Companies' Earthquake Retrofitting Plan," announced in January 2024 by the four expressway companies, including three NEXCOs, also indicates that the proportion of bridges requiring retrofitting differs according to each company. In order for the SHO-BOND Group to maintain both a strong order backlog and stable profit growth in the future, we must respond more flexibly not only to changes in annual order volumes but also changes in the regions and types of work being ordered.

Within this environment, in October 2025 our Group conducted

a review of our East/West Japan in-house company structure, which has been in place since 2020, to enable more flexible allocation of personnel. By fully leveraging the horizontal deployment of our engineers, which is possible due to our status as a maintenance specialist, we aim to swiftly respond to changes in the business environment and steadily build up our order backlog.

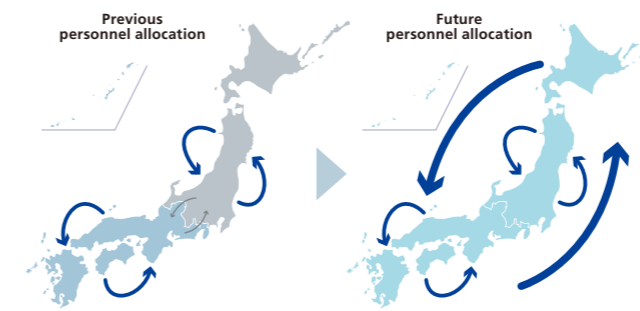


Percentage of bridges with seismic performance level 2 (bridges with completed seismic retrofitting measures allowing only minor damage and prompt functional recovery even during earthquakes of similar magnitude to that of the Southern Hyogo Prefecture Earthquake)

*Prepared by SHO-BOND based on MLIT data

Graphic representation of optimal personnel allocation

Personnel will be allocated in response to order forecasts for each customer. Going forward, we will give increased consideration to optimal allocation on a national scale.



Participation in new initiatives of national and local governments in Japan

The "1st Mid-term Plan for the Implementation of National Resilience" was approved by the Cabinet in June 2025 as a nationwide measure addressing the aging of infrastructure and disaster preparedness. The plan has a span of five years starting in FY2026 and a project scale exceeding 20 trillion yen, and measures with a planned budget exceeding the 15 trillion yen budget scale of the current Five-Year Accelerated Measures Package will continue to be implemented in the future. As various measures have been implemented since 2013, designated by MLIT as the inaugural year for social infrastructure maintenance, new challenges have been identified, and countermeasures and improvements have been implemented. The SHO-BOND Group is therefore promoting measures to address changes among our customers, comprising not only expressway companies but also national and local governments.

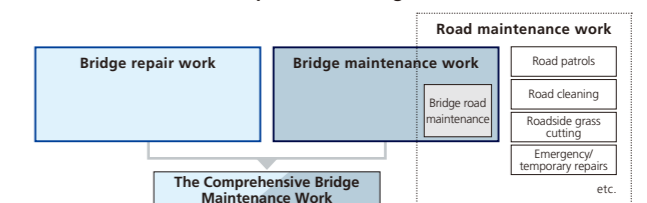
One specific example is our procurement of orders for the Comprehensive Bridge Maintenance Work. This is an example of a new order procurement method on bridges managed by the national government, developed in response to issues such as frequent unsuccessful bidding on small-scale projects involving dispersed construction sites. By consolidating multiple bridges and works into a single project order, contractors gain room to maneuver to ensure

profitability, while customers benefit from steady progress in bridge repairs. On the other hand, contractors must possess high levels of expertise and construction capabilities when securing contracts, given the need to proactively propose repair methods and to efficiently manage dispersed construction sites so as to ensure profitability. SHO-BOND secured the first domestic project under this ordering system and successfully completed it in 2023. These types of expertise have permeated throughout our Group's various sites, thereby contributing to the diversification of revenue sources in regions with a low volume of large-scale construction orders and within the KAKO Group, which mainly handles national and local government construction projects.

Meanwhile, local governments, which manage more than 90% of Japan's bridges, continue to face the problem of delayed infrastructure maintenance measures due to a shortage of technical staff. As part of our Group's unique initiatives, we developed the "AI Shindanshi" system, enabling administrators to perform simple diagnoses of infrastructure deterioration. In FY2025, we demonstrated the effectiveness of this system by having local government employees perform trial diagnostics. We have also launched an initiative to support the recently promoted scheme known as "Strategic Management for Revitalization of Regional Infrastructure Groups." In November 2024, we held a training session at our Group's Tsukuba Training Center at the request of the Support Organization for Administrative Engineers (commonly referred to as Sorae)*. By providing hands-on training in construction methods and introducing DIY products that we have been focusing on in recent years, we aim to contribute to solving the problems faced by local government engineers. We believe that continuously promoting these initiatives will lead to the resolution of social issues and contribute to our company's profit growth over the medium to long term.

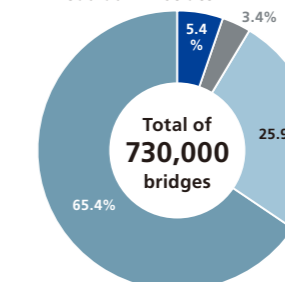
*A support organization for civil servants that primarily targets technical civil servants with the aim of enhancing technical knowledge and fostering interaction among members.

Illustration of the Comprehensive Bridge Maintenance Work



A customized ordering system for bridges. Bridge repair work is performed on all bridges within the target area, in addition to maintaining operations (cleaning, etc.). The bridges to be repaired are determined by consultation between the contractor and the customer after the project order is placed. While based on a multi-year contract, the contract amount can be adjusted up to the budget ceiling set for each individual year.

Percentage of bridges by road administrator



■ National
 ■ Expressway companies
 ■ Prefectures and government ordinance-designated cities, etc.
 ■ Municipalities

Numbers of municipal technical staff



■ 0 staff
 ■ 1-5 staff
 ■ 6-10 staff
 ■ 11 or more staff

*Prepared by SHO-BOND based on the results of the 2024 Local Government Staffing Survey.

*Technical staff are defined as civil and building engineers.

*Aggregated data for general administrative departments. Data includes government ordinance-designated cities.

Domestic Construction Business

Strengthening adjacent markets and opening up new markets in maintenance

Prior to the launch of our Medium-term Business Plan 2027, the SHO-BOND Group formed working groups for each business area targeted for new development, and has undertaken organizational operations with the aim of bolstering our earning power outside our key business fields. Each General Manager responsible for revenue in their respective area will serve as a leader of their respective working group, and will guide other group members nationwide with the aim of strengthening cross-functional collaboration, creating business opportunities, and securing revenue sources from a medium-to-long-term perspective. These initiatives are gradually yielding results even over the short term, with the percentage of construction orders in adjacent areas increasing in recent years relative to our total construction orders. Even under the current circumstances, whereby our human capital has been concentrated on large-scale projects over the past decade, we have succeeded in increasing orders in other areas in response to market conditions, partly by sharing the company's capabilities cultivated over time within our working groups. Furthermore, the Marketing and Sales Division takes the lead in holding technical briefings for our customers on our Group's construction methods and products, and promoting business alliances and other forms of collaboration with multiple companies.

In addition to our existing focus on building a stronger foundation for growth and optimizing internal resource allocation, we will continue to pursue external challenges such as developing new business areas and collaborating with other companies with the aims of boosting our profitability and diversifying our revenue streams.

Specialty construction company



Kyna-Tech

Kyna-Tech is a specialty construction company that became a wholly owned subsidiary of SHO-BOND CORPORATION in 2016 as part of the Group's strategy to increase profitability and diversify its operations. Kyna-Tech's core businesses consist of high-frequency core drilling and water-jetting work utilizing highly specialized technologies.

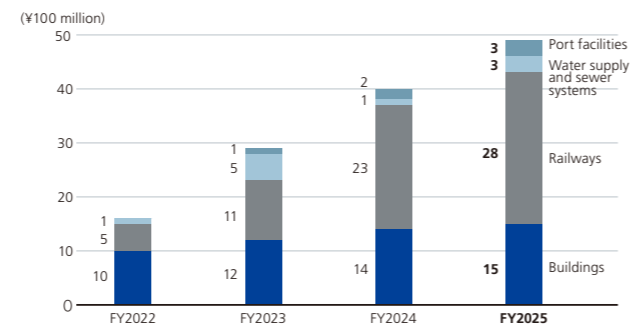
High-frequency core drilling is a drilling technique that enables low-noise, low-vibration, and low-dust construction on existing concrete structures. Our lineup includes models capable of drilling at approximately 2.5 times the speed of standard machines, enabling construction even in confined areas with limited space above the work site.

The water-jet method is a technique that uses high-pressure water jets to perform surface treatment and partial removal of concrete. By harnessing the power of water, we can perform precise construction only on required areas without damage to healthy parts of concrete structures. This technology is indispensable for repairing concrete structures, and performing water-jetting in-house also leads to cost reductions for the entire Group.



Concrete surface treatment using water-jetting

Construction orders in major adjacent areas



Railway construction project (completed seismic reinforcement of Kobe New Transit Port Island Line [PT Station and NK Station])

Surveying and diagnostics company



Maintenance Technology Inc.

Maintenance Technology Inc. was established in 2011 as a construction consulting and design firm. The company's main operations comprise surveying, diagnostics, analysis, and repair design for infrastructure such as bridges and tunnels. Maintenance Technology is contributing to quality improvements in the maintenance field by enhancing the efficiency of the Group's on-site operations through proximity surveys and test analyses, and by providing highly specialized design engineering support leveraging our expertise in repair techniques. One of the company's operations is surveying existing structures using 3D measuring equipment. For instance, when installing new reinforcing components, accurate measurement data of the structure is essential. Maintenance Technology Inc. has introduced a state-of-the-art, wide-area 3D measurement device that is effective for surveying existing structures with complex shapes, and is using this device extensively for the fabrication and machining of newly installed components and for design reviews.



Status of measuring anchor bolt drilling positions using a 3D measuring instrument

Feature Repair of Historic Structures—Transforming the former Harumi Railway Bridge into a pedestrian walkway

The former Harumi Railway Bridge connecting Toyosu in Koto City and Harumi in Chuo City, Tokyo, served as a freight-only railway bridge for approximately 30 years from 1957 to 1989. The bridge supported postwar development by facilitating the transport of freight from Tokyo Port to the city. The Tokyo Metropolitan Government is making improvements to the entire waterfront park area including the former Harumi Railway Bridge, and SHO-BOND performed the work to convert the bridge into a pedestrian walkway as part of this initiative. In this Feature, we present a case study of our repair work on a distinctive historic structure.

What is the former Harumi Railway Bridge?

This bridge supported Japan's postwar economic development by carrying freight trains loaded with wheat and rolls of paper from the postwar period through Japan's high economic growth period. It was also the first railway bridge in Japan to employ continuous PC and Nielsen-Lohse girders, thus serving as a valuable historical record of the cutting-edge bridge construction technology of its time. Even after the railway tracks were removed in 1989, the bridge was preserved in its original state as a structure of high historical value in both economic and civil engineering terms.



The bridge during its use for transporting freight (photo courtesy of Tokyo Port Promotion Association)



The former Harumi Railway Bridge prior to conversion work. The entire bridge coated in reddish-brown rust

Description of the work

To perform the repair work, a barge was used to install scaffolding. To ensure the safe navigation of seafaring vessels during the project, we first constructed the Toyosu side and then replicated the work on the Harumi side.



(1) Repainting work to recreate the bridge's original color during its use for transporting freight



(2) After installation of the flooring base, the original rails from the time of operation were restored.



(3) Installation of wooden decking to surround the railway tracks



(4) Installation of glass flooring to allow pedestrians to see the restored railway tracks and sea surface



After approximately two years of construction, the former Harumi Railway Bridge was opened as a pedestrian walkway on September 19, 2025, thereby transforming into a new community leisure space while carrying its legacy into the future.

SHO-BOND will continue to proactively undertake the repair of historic structures and contribute its infrastructure maintenance expertise and technologies to local communities.



Construction Materials Manufacturing and Sales Business



In our construction materials manufacturing and sales business, we manufacture and sell products used in the repair and reinforcement of infrastructure, including bridges and tunnels. Since our founding, the SHO-BOND Group has specialized in repair and reinforcement. Leveraging the Group's distinctive comprehensive maintenance system, we possess strengths in developing products specifically suited to repair and reinforcement. As infrastructure continues to age, barriers such as labor shortages and budget constraints have also arisen. Our Group is contributing to addressing the social issue of aging infrastructure by developing, manufacturing, and selling products that enable efficient and effective repair and reinforcement.

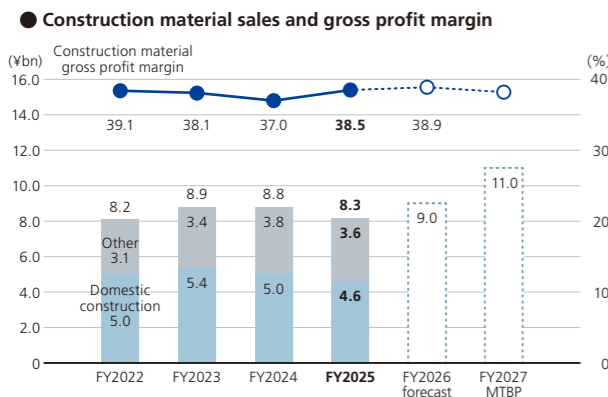
Setsu Arai
Director of Group Strategy, SHO-BOND Holdings Co., Ltd.
Director and General Manager of Overseas Business Department, SHO-BOND CORPORATION

Strengths	Risk factors	Opportunities
<ul style="list-style-type: none"> Extensive product lineup specifically suited to repair and reinforcement Organizational capabilities to develop products that meet market demands Sales personnel with on-site experience in repair work 	<ul style="list-style-type: none"> High cost of energy, construction materials, and raw materials Increase in logistics costs Damage to or shutdown of operations at disaster-stricken own factories or contracted manufacturing plants 	<ul style="list-style-type: none"> Growing demand for life-extending works due to accelerated measures to address aging infrastructure Growing demand for reinforcement works due to greater severity and frequency of natural disasters Demand for environmentally friendly products

Overview of Construction Materials Manufacturing and Sales Business

The SHO-BOND Group's reportable business segments are classified into the "domestic construction" business and "other" businesses. The sale of construction materials is undertaken in both of these segments, primarily by SHO-BOND CORPORATION in our domestic construction business and by SHO-BOND MATERIAL CO., LTD. in our other businesses. Approximately 60% of these construction material sales are in the domestic construction business and the remaining 40% are in the other businesses, with each segment handling marketing and sales for their respective regions and customers.

Construction material sales in FY2025 decreased by 480 million yen (5.5%) year on year to 8.27 billion yen due to a decline in sales of products for seismic retrofitting work. Going forward, we aim to achieve the Medium-term Business Plan (MTBP) 2027 target of 11 billion yen in construction material sales mainly through a recovery in demand for seismic reinforcement materials, increased sales of new products jointly developed with road companies, and increased sales of couplings (pipe joints). Our gross profit margin has remained at around 38%, although the precise percentage depends on the breakdown of products sold.



Review of FY2025 and Future Initiatives

Under the Medium-term Business Plan 2027, we are pursuing initiatives that will contribute to addressing aging infrastructure, such as developing new products and reviewing our sales methods. Under this policy, we made preparations in FY2025 to improve our product catalog and completely update our website. We have also investigated the development of DIY products and commercialized "L Putty"—a repair material for small damaged concrete surfaces. L Putty's features include low specific gravity allowing thick application to ceilings and other surfaces, and mixing without the need for machinery or water. The product thus allows simple maintenance tasks to be performed even by local governments facing a shortage of engineers.

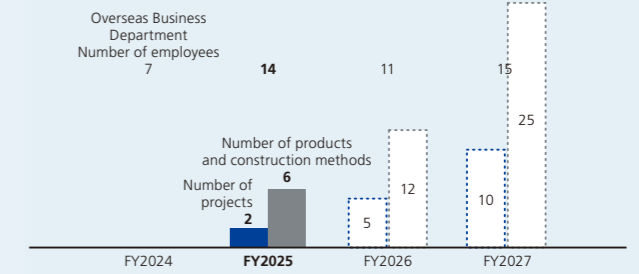
Meanwhile, we are also focusing on expanding sales of couplings, which is one of our existing core products. Due to their ease of use for pipe repairs, demand for our couplings has increased for applications such as condominium repairs, and we have constructed a new factory in Yashio City, Saitama Prefecture, to bolster our coupling production capacity.



"L Putty" (left: repair work with L Putty, right: a lump of L Putty floating in water due to its light weight)

Overseas Businesses

In our overseas businesses, the SHO-BOND Group is contributing to addressing aging infrastructure and the increasing severity and frequency of disasters overseas by applying the expertise and products developed in our domestic infrastructure repair and reinforcement business. We provide our expertise and products after selecting market-tailored approaches, such as establishing joint ventures with leading local companies, collaborating with Japanese firms, and investing in existing overseas companies.

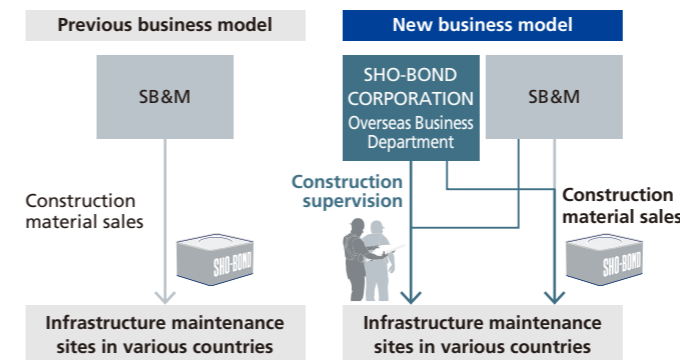


Strengths	Risk factors	Opportunities
<ul style="list-style-type: none"> SHO-BOND Group's technology development capacity for development and modification of construction methods and products to match the requirements of specific countries and regions Global business network and overseas development and management capacity of MITSUI & CO. in 62 countries and 124 business sites 	<ul style="list-style-type: none"> Country risk due to economic and political instability Uncertainty involving laws and regulations and logistics for shipments of products Rising cost of materials and exportation and uncertainty about foreign exchange rates Cost competition with local companies and other entrants 	<ul style="list-style-type: none"> Increasing public awareness worldwide of the need for maintenance of aging infrastructure Joint activities with other Japanese companies for the dissemination of infrastructure technology proven in Japan Growing need for protection against earthquakes, floods, and other natural disasters around the world

Review of FY2025 and Future Initiatives

Our Medium-term Business Plan 2027 sets out the restructuring of our overseas business models. Since its commencement, our main overseas business has been the sale of construction materials with a proven track record in Japan, initially by SHO-BOND & MIT Infrastructure Maintenance Co., Ltd. (SB&M: SHO-BOND 51%, MITSUI & CO. 49%). However, there has been growing local demand for on-site technical cooperation with our Group. To meet these expectations, we established a new Overseas Business Department within SHO-BOND CORPORATION in April 2024, thereby creating a system in which SHO-BOND's engineers can provide on-site construction supervision and other services to local entities. This has also allowed us to gather specific information on local needs and infrastructure-related challenges. Based on this gathered information, we are now reviewing the regions and business strategies that we will pursue in the future. As part of these efforts, in FY2025 we conducted trial construction work using our company's construction methods on bridges in India and El Salvador.

Meanwhile, regarding Thailand and the United States, where we have previously expanded our business through SB&M, in Thailand, CPAC SB&M Lifetime Solution Co., Ltd., which we established in 2020 together with CPAC, a company of The Siam Cement Group, achieved profitability for the first time in 2024. In addition, tremors from the earthquake in Myanmar that occurred in March 2025 reached Bangkok, the capital of Thailand, causing damage particularly to high-rise buildings. Against the backdrop of growing interest in seismic retrofitting triggered by this earthquake, we held a seminar in Bangkok in September 2025, appealing to more than 220 attendees, including high-rise building owners, about the necessity of seismic reinforcement. Going forward, we plan to increase personnel and aim for further business expansion. In the United States, although the performance of Structural Technologies, LLC, in which we invested in 2023, declined in FY2025, the company has a substantial order backlog, and we expect future growth.



Trial construction in India Seminar in Thailand

Technology Development



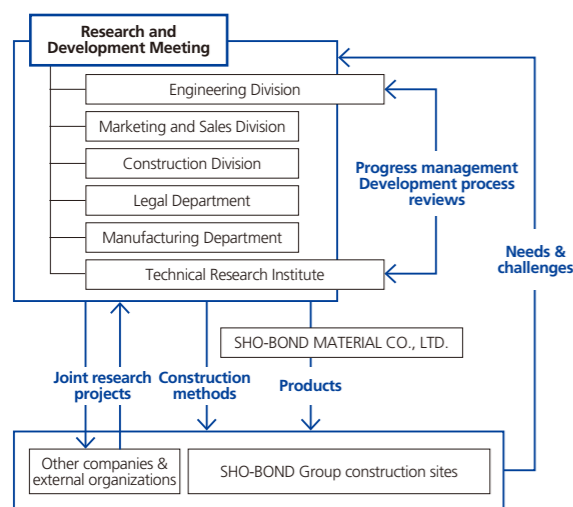
Technology development within the SHO-BOND Group refers to the improvement of our existing construction methods and products, and the development of new ones. As a comprehensive infrastructure maintenance company, our Group has long focused on developing technologies related to repair and reinforcement. In recent years, we have been leveraging our accumulated technological development capabilities to address increasingly diverse and complex needs and challenges accompanying the rise in expressway and other large-scale projects, and these capabilities have underpinned our Group's strong competitiveness. As a leader in the infrastructure maintenance industry, we will continue to develop construction methods and products that meet market demands.

Hiroshi Takemura
Managing Director and General Manager of Engineering Division and Director of the Technical Research Institute, SHO-BOND CORPORATION

Development Promotion System

At the core of our Group's development promotion system is the "Research and Development Meeting." The Research and Development Meeting comprises members from the Technical Research Institute and our Engineering Division, Marketing and Sales Division, Construction Division, Legal Department, and Manufacturing Department. It selects development themes from multiple perspectives based on consideration of factors such as marketability and conformity. For ongoing themes, the Engineering Division confirms their progress with the Technical Research Institute and reviews the development process where necessary for steady promotion. Our developed construction methods and products are used not only by our customers but also at the numerous construction sites operated by our Group across the country. We are also facilitating further improvements to our existing technologies and the development of new technologies by ascertaining the needs and challenges of our Group's on-site engineers. In this way, we leverage our strength in the form of our Comprehensive Maintenance System to develop technologies based on theory and empirical evidence.

Through active participation in various academic conferences and research meetings, we continuously gather information on the latest technology trends. These forums provide opportunities to receive inquiries and requests from private-sector companies and external organizations, which may lead to joint research projects. Through technology development, we address needs and challenges from within and outside the company to enhance our corporate value from the dual perspectives of economic efficiency and social progress.



Technical Research Institute

Overview

In 1996, the year after the Great Hanshin-Awaji Earthquake, SHO-BOND established its third research laboratory (with a site area of approximately 22,000 m²) in Tsukuba Science City.

We named it the Technical Research Institute (TRI) based on the philosophy of raising infrastructure repair skills to the level of scientific research. TRI focuses on identifying the mechanisms of structural deterioration and damage, improving fatigue durability against large vehicles, and researching and developing effective reinforcement technologies for earthquakes. TRI is unique within Japan as a research facility that specializes in the repair and reinforcement of structures and that is well-equipped with state-of-the-art devices. Many materials and construction methods developed at the Institute have been adopted as standard repair methods. It comprises three research groups—the Organic Group, the Inorganic Group, and the Structure Group.



Main Building, Technical Research Institute

Organic Group

The Organic Group develops products and construction methods using organic materials (resins). Development themes range from concrete protection, steel protection, and modification of asphalt pavement and road base materials.

Inorganic Group

The Inorganic Group leads the unique development of inorganic materials such as cement and concrete. While establishing fundamental technologies that will serve as the basis for our inorganic material development, we are also developing products that leverage these technologies and creating innovative products such as CPJ-L.

Structure Group

The Structure Group develops and validates materials and construction methods mainly related to structural mechanics, and is also actively engaged in the latest digital technologies such as AI and VR/AR to promote on-site DX.

Development Case Study: Development of low-elasticity SFRC for thickening concrete deck slab surfaces

Development background

Since opening to traffic in 1962, the Metropolitan Expressway has experienced heavy traffic from large vehicles that continuously places significant stress on its pavement, thus shortening the cycle for replacing the asphalt pavement. During asphalt pavement replacement, the top surface of the RC deck slab is milled by asphalt milling machines that remove the asphalt and waterproofing layers, resulting in instances where the reinforcing bars become exposed. Once exposed, these reinforcing bars are susceptible to corrosion and other deterioration, so new concrete must be added to thicken the deck slab.



Reinforced bar exposure*

Until now, steel fiber reinforced concrete (SFRC) and polymer cement mortar (PCM) have been used as deck slab thickening materials. However, there were concerns about the durability of SFRC given the tendency of the road surface to deform within a few years after construction. The PCM that was developed to resolve this issue faced cost challenges due to the use of expensive mortar. We therefore sought to address these challenges by undertaking a joint research project with the Shutoko Technology Center and NIPPO Corporation.

Development process

In addition to cost considerations, the developed material needed to set quickly after application to expedite lifting of traffic restrictions, and to possess the same static modulus of elasticity as the existing deck slab to ensure structural uniformity. Although these requirements involve a trade-off that made development a

challenging prospect, we fully leveraged the inorganic material development technologies and expertise cultivated by the Inorganic Group and, after repeated studies on material selection and formulation, we developed the "Ultra-Rapid-Setting Latex-Modified Steel Fiber Reinforced Concrete" (herein LSF).

Moreover, by incorporating crack-repairing properties into the joint adhesive used during LSF construction, it is possible to enhance the fatigue durability of the existing deck slab. To achieve this, the Organic Group leveraged our expertise in organic materials cultivated since our founding and took the lead in developing a joint adhesive with crack-repairing properties, which we call "High-Penetration Primer."

Development results

To compare the performance of LSF with conventional products such as SFRC and PCM, the Structure Group performed evaluations of physical properties and fatigue durability. The results of these evaluations demonstrated that LSF exhibits equivalent or superior performance compared to SFRC and PCM in terms of static modulus of elasticity, compressive strength, and fatigue durability.

We anticipate that LSF will make a significant contribution to solving expressway challenges by reducing costs by approximately 50% compared to PCM while still meeting performance requirements.

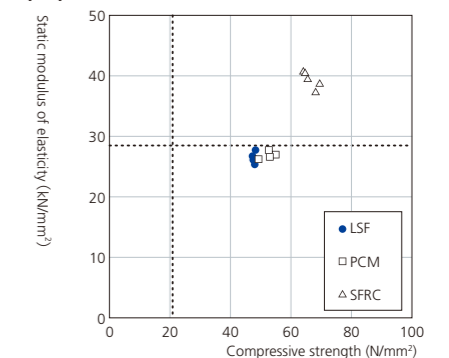
During a trial construction conducted on the main lanes of the Metropolitan Expressway, we confirmed that LSF possessed good workability and post-construction quality, and garnered high praise from project officers at Metropolitan Expressway Co., Ltd. and the Shutoko Technology Center.

This development epitomizes how our technical development capabilities, integrating chemical and civil engineering technologies, were fully demonstrated by the synergies of TRI's research groups.



LSF trial construction on the Metropolitan Expressway

Results of evaluation of LSF's physical properties*



*Images courtesy of: Satoshi Aoki, Kazuya Kaba, Doyeon Kwak, Masayoshi Yoshida; Development of low elasticity SFRC for use in thickening the top surface of concrete decks, Proceedings of the Japan Concrete Institute, Vol.46, No.1, pp.1951-1956, 2024.

Construction Techniques



Our construction techniques embody the construction know-how cultivated by the SHO-BOND Group since our founding, with a special focus on maintenance work. For over 65 years, our Group has been fully dedicated to infrastructure repair and reinforcement work while refining our expertise to work more efficiently and maintain profitability even on smaller projects, and passing down this expertise as experience-based engineering. These construction techniques are a valuable asset on par with our developed technology, and are the source of our Group's high profit margins. In this section, we introduce the unique features of our maintenance work, and our company's construction techniques that enable efficient work tailored to these features.

Tsuneyuki Ashizawa
Director and General Manager of Construction Division and Director of Tsukuba Training Center, SHO-BOND CORPORATION

Features of Maintenance Work

Discrepancies between design and reality

Unlike new construction, maintenance work involves work on structures that have been in service for some time. Therefore, discrepancies from the initial projections frequently arise after commencing on-site work, such as discovering deterioration within structures that cannot be visually inspected or existing components not documented in design drawings. When these discrepancies arise, it is necessary to re-perform tasks such as structural measurements, determination of construction specifications, and design of components for installation. This not only requires time and effort but also tends to create waste and inconsistencies in the construction process.



During pavement repair work, the underlying deck slab was found to be significantly damaged upon removal of the pavement, and the reinforcing bars were also corroded.

Construction work during use

In maintenance projects, the work must generally be performed while the structure remains in use. Therefore, especially when dealing with road structures such as bridges and tunnels, the construction work must be completed within the minimum required area and with the shortest possible traffic restrictions so as not to obstruct pedestrian and vehicle traffic. Furthermore, given the close proximity of pedestrians to the construction site, even minor mistakes can lead to major accidents. This is a feature not often seen in new construction projects, and requires more detailed process and safety management.



(Left) Construction work on a bridge in use. Passenger vehicles are passing in close proximity to the construction crane.
(Right) Jacking up the superstructure. The in-use bridge girder is being lifted with jacks to replace the bearings.

Small-scale, highly diverse work types

Maintenance work is relatively smaller in scale than new construction, and inevitably involves diverse processes. It is not uncommon for multiple construction sites to be dispersed within a single project, such as when a single contract comprises repair work on two or three nearby bridges. These features tend to increase the costs associated with repair and reinforcement work, while also making schedule management more complex.

Example of small-scale, highly diverse work: Repair work on a pedestrian overpass

Compared to road bridges, pedestrian overpasses have smaller and more diverse components and use thinner steel plates and pavements, making them prone to localized damage. Moreover, the budget constraints faced by administrators mean that repair work is often small-scale and highly diverse, thus requiring contractors to be highly adaptable.



<p>(1) Patch plate repair In areas of the bridge near ground level, localized corrosion had occurred due to rainwater pooling, so we only applied metal plate patches to those damaged sections.</p>	<p>(2) Partial pavement repair Due to partial cracking and delamination of the pavement, we performed a detailed survey and design, then undertook construction to join up with the existing pavement.</p>
<p>(3) Replacement of screening panels After performing a detailed survey and design, we prepared new panels to match the existing guardrails and replaced the damaged panels.</p>	<p>(4) Partial repainting The paint had partially deteriorated on the rear side of the stairs, so we performed a partial repaint.</p>

Even when the volume of each type of work is small, the required quality does not differ from that of standard projects, such as traffic control and coordination with relevant agencies, material formulations that match existing sections, and quality and progress control of welding and painting. On the other hand, due to their very nature, small-scale projects require high-level management capabilities to prevent waste and inconsistencies in processes and materials. Even in these small-scale repair projects, SHO-BOND leverages its strengths to deliver efficient, high-quality, and safe construction work.

SHO-BOND's Construction Techniques

Adaptability through our Comprehensive Maintenance System

The SHO-BOND Group uses its Comprehensive Maintenance System to address the inherent challenge of maintenance work, namely that it is impossible to ascertain the precise circumstances of a project until work commences on-site. In the event of discrepancies from the original design, only engineers who specialize in repair work are capable of modifying the structure's design after ensuring that the customer understands the appropriate repair method. Our extensive experience as a dedicated maintenance provider has allowed us to accumulate in-house expertise, which we then leverage to identify potential deterioration based on a structure's materials, design, and environment, and to apply past lessons to design modifications, thereby enabling a swift response. Having a material supply system within the Group is also a strength.

More efficient process management

We implement rigorous, waste-free process management to ensure that construction work is completed in the shortest possible time without the need for reworking. At work sites engaged in SHO-BOND's core business of maintenance work, the types of work performed are typically small in scale but highly diverse. Therefore, we strive to complete every project as quickly as possible while considering the most efficient and safest sequence and methods for performing the various processes. This expertise in process management has been cultivated over many years as our Group accumulated experience from numerous small-scale maintenance projects. Our partner companies, with whom we have overcome these challenges, have fostered experienced people covering a diverse array of construction skills. A single partner company is therefore capable of handling multiple tasks, leading to significant reductions in project duration.



Superstructure widening work

Cost management tailored to maintenance work

Previous maintenance projects were generally smaller in scale individually than they are today, making it difficult to ensure profitability. To generate a profit even on small-scale projects with tight margins, it is essential to carefully scrutinize costs and pursue efficiency. On small-scale work sites, the engineers handled everything from daily cleaning and other minor tasks to cost management that had a direct effect on company performance. Accordingly, all of SHO-BOND's engineers honed their comprehensive cost management skills from their early years. This corporate culture, unique to a dedicated maintenance company, has been passed down and remains deeply entrenched in our entire Group to this day.

Transmitting and enhancing our know-how

The SHO-BOND Group has cultivated construction techniques based on accumulated experience in handling small-scale projects. However, as the scale of project contracts has grown in recent years, the environment for fostering engineers has also changed. Previously, the scale and nature of the projects undertaken by SHO-BOND were largely consistent nationwide, and new employees started on an almost level playing field, with training taking the form of OJT. However, in recent years, the nature of projects we have been involved in has diversified, ranging from large-scale to relatively small-scale construction, and encompassing both general contractor and subcontractor work. As a result, it has become difficult to train engineers using conventional methods that are reliant on OJT. Furthermore, large-scale construction projects typically have long construction periods of around two to three years, requiring workers to be assigned to the same project for extended periods. This makes it difficult for employees to gain experience in various types of work, and to broaden their skills and knowledge.

To ensure know-how is preserved and passed down amid these changes, we are committed to rotating our human resources and training them via the Tsukuba Training Center. In rotating our human resources, we devise assignments that will equip our young employees with experience in diverse types of work and tasks, and provide them with comprehensive skills in construction work management, including process and cost control. Another important element is our rank-specific training conducted at the Tsukuba Training Center. Rank-specific training provides a valuable opportunity for employees of the same age and experience level to gather together. The training programs therefore include sessions where participants share their experiences and inspire one another. Furthermore, we clearly define the on-site skills required at each level and conduct practical training using the training bridge. Through these initiatives, our engineers can acquire a broad range of knowledge not only on the types of work in which they are involved, but also from the experiences of their peers and from practical training programs. We also share case studies of past failures and the lessons learned within our Group to ensure a company-wide commitment to not repeating the same mistakes. It is essential to not only pass down the know-how accumulated over time, but also to continuously update that know-how. The SHO-BOND Group has proactively recruited mid-career professionals and leverages the insights gained from these hires in regional office-level training programs to supplement any gaps in knowledge or experience, thereby improving the skill levels of each engineer.



Practical training on anchor hole dimensional inspection and quality control