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### CORPORATE PROFILE



### Today's Work, Tomorrow's Heritage

In 1804, founder Kisuke Shimizu established a carpentry shop in the Kanda Kajicho district of Edo (now Tokyo), launching a company history that now spans more than 210 years.

During the company's early years, Shimizu appointed Eiichi Shibusawa, a renowned industrialist of the Meiji Era (1868-1912), to serve as senior advisor, and based its management style on his book, The Analects and the Abacus. This work set forth his concept of how businesses can contribute to society based on the unity of ethics and economics.

"With devotion and a spirit of innovation, we work to create value that exceeds expectations and contribute to a sustainable tomorrow" even as the needs of our customers become more diverse over time. These are the management principles of Shimizu.

While fulfilling the construction industry's vital social roles —developing a safe and reliable infrastructure, protecting against natural disasters, and promoting environmental sustainability— we are also taking on the challenge of expanding into new business domains and bringing the "Shimizu Dream," our vision for the future, into reality, all from a global perspective.

Shimizu works with great passion in order to hand down the Shimizu heritage to our children and future generations. We express this approach with our corporate slogan: "Today's Work, Tomorrow's Heritage."

Shimizu Corporation President and Director

Kaguyuki Inoue



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Shimizu's History

### The spirit of craftsmanship handed down for more than two centuries ensures that our structures stand the test of time.

Shimizu was founded in 1804, when Kisuke Shimizu I, a carpenter from Toyama (then a part of the Etchu district) start in business in Edo (now Tokyo).

Kisuke Shimizu I had been aspired "To be trusted by creating good structures with wholeheartedly devote ourselves to work" since its founded.

Carrying on this spirit, we have pursued new knowledge and technologies for more than 200 years.

#### Shimizu's History

# Kisuke Shimizu I and Kisuke Shimizu II, builders of Shimizu's foundations: Expanding business from construction of the Nishinomaru (western citadel) of Edo Castle to the Tsukiji Hotel

Kisuke Shimizu I applied outstanding skills and management acumen to launch a solid business, securing a contract in 1838 to build the Nishinomaru (western citadel) of Edo Castle. In the closing years of the Edo Period, Kisuke Shimizu II drew on personal funds to build Tsukiji Hotel, Japan's first truly Western-style hotel. The hotel was ultimately completed in 1868. With his enterprising spirit and strong technical skills, Kisuke Shimizu II established the foundations for today's Shimizu, contracting design and build Daiichi Kokuritsu Ginko (Mitsuigumi House), Kawase Bank Mitsuigumi, leading structures of the early Meiji Period, among various other structures.



Kisuke Shimizu II

Kisuke Shimizu I





Fiichi Shibusawa

### Rongo to Soroban (The Analects and the Abacus): Eiichi Shibusawa and Shimizu

Elichi Shibusawa contributed to the modernization of Japan from the start of the Meiji Period through Showa Period (which began in 1926). Advocating the fundamental concepts of Rongo to Soroban ("The Analects and the Abacus", a theory of ethical management that proposed a balance between the ethical humanism of the Analects of Confucius [552–479 B.C.] and the economic activity symbolized by the abacus), he argued that a company must benefit society and not just pursue profits. In 1887, Shimizu appointed Shibusawa to serve as a senior advisor. Thereafter, the company's management outlook was based on his book, Rongo to Soroban.





The lumber cutting and assembling facility that preceded the Tokyo Mokkoujou Arts & Crafts Furnishings

#### Handing down the craftsman's time-honored skills: Tokyo Mokkoujou Arts & Crafts Furnishings

Tokyo Mokkoujou Arts & Crafts Furnishings got its start in 1884 as a lumber cutting and assembly facility in Tokyo's Fukagawa Ward (now Koto-ku). Shimizu is the only major construction company that continues to operate a woodworking plant where craftsmanship remains so highly valued.

Edo eriod	1804	Kisuke Shimizu start in business in the Kan district of Edo.
	1838	Kisuke Shimizu I participates in the constru Nishinomaru (western citadel) of Edo Castle
	1859	Shimizu advances into the open port of Yok acquires Western construction techniques.
Meiji 'eriod	1868	Completion of Tsukiji Hotel, Japan's first trustyle hotel
	1872	Completion of Japan's first bank, Daiichi Ko (Mitsuigumi House)
	1884	Lumber cutting and assembling facility (now Mokkoujou Arts & Crafts Furnishings) open Fukagawa-Shimadacho district.
	1887	Eiichi Shibusawa appointed as a senior adv
	1891	Shimizu opened bases all over the country branch offices opening.
	1903	Shimizu relocates to its newly constructed in Minamisayacho, Kyobashi-ku, Tokyo (nor Chuo-ku).
aisho 'eriod	1910	Completion of Japan's first true steel-frame Nihonbashi Maruzen Head Office
	1915	Company reorganized from owner-operato limited partnership Shimizu-gumi.
	1917	Completion of Yokohama Port Opening Me
	1920	Completion of the Industry Club of Japan B
howa eriod	1925	Completion of Tokyo Imperial University led (Yasuda Hall; now the University of Tokyo Y Auditorium)
	1936	Completion of Yasuoka Power Station, own Yahagi-Suiryoku Co., Shimizu's first dam p
	1937	Reorganized as Shimizu Gumi, Ltd.
	1944	Predecessor of the Institute of Technology the head office.
	1948	Renamed Shimizu Construction Co., Ltd.
	1957	Japan's first nuclear reactor (No. 1 Reactor Japan Atomic Energy Agency.
	1959	Completion of Main Building of the Nationa Western Art Completion of Kuromata River No. 1 Dam
	1962	Shares listed on the first section of the Toky Exchange.
	1964	Completion of Yoyogi National Stadium Completion of Tokaido Shinkansen Shizuok Overpass Construction of Japan Atomic Power Compan Power Station, Japan's first commercial nucle
	1969	Completion of 12 buildings for the Japan W Exposition, including the Japan Pavilion
	1970	Construction of Tokyo Gas's Negishi LNG To Japan's first underground LNG storage tan
	1972	Completion of Institute of Technology in Toky

# SHIMIZU'S HISTORY

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Daiichi Kokuritsu Ginko (Mitsuigumi House) (1872)

Yokohama Port Opening Memorial Hall (Built 1917, conserved and restored in 1989)

The Industry Club of Japan Building (1920)

Tokyo Imperial University Lecture Hall (Yasuda Hall; now the University of Tokyo Yasuda Auditorium) (1925)



The National Museum of Western Art (Built 1959, restored in 1998)



Kuromata River No. 1 Dam (1959)

Makuhari City Center (1989-)

/o's Koto-ku



#### The Institute of Technology: The construction industry's first R&D facility

Reflecting its commitment to technological development, Shimizu established the construction industry's first internal technical research organization in 1943. In 1972, separate research facilities were merged into a newly constructed research center in Koto-ku, Tokyo.

#### The first drafting office in Japan's construction industry: Delivering ever improving structures to our customers

In Japan's construction industry, the tradition is for master builders to handle both design and construction work. Transferring these traditions inherited from Kisuke Shimizu I and Kisuke Shimizu II to Western-style construction methods, Shimizu established a drafting office in 1887, the precursor of today's Design Division, where it trained the staffs capable of drafting and designing Western-style buildings.



#### Yoyogi National Stadium: Tackling the challenges posed by an unprecedented hanging roof structure

This facility served as a symbol of the 18th Olympic cables. It suspended two cables weighing approximately 250 tons each and measuring 33 centimeters in diameter advanced construction technologies of the time.

Games, held in Tokyo in 1964. Among its striking features is its exterior, which combines two flowing curves. The design was made possible by a roof hung from wire between two massive pillars rising 40 meters and standing 126 meters apart. Unprecedented in scale for such a structure, the project incorporated the most

#### Repairs of the Great Buddha Hall of Todaiji Temple: Applying the latest technologies to support Japan's time-honored architectural traditions

The Great Buddha Hall of Todaiji Temple is among the world's largest wooden structures. Over a six-year period starting in 1974, Shimizu used approximately 130,000 tiles to recover its roof, which measured some 7,900 square meters in surface area. Shimizu also erected a massive base roof to cover the Great Buddha Hall. Steelframe units of the roof base assembled on one side were slid into place on the other side. Including temple carpenters, over 100,000 workers took part in the construction, applying both traditional techniques and state-of-the-art technologies to complete the massive renovation project.





- Representative office opened in Singapore; start of fullfledged international business development
- Awarded the Prime Minister Prize of the Japan Industrial 1980 Technology Grand Prix for the development and construction of large-capacity underground LNG storage tanks Completion of large-scale repairs to the Great Buddha Hall of Todaiji Temple in Nara

1973

- 1982 Construction of Japan's first rock oil tank
- Completion of Makuhari Messe (in the new city center of 1989 Makuhari in Chiba)
- 1991 Headquarters relocated from Kyobashi to recently completed Seavans (Minato-ku, Tokvo).
- Construction of DN Tower 21 (Dai-Ichi · Nochu Building), 1995 revitalizing famous prewar structures Completion of Republic Plaza (Singapore)
- 1997 Tokyo Wan Aqua-Line tunnel opens. Shimizu completes the tunnel portion, Umihotaru artificial island, and other facilities. ISO 9001 certification received in Japan. Completion of Malaysia-Singapore Second Link Bridge
- First seismic retrofitting in Japan performed during 1998 renovation of The National Museum of Western Art.
- 1999 ISO 14001 certification received in Japan. Order awarded for Japan's first PFI project (Kanamachi Water Purification Plant, Bureau of Waterworks, Tokyo Metropolitan Government).
- 2001 New Acoustic Laboratory, the most advanced in Japan, opens at the Institute of Technology.
- 200th anniversary of Shimizu's founding 2003 Completion of new main building at the Institute of Technology
- 2006 Construction of Bai Chay Bridge in Vietnam, featuring the world's longest span for a single-plane PC cable-stayed bridge
- Corporate slogan "Today's Work, Tomorrow's Heritage" 2008 announced.
- 2009 World's first successful experiment in recovering nearsurface methane hydrate gas
- Long-term vision "Smart Vision 2010" formulated. 2010 Completion of Tokyo International Airport D-runway
- 2012 Completion of new Head Office in Tokyo's Kyobashi district
- Completion of GINZA KABUKIZA 2013 Completion of the Materials Laboratory and the Multipurpose Testing Laboratory at the Institute of Technology
- 2015 Advanced Earthquake Engineering Laboratory at the Institute of Technology began full-scale operations. Pahang-Selangor Raw Water Transfer Tunnel completed (in Malaysia).
- 2017 Monozukuri Training Center opened. Shimz Smart Site, next-generation production system developed.
- 2018 Tokyo 2020 Olympic and Paralympic Games Official Supporter agreement concluded.
- 2019 Management principles, "The Analects and the Abacus," reestablished as the corporate credo. New management principles and SHIMZ VISION 2030 long-term vision formulated

# SHIMIZU'S HISTORY



Seavans (1991)

DN Tower 21 (Dai-Ichi•Nochu Building)

Republic Plaza (1995)

Umihotaru (1997)



Malaysia-Singapore Second Link Bridge





New Head Office (2012)

GINZA KABUKIZA (2013)

Advanced Earthquake Engineering Laboratory (2015)

Our vision for 2030 is to be a "Smart Innovation Company."

Shimizu's Vision

SHIMZ VISION 2030, the long-term vision formulated in 2019, expresses our ten year plan for the Shimizu Group.

### **SHIMZ VISION 2030**

The Shimizu Group will create new value and contribute to a safe, healthy and sustainable future for everyone by transforming and challenging ourselves beyond construction and co-creating with diverse partners.

# Shimizu's Businesses

#### Shimizu Group

The Shimizu Group consists of Shimizu Corporation, 66 subsidiaries, and 15 affiliates. Our group operates many businesses in Japan and overseas, including the construction, the investment development (real estate development), and the engineering businesses.



#### Shimizu Corporation

#### Construction Business







Building Construction

Civil Engineering ►►► P14

#### Non-construction Businesses







Investment Development (Real Estate Development) >>> P20

Engineering
P22

LCV (Life Cycle Valuation)











Frontier Business ▶▶▶ P26

### **Group Companies**

#### **Construction Business**

#### Main consolidated subsidiaries

- FaB-Tec Japan Corporation
- Daiichi Setsubi Engineering Corporation
- SHIMIZU BLC Co., Ltd.
- Shimizu Corporation (China) Ltd.
- Shimizu North America LLC

#### Main affiliates

• The Nippon Road Co., Ltd.

#### **Development Business**

#### Main consolidated subsidiaries

- Shimizu Comprehensive Development Corporation
- Shimizu Investment (Asia) Pte. Ltd.

#### Main affiliates

• Makuhari Techno-Garden Co., Ltd.

#### Service Operations

#### Main consolidated subsidiaries

- MILX Corporation
- SC Machinery Corp.
- Tama Medical PFI Corporation
- Shimizu Finance Co., Ltd.
- Shimizu International Capital (Singapore) Pte. Ltd.

Building Construction

### Building on the skills and spirit of craftsmanship

Throughout the two centuries that span Shimizu's history, the deep and abiding trust of our customers has served as our foundation. This bond of trust has emerged as a result of Shimizu's tradition of placing the highest priority on customer satisfaction, which we ensure through expertise and a high sense of craftsmanship.

We uphold this spirit throughout turbulent times as well, through application of the latest technologies and our wealth of experience, and this spirit carries over in construction too.

The building life cycle starts with the planning stage and extends through design and construction to maintenance, management, and operations.

Maximizing the value of a building throughout its entire life cycle as our goal, we deliver a level of craftsmanship that surpasses customer expectations.

### Shimizu's Architectural Construction Business



In addition to basic post-completion services, we provide operational and maintenance support for buildings and building equipment. Furthermore, we propose building energysaving methods and efficient operational management, as well as building diagnostics and renewal solutions. We strive to maintain and improve the value of important assets for customers.

Based on mutual understanding of the goals and ideals between customers and designers, we construct high quality building by exploring optimal construction methods for each project. During this stage, we draw on a wide range of state-of-the-art production systems and construction technologies.



Shimizu formulates and proposes optimal plans based on various simulations and studies of building life cycles, economic potential, and the latest trends in society, among other factors, thereby meeting the needs of customers.



Based on customer needs, Shimizu utilizes the latest technologies, such as building information modeling (BIM)\* and computer graphics, to give a concrete profile to building shapes and performance. By working throughout the construction stage, we incorporate our insights and experience to achieve optimal quality and value with the shortest construction period.

\*BIM: a three-dimensional building model allowing the generation of 3D building models and centralized management of information on building attributes, including building design, structure, facilities design, cost, and finish



### BUILDING CONSTRUCTION

(Tokyo, scheduled for completion in July 2020) The msb Tamachi project is targeting mixed use communit development at the east entrance of JR Tamachi Station

msb Tamachi Tamachi Station Tower N

Shimizu is responsible for the 180-meter ultra-high-rise office building with 36 floors above ground and 2 floors below ground. A smart energy center has been installed in the basement. It controls power supply to the entire city block and is capable of supplying electricity for 72 hours or longer during an emergency via gas co-generation. It is promising as an office building with rigorous BCP (business continuity planning).

### Building Construction



#### KYOBASHI EDOGRAND (Tokyo, 2016)

This is an ultra-high-rise complex consisting of the historic MEIDI-YA Kyobashi building and two newly redeveloped buildings. The look of the area was preserved by aligning the low-rise section of the redeveloped buildings with the height of the MEIDI-YA Kyobashi building.





Tottori Prefectural Central Hospital (Tottori, 2018) This hospital plays a central role in regional medical care in the eastern part of Tottori Prefecture. A new main building was built as a new hospital to provide a fuller array of advanced medical functions. A seismic isolation structure was used for the hospital. It was given a new lease on life as a facility capable of continuing to provide health care even during disasters by locating medical treatment facilities on the second floor and higher to prepare for tsunami and flooding.



KAMISU BOUSAI ARENA (Ibaraki, 2019) This multipurpose facility was built as a disaster shelter for the region. It is equipped with a disaster prevention terrace, main arena, music hall, and other amenities. Each of these facilities can serve as an evacuation shelter during a disaster, and can be converted into space for rescue and relief activities.

#### Osaka Fukoku Seimei Building (Osaka, 2010)

Realized through the random placement of glass curtain walls, the narrative concept underlying this design by French architect Dominique Perrault is a large tree rising into the sky.



#### Seismic Retrofitting and Renovation of Hotel New Grand (Kanagawa, 2016)

The ceiling was designated as an historical structure that should be preserved, so we reinforced it without changing the design. Skillful craftsmanship enabled us to preserve the historical value and pass it on to future generations, and improve earthquake resistance.





Meiji Jingu Museum (Tokyo, 2019)

The museum was built as part of the activities for the enshrinement centennial festival for Meiji Shrine, to commemorate the 100th anniversary of the shrine's founding in 2020. It was designed to blend in with the woods flanking the sacred bridge leading up to Meiji Shrine, one of the symbolic aspects of Meiji Shrine. The museum stores and displays a collection that includes items associated with Emperor Meiji and his wife, Empress Dowager Shoken.

### BUILDING CONSTRUCTION

#### Kanazawa Station Improvement Project (Ishikawa, 2014)

This project for urgent maintenance of the railway station integrated with community development was begun in 1992. Shimizu worked on main construction projects such as construction of the elevated rail line, the east plaza (completed in 2005), and the Hokuriku Shinkansen station (completed in 2014). The Motenashi Dome, a large glass roof that is 30 m high, was built with a truss construction using 6,000 aluminum frame sections and is the largest example of this type of construction in architectural structures in Japan.



#### Kumagaya Rugby Stadium (Saitama, 2019)

nis is one of Japan's leading rugby stadiums and was renova )19 Rugby World Cup. Shimizu was responsible for consi ne main stands on the east side and the side stands on the no s. We built the stands with a maxir a clear view of the field and the fe

### Building Construction

### SKYZ TOWER & GARDEN·BAYZ TOWER & GARDEN (Tokyo Wonderful Project, Tokyo, 2016)

These are large-scale residential towers located on one part of Toyosu Pier, which is being developed. The two towers are 150 m and 100 m high (with 1,660 residential units in total). We aimed for community development that achieves the harmonious co-existence of people with nature by securing a greening ratio of roughly 45% of the area developed, installing a waterscape that promotes wildlife on the premises, and other amenities. Japan's first seismic isolation and vibration damping structure was used in both buildings to enable residents to



#### Waseda University Building 37, Waseda Arena, and Toyama Hill (Tokyo, 2018)

The aging Memorial Hall was rebuilt as a multipurpose sports arena that also houses a learning commons and a sports museum. The main arena is located in two underground floors to meet the campus building coverage restrictions. We built Toyama Hill, which is lush with greenery, on the ground above the arena roof to solve the lack of green areas and open space on campus.



#### Dai Nagoya Building (Aichi, 2015)

Shimizu rebuilt the old Dai Nagoya Building, which was the familiar face of Nagoya Station for close to half a century. We retained the façade of the old building and gave it a new life as a large complex that includes approximately 33,000 m<sup>2</sup> of customer-attracting facilities. We intend for it to be a new landmark in the Tokai area, which is becoming more international.

#### GINZA KABUKIZA (Tokyo, 2013)

This complex combines a traditional Kabukiza theatre on the lower floors with Kabukiza Tower, a state-of-the-art office tower. To carry on the beloved traditional design of the theater, the project drew on traditional temple construction knowhow perfected by master temple builders and Building Information Modeling to carefully reproduce the finest details. GINZA KABUKIZA won the 55th BCS Award in 2014. (Photo courtesy of Shochiku Co., Ltd., Kabuki-za Co., Ltd.)

1804

#### JR Hakata City (Fukuoka, 2011)

This large multipurpose building consisting of a railway station and commercial facilities was built to coincide with the start of full operation of the Kyushu Shinkansen high-speed train. The facility was planned to be built both above and below the tracks, and the construction itself involved no interruptions to train services.





### Bank of Iwate Red Brick Building(preservation & restoration work)(Iwate, 2016)

This is the only surviving work of Kingo Tatsuno in the Tohoku region. The historical structure, which operated as a bank for roughly 100 years, was reborn as Bank of Iwate Red Brick Building with the completion of work on preservation and repair. The exterior damage from the Great East Japan Earthquake required only minor repairs, and we performed repair and preservation work based on the policy of restoring the form, which had been changed from additions and renovations in the Showa era to the original form when built.



#### Livedo Corporation Ehime Niihama Factory (Ehime, 2013)

This factory manufactures compact kits of medical materials for surgical use. The structure's simple and attractive rounded exterior evokes a packaged surgical kit and harmonizes well with the surrounding landscape.



Sapporo Race Course Stand (Hokkaido, 2014)

This project involved the demolition and reconstruction of a stand that operated for roughly 40 years. The stand has gained new life as a venue where spectators can stand closer to race horses while enjoying the open air of Hokkaido. With its distinctive snow-white exterior walls, which are representative of this northern region, the facility offers 120 meters of terrace seating.



#### Toyosu Wholesale Market (Tokyo, 2016)

Shimizu was responsible for construction of the wholesale fish market, which is roughly 1.5 times the size of Tokyo Dome. We took on the challenge of large louver unitization to achieve both high quality and a shorter construction period by reducing the labor required, and achieved this with zero external scaffolding. The scenery of Tokyo Bay can be enjoyed from the green plaza on the roof, which was built to take the environment and landscape into consideration.

### BUILDING CONSTRUCTION

#### Izumo-Oyashiro (preservation & restoration work) (Shimane, 2013)

This project was conducted together with a shrine transfer ceremony in May 2013, the first such ceremony in 60 years. Drawing on traditional techniques to dismantle, remove, preserve, and renovate damaged portions of the structures using existing materials wherever possible and adding new materials only when necessary. Shimizu handled preservation and repairs for 14 structures, including the main shrine (designated a national treasure) and several important cultural properties.



#### Tokyu Plaza Ginza (Tokyo, 2016)

Constructed on a site measuring approximately 3,700 m<sup>2</sup> at the Sukiyabashi intersection in the Ginza district, this project is one of the area's largest commercial facilities. Modeled on the concept of a "vessel of light," the exterior design of this new Ginza landmark incorporates an Edo kiriko cut glass motif.

Civil Engineering

# Safe, secure and cost-competitive construction, contributing to long-life infrastructure.

Roads and railways, water, electricity and gas lifelines are indispensable for everyday infrastructure. Infrastructure helps protect communities from earthquakes, tsunamis and floods. In recent years, we have increasingly faced the need to manifest Shimizu's integrated strengths to fulfill the needs of society in building these types of facilities. We have been working on the needs by responding to the construction workforce shortage problem and by implementing work-style reforms in addition to the already existing needs for high quality, cost-competitiveness, and shorter construction periods for these infrastructure facilities. With our rich experience and technological capabilities, we provide customers with optimal solutions at all construction stages, from design to construction.

80,

On the other hand, the need for maintenance of existing facilities will increase in the years to come. We are also working to extend the service life of existing facilities and to meet customers' maintenance and renewal needs.



Yamba Dam Construction (Gunma, scheduled for competition in 2020) A concrete gravity dam 116 m high, with a crest length of 290.8 m, dam volume of 1 million m<sup>3</sup>, and water reservoir capacity of 107.5 million m<sup>3</sup>. To reduce the construction period, we introduced the cruising RCD (Roller Compacted Concrete for Dam) construction method and other technologies newly developed using ICT.



### CIVIL ENGINEERING

### Civil Engineering

#### Onahama Marine Bridge (Fukushima, 2017)

A PC extradosed bridge with five continuous spans that connects the man-made island in the Eastern Port area of Onahama Port with Wharf No. 3. It was a challenge to adjust construction times in a port congested with ships, including those used for earthquake recovery construction, and influenced by sea conditions. We successfully completed the construction the Japan Society of Civil Engineers "Tanaka Award" during fiscal 2017.





#### Haneda D-runway (Tokyo, 2010)

This construction project included the construction of Haneda Airport's fourth runway, consisting of a 1,100m pier, and a 2,020-m landfill area to form the new runway and related facilities, in the existing offshore airport. This project was awarded the Japan Society of Civil Engineers "Tanaka Award" during fiscal 2010. (Photo courtesy of Haneda Airport Runway D Extension JV)



#### New Final Waste Disposal Site in Tsu City (Mie, 2016)

The final waste disposal site is a closed system for general waste disposal with a retention capacity of 90,000 m<sup>3</sup>. It consists of a steel frame roof and a concrete retention tank lined with water-impermeable sheet. We completed it by marshalling Shimizu's integrated strengths in civil engineering, building construction, and construction of complex equipment.



Obara Dam (Shimane, 2012)

operates in harmony with nature.

Transport and Tourism)

Measuring 90 meters high, 441 meters long, and

690,000 m<sup>3</sup> in volume, this concrete gravity dam

represents an effort to build a safe, secure dam that

(Photo courtesy of the Ministry of Land, Infrastructure,

Preventive Maintenance Work on Nihonbashi Bridge (Tokyo, 2011) One hundred years have passed since it

was rebuilt to its current stone structure; Nihonbashi Bridge is an important cultural property and an active main road. Aiming for another 100 years of operation, we performed the repair work under the concept of "without affecting the bridge's historical value, repair while using it".

#### Tokyo Metro Yurakucho Feeder Line Between Kotake-Mukaihara and Senkawa (Tokyo, 2017)

The purpose of this project was to eliminate Japan's first level crossing on an operating subway line. Because dismantling the existing structure would produce 5.000 tons of materials, we worked to increase the size of block cuts and use precast concrete for installation of the new floor slab and pillars. We completed the construction without obstructing the operating line through a series of ingenious measures. This project was awarded the Japan Society of Civil Engineers "Technology Award" during fiscal 2017.

#### Ohorayama Wind Farm (Kochi, 2018)

Located in the town of Otsuki in Kochi, this 33,000-kW wind farm is the largest in Shikoku. We incorporated several Shimizu technologies to build a 7.5 km road, attach eleven turbine pinwheels (50.2-meter-long with a hub height of 85 meters), and install 16.7 km of buried power transmission lines in the urban area. The project took two and a half years to complete.







Yoshinoura Thermal Power Station (Okinawa, 2013)

Incorporating two 250,000-kW turbines and two 140,000kl aboveground prestressed-concrete LNG tanks, this compact, state-of-the-art LNG thermal power station was built under a turnkey construction contract. Project mandates included protecting the landscape, environment and the beautiful sea of Okinawa - an area with a diverse natural environment and where historic and cultural heritage can be found.

### ENGINEERING

#### Shin-Tomei Expressway in Hagi District, Toyokawa City (Aichi, 2015)

This was a complex, large-scale project involving a 3.1-km-long section of the Shin-Tomei Expressway in Aichi. It involved the construction of a tunnel approximately 1.2 km, two bridge sub-structures (abutments and 19 bridge piers), soil cutting (1.3 million m³), soil filling (2.41 million m³), retention reservoirs (five locations), and other related work. We successfully completed the work within a short construction period by utilizing the latest technology and devising numerous construction techniques. This contributed to the early opening of the road.



#### Continuous Grade-separated Junction near Chofu Station Project (Tokyo, 2012)

his project near Chofu Station involved moving a railway track belonging to Keio Railway underground. We handled the construction of four parallel tunnel all located in very close proximity, with as little as four meters of earth separa ing the tunnels from the rail lines operating directly overhead. This project was rded the Japan Society of Civil Engineers Awards

### Overseas Construction

# Shimizu's comprehensive strengths play an important role on the global playing field.

Factors such as economic growth in emerging markets and the internationalization of Japanese business are expanding Shimizu's range of activities on the world stage. To deliver optimal service to customers around the world, Shimizu makes the most of its cumulative experience and the expertise of its technical staff.

To support customers globally, Shimizu also draws on its comprehensive capabilities, including its wide business network and teams of trained staff deployed around the world.



#### Pahang-Selangor Raw Water Transfer Tunnel (Malaysia, 2015)

This tunnel supplies water for residential and industrial use to Malaysia's capital, Kuala Lumpur. Shimizu overcame extreme conditions with a team effort from the multi-national staffs. Measuring 44.6 km in length, this is the longest such tunnel in Southeast Asia.

#### Bai Chay Bridge (Vietnam, 2006)

With the longest center span of any single-plane, cable-stayed, prestressed-concrete bridge in the world, this massive bridge crosses Ha Long Bay, a UNESCO World Heritage Site. The project incorporated wind-stability testing during and after construction of the bridge, as well as other cutting-edge construction technologies.



#### Menara Astra (Indonesia, 2017)

This is the headquarters building for Astra International, the largest conglomerate in Indonesia. At 261.5 meters high, it far surpasses other buildings and has a landmark presence on the main street in Indonesia's capital, Jakarta.







#### Changi Airport Terminal 3 (Singapore, 2007)

The new terminal at Singapore's main gateway was constructed by Shimizu. Work on the large roof (300 meters wide by 215 meters deep) marked the first successful attempt to lift such a large steel-framed truss into place.



#### National Heart Centre Singapore (Singapore, 2014)

NHCS is an advanced medical facility servicing a growing demand for cardiovascular treatments. Though it was our first medical project in Singapore, Shimizu successfully completed the project utilizing its comprehensive capabilities based on its many experiences in Japan and abroad.

## OVERSEAS CONSTRUCTION

#### TICA Georgia Factory (U.S., 2013)

This design and build project was delivered by Shimizu North America LLC on a fast track basis. This facility, for Toyota Industries Compressor Parts America (TICA), produces automotive compressors to the automotive industry.



#### Mapletree Business City (Singapore, 2010)

Featuring four buildings with a total floor area exceeding 230,000 m<sup>2</sup>, this large-scale office facility was completed in a mere 26 months, including the demolition of preexisting structures on the site.



Investment Development ( Real Estate Development

### Shimizu is actively employing its extensive knowledge of buildings in a broad range of real estate business in Japan and overseas.

This is the core of our non-construction businesses. We will expand our business domain and areas while keeping the optimal business portfolio for further growth in mind, and will utilize Shimizu Group technologies in development of comfortable, efficient communities.

### Shimizu's Investment Development



Pursuing high-quality real estate development with strong business potential based on full and partial investment as a developer and Shimizu's expertise in state-of-the-art real estate development and construction

Developing securitization, new business models, and other advanced business schemes to deliver real estate development solutions that meet customer needs and the distinguishing features of each project

#### Utilization of sales network and technical skills

We will use our sales network throughout Japan and overseas that we have grown over the course of our more than 210-year history to generate projects and plan unique projects stemming from our advanced technical skills in the general contracting industry to differentiate Shimizu in the real estate business.

#### Expansion of business domains

We will further expand rental assets aimed at securing stable revenue in Japan, primarily in our core business (offices and logistics facilities), and will also strengthen initiatives in growth markets such as hotels and data centers, and expand the group's overall building stock business.

#### Expansion of business areas

Overseas, we will diversify the countries in which we invest based on growth potential and stability (ASEAN, North America, and elsewhere), and work to strengthen alliances with local partners in each area





#### AKIHABARA i-Mark Building (Tokyo)

This building utilized our technical skills, which are our strength as a general contractor. Our use of multiple technologies to reduce the burden on the environment such as ecological designs and a radiant air conditioning system resulted in the acquisition of ZEB Ready\* certification, a first for a multi-tenant office building in the Greater Tokyo Area, under the Building-Housing Energy-efficiency Labeling System (BELS) sponsored by the Ministry of Land, Infrastructure, Transport and Tourism. The building has also obtained LEED (Leadership in Energy and Environmental Design) Gold certification, an international system for evaluating the environmental performance of buildings. (\* ZEB Ready: A reduction in energy usage of 50% or





#### G-BASE Tamachi (Tokyo)

This is an office building that incorporates attempts to respond to the diversification in work style throughout. We used skeleton specs for the exclusive area of the office and proposed an open space and freedom with the interior to the customers. For the common areas, we incorporated distinctive plans for an entrance with the material feel of wood or steel, an elevator hall that uses lighting for dramatic effect, and level display signs with art for each floor. We also installed a rooftop garden as a space to relax and a lounge equipped with shower rooms



#### S.LOGI Kawashima (Saitama)

This is a BTS\* warehouse located in the Kawashima industrial park, which connects directly to the Kawashima Interchange on the Ken-O Expressway. The project involved taking on the challenge of developing a specialty warehouse containing three of the largest class of cranes in Japan as a new category of S.LOGI logistics facilities developed by Shimizu, and it is capturing the interest of investors. (\* Build-to-Suit: A facility built according to the specifications of the tenant who intends to occupy it)



ANA Intercontinental Beppu Resort & Spa (Oita) This is a luxury spa and resort developed in the city of Beppu in Oita Prefecture, a flourishing area known as the No. 1 hot springs location in Japan both for the number of hot springs and water flow volume. It has 89 guest rooms and is located in a picturesque spot that overlooks the city of Beppu and Beppu Bay. The resort has an infinity pool with a breathtaking panoramic view, a spa, open-air bath, and hot spring facilities, a club lounge, and a restaurant and bar that incorporates beautiful modern designs characteristic of Japan. It draws a wide range of customers from Japan and overseas as a spa and resort with a motif characteristic of Japan that is run by Intercontinental, a world-class luxury hotel brand.

#### ISORAS CIKARANG (Indonesia)

This is a serviced apartment building developed in the industrial park area in eastern Jakarta, the capital of Indonesia. As the first project developed by Shimizu on its own in the overseas, we handled all aspects of the process, from land purchase and permit acquisition to negotiation of the tenant leasing agreement for the entire building. Shimizu Bangun Cipta Kontraktor, a local subsidiary of Shimizu, was in charge of the design and construction. We expect it to be used mainly by employees of Japanese companies stationed in Indonesia long-term and employees on business trips.

## INVESTMENT DEVELOPMENT





Shimizu's

### Engineering

information.

generation.

\*EPC: Engineering, Procurement and Construction

Shimizu's Engineering

Renewable energy

Onshore wind farms • Ocean bed resource





immediately after the Kumamoto earthquakes.







### Renewable Energy Engineering



Akita Katagami Wind Farm (under construction)



#### We provide integrated support for construction of solar power, onshore and offshore wind power, and other types of renewable energy facilities, from front-end planning Renewable energy and licensing to planning, design and construction.

#### Soil Environment Engineering

#### Soil remediation

We are performing remediation work to clean up the radioactive substances released into the soil environment from the nuclear power plant accident.







Shimizu's engineering will achieve a carbon-free

society and safe and healthy living environment.

We are engaged in the EPC\* business in the areas of energy, the environment, plants, and

In the energy area, we are focusing on onshore and offshore wind power and other forms of renewable energy which will follow solar as key areas in the future. We are also working on hydrogen-fueled energy, marine resource development, and other initiatives aimed at the next

We will strengthen soil and groundwater remediation engineering in the environmental area,

production and logistics engineering in pharmaceutical, food, and functional chemical plants

Plants

in the plant area, and will use of IoT and AI in ICT engineering to achieve energy savings,

automated production, ensured security, and for other purposes in the information area. In ICT, we will implement integrated initiatives across a broad range of areas, and will work to

expand business opportunities to meet increasingly complex and diverse needs.

#### Soil remediation plant in interim storage facility in Okuma 2nd Area

# ENGINEERING

#### Plant Engineering

Okashino Kobai Aso Nishihara Factory This factory was designed and built with the latest food production equipment while recovering the plants

#### Building a Safe, Secure, and Labor-saving Food Plant

The Ministry of Health, Labour and Welfare is working to systematize HACCP.Shimizu is using its past track record and expertise to build highly efficient food plants by building HAC-CP-compliant production lines and installing labor-saving technologies and automation.

#### Information System Engineering



Fukushima Medical University cell bank





ICT systems that match facility type and customers' needs We build ICT systems according to facility type and

customer's need including network security system.

Shimizu's

### Life Cycle Valuation

### We will achieve sustained improvement in the value of buildings, infrastructure, energy, and communities over the course of their life cycles.

Our LCV (Life Cycle Valuation) Business extends beyond providing services along with buildings. We link the three businesses of BSP\*1, energy and infrastructure management, and the ICT and smart business to generate new value and a new business model for communities and customers.

We meet the increasingly diverse needs of customers by providing more energy savings, decarbonization, and strengthening the business continuity function (ecoB-CP), and improving heath and comfort in the work and living environments (WELL). To achieve this, we provide comprehensive solutions that utilize renewable energy, IoT, and AI, and include business planning and investment.

We achieve sustained improvement in value and user satisfaction over the life cycles of buildings infrastructure, and communities, and build a sustainable future.

\*1 BSP: Building Service Provider



\*3 PM:Property Management \*4 PPP:Public-Private Partnership \*5 O&M:Operation & maintenance **BSP** business



#### Tama Medical Center and Children's Medical Center (Tokyo)

This was a PFI project to relocate four metropolitan hospitals to the Tama Medical campus, reorganize them, and establish a new 1,350-bed hospital and provide medical-related services. Shimizu not only performed construction but provides operation management support, and maintenance and management for both hospitals as the representative company of the business operation company.

#### WELL services

WELL certifications evaluate a building and its interior environment from the perspective of well-being and comfort. We promote acquisition of WELL certification to customer facilities.

#### **ICT/Smart business**



Photo of verification testing of the indoor-outdoor voice navigation system



Shimizu's Shanghai office in China, which acquired WELL certification

Facility management business We accurately assess the needs of the entity

and stage of the life cycle.

placing an order for maintenance of a facility and provide long-term facility management services according to the building characteristics

#### Guidance service

This service uses an advanced indooroutdoor voice navigation system that uses location data transmitted via beacons and cognitive technology (technology in which the computer thinks autonomously about vague questions, learns, understands, acts, and elicits a response). The service is intended to guide visitors comfortably to their destination, by the method suited for them (including people in wheelchairs and visually impaired people) and in the language they prefer.



continue this for 20 years.

nance, and other services

## LIFE CYCLE VALUATION

#### Energy/Infrastructure management business

#### Renewable energy business

We are responding to the demand for decarbonization to achieve sustainable communities through initiatives in power generation using renewable energy, expanding the use of renewable energy and providing electricity distribution services of high environmental value.



#### Ako Solar Power Plant (Hyogo)

Approximately 48,000 solar panels have been installed on a large parcel of land that is around 165,000 m<sup>2</sup> in size. The plant is capable of providing power to 3,800 typical households. The plant began selling all electricity generated to Kansai Electric Power Co., Inc. in April 2014 and plans to

#### PPP & concessions

We meet the demand for stream lining and improving the profitability of infrastructure management through PPP and concessions, local government asset management (AM), infrastructure mainte



Schematic diagram of airport concession business



#### Smart communities

We promote the effective use of energy in the whole community and use of renewable energy, and are developing communities that achieve the dual goal of ensuring business continuity and maintaining lifestyles. We strengthen area fire prevention functions and support the transition to a low-carbon community.

### Frontier Business

### We will commercialize new technologies and concepts aimed at new frontiers in space and on earth.

Shimizu began research and development on the concept of developing new frontiers in space, the ocean, and elsewhere in the 1980s. Due to advances in IT technology and the inflow of private funds in recent years, we anticipate moving from the conceptualization and R&D stage to commercialization, and anticipate growth in these areas as promising markets. In the future, we will focus on the four areas of ocean city development, space development, coexistence with nature, and venture investment, and will use our pioneering spirit to generate new businesses.

### Shimizu's Frontier Businesses

#### Ocean City Development

- Building a business model for ocean city development
- Creation of a new market, the "Ocean City of the Future"
- Establishment of a one-stop business model providing everything from engineering & construction to facility management

#### Coexistence with Nature

- Building agriculture, forestry, and fisheries businesses that achieve environmental innovation
  - Entrance into the closed-system plant factory sector to ensure stable food supply • Production and sale of microalgae, which are
  - highly efficient in producing proteins and fats
  - Entrance into the business of eliminating dependence on petrochemicals through bio-plastics (new materials derived from wood)
  - Use of agricultural residues and restoration of local agriculture

Venture Investment

Investment in next-generation

a global scale

construction technology and new

Investment in venture firms with future

potential and continuing collaboration • Introduction of ICT technology, robots, AI,

and other technologies in construction

• Expansion into new business domains through venture investments

through open innovation

businesses that solve problems on

#### Space Development

Leading a new era in the space business as an integrated space company

- Entrance into the small rocket launching business
- Promotion of businesses that use satellite
- · Pursuit of steady research & development on use of lunar resources, construction of lunar structures, etc.

#### **Ocean City Development**



#### OCEAN SPIRAL city working to restore the earth with the power of the deep sea

This city of the future is based on the concept of a direct connection to the deep sea. It targets utilization of the limitless potential of the deep sea to restore the earth. Our goal is to harness the untapped power of the deep sea through integrated vertical connection of the atmosphere, ocean surface, deep sea. and seabed to solve the problems facing the earth and mankind concerning food, energy, water, CO2, and resources.



#### Space Development

#### Lunar development and use

We have been conducting research and development on the design and construction of facilities and equipment that will support the activities of astronauts in space and on the moon and other celestial bodies, and on the use of local resources for this. Our goal is to achieve this by around 2030, and we will pursue research and development on automatic deployment and storage that envisions use in the harsh lunar environment.





#### GREEN FLOAT Sustainable eco island

This city of the future concept is based on the concept of a biomimetic plant-like city. It involves construction of an artificial floating structure located directly on the equator that exists in harmony with the environment and re-envisions a city equipped with integrated environment measures in a completely new way.



We took on the challenge of our first space business based on the increasing need for dedicated rockets to launch small satellites and invested equity in SPACE ONE Co., Ltd., the first private sector small rocket launching business, in July 2018. We have subsequently been working with joint investment partners to develop small rockets and build the terrestrial infrastructure



novation.



26

### FRONTIER BUSINESS

#### **Coexistence with Nature**

#### Initiative in large-scale greenhouse horticulture

We are building a vision of sustainable agriculture by utilizing construction industry technologies such as facility maintenance and environmental control in next-generation agriculture that performs efficient, planned production through the use of ICTequipped environmenta control technology.



Strawberry greenhouse, a joint venture with tomatoh farm



#### Entrance into the business of eliminating petrochemical use with bioplastics (new wood-based materials)

We are pursuing research and development aimed at the manufacture and sale of lignophenol, a bioplastic derived from trees. This can protect the mountains by using local wood resources in addition to contributing to the creating a post-petroleum society and combatting climate change.

Basic summary of lignophenol (Some photos provided by Fujii consulting & associates)

#### Venture Investments

#### Venture business

Shimizu is investing in venture funds in Japan aimed mainly at manufacturing. We are also collaborating with venture firms and entering alliances through investment in venture funds in Silicon Valley, the leading ecosystem for in-





Palo Alto office located in the center of Silicon Valley

Research and Development

### Laying the groundwork for 10 years from now — Targeting new technologies and value creation —

# Shimizu Institute of Technology

Established in 1944, the Shimizu Institute of Technology was the industry's first such institute and has played a significant role in modernizing construction technology. The Institute of Technology is an R&D center that brings together diverse talent in electronics, chemistry, medicine, and agriculture in addition to architectural and civil engineering. It also serves a venue for experimental verification of technology developed and transmission of information. Our goal is to create technologies and value that exceeds the expectations of our customers.

# Advanced Earthquake Engineering Laboratory, developing advanced technology for earthquake disaster mitigation

This laboratory is equipped with E-Beetle, most advanced large-scale shaking table in the construction industry, and E-Spider, the world's most advanced large-stroke shaking table. These can assess the total seismic performance of buildings, from the main structure to ceilings and other interior and exterior finishing materials and equipment. They can also replicate rooftop equipment installed on ultra-high-rise buildings and the movement of furniture with a high degree of precision.



Advanced Earthquake Engineering Laboratory



E-Beetle large-scale shaking table



Photo of an experiment with E-Beetle



E-Spider large-stroke shaking table



Photo of an earthquake experiment with E-Spider



equipped with the latest technology and enables collaboration between human workers and robots. These robots were developed in the Robotics Laboratory.





Automated material transport

Automated welding



Exterior view of the Wind Tunnel Testing Laboratory

#### Shimizu Cell Laboratory(S-Cell Lab) for Regenerative Medicine



S-Cell Lab, the regenerative medicine laboratory

This research facility was designed to address the need for construction of cell-culture facilities to meet the anticipation growth in demand accompanying the proliferation of regenerative medicine. It is capable of monitoring the cell-culture environment in real time and comprehensively verifying the cell-culture process. It is located in the Cleanroom Laboratory.



Culturing work performed inside a safety cabinet in the cell processing room



Elementary school students listening to an explanation in the testing lab

## RESEARCH & DEVELOPMENT





Installation of ceiling panels

#### The Wind Tunnel Testing Laboratory: Advancing wind engineering at the industry's largest facility

This facility is used to reproduce wind phenomena, confirm structural wind safety, and ascertain the effects of wind on nearby areas caused by the construction of a new building. The facility's data processing systems can measure actual wind phenomena in real time.

#### Shimizu Open Academy

With the goal of passing on the fascination and profundity of construction technologies to younger generations, Shimizu Open Academy draws on specialists from the Institute of Technology to provide comprehensive lectures covering a wide range of subjects. 2018 marked the 10th anniversary since the academy first began, and more than 50,000 people in total have participated in the academy thus far.





The Association for Corporate Support of the Arts has recognized Shimizu Open Academy activities and certified it as an initiative in creating a vibrant society through support of the arts and culture.

High school students at the Wind Tunnel Testing Laboratory

### We strive to co-exist harmoniously with social community.

### Coexisting with Society

As a corporate citizen, Shimizu actively contributes to society and local communities to create an abundant earth and future society to enable all people to lead happy lives, based on the philosophy expressed in our corporate credo, The Analects and the Abacus, and our corporate slogan, "Today's Work, Tomorrow's Heritage."

#### Kyobashi Hill in Tokyo Square Garden: Creating a Building Green Space and Utilizing it to Educate People About Biodiversity



MI IT Minister's Award in the 14th Roof, Walls, and Special Greening Technology Competition, certified as a SEGES 2016 Urban Oasis

Kyobashi Hill in Tokyo Square Garden, which was completed in 2013, is part of the green road network stretching from Sea Forest in Tokyo Bay toward the Imperial Palace. In addition to creating a green habitat for wildlife to restore the urban ecosystem network, this also required effective use of the green area. Shimizu held a joint study session with The Dai-ichi Life Insurance Company, Limited on biological diversity using the green areas outside of buildings such as Kyobashi Hill.

Events such as wildlife observation and hands-on experience in beekeeping were used to confirm wildlife living in the green area created around the building and to enable people to experience biodiversity and the importance of urban green spaces.



Wildlife observation event. Held with one other company as part of Ikimono (Nature) Days events planned by Japan Business Initiative for Biodiversity (JBIB).

#### Activities of Tokyo Mokkoujou Arts & Crafts Furnishings: Raising Children in a Spirit of Abundance

At Tokyo Mokkoujou Arts & Crafts Furnishings where sophisticated woodworking techniques are passed down, we hold a woodworking class to convey the allure of wood to children and other activities to educate them about trees. Our goal is to communicate the warmth of wood to the children and provide an opportunity for them to think about the trees and forests of Japan. These tree educational activities were first begun in fiscal 2007 for the families of employees, and we have since expanded the woodworking classes in various locations around Japan for children in the local communities.



A completed iten

We have also held ongoing volunteer woodworking classes for elementary school children in the town of Minamisanriku in Miyagi Prefecture, an area affected by the Great East Japan Earthquake, since the year after the earthquake. Shimizu will continue to promote educational activities about trees in the future as an activity that connects our company to the community and the people living there



odworking class held in the town of Minamisanriku



Dad's turn! Parents and schoolchildren take on the woodworking challenge

#### Activities to Pass on Information about Historical Structures

Among the structures that were built before the war, there are historical structures in various locations nationwide that have withstood earthquakes and war damage and continue to be used and cherished. Shimizu surveys buildings and engages in activities to leave a record for future generations of the value of these historical structures and the skills of the master craftsmen. We also work to preserve and restore them. We have relocated the former Shibusawa home, which was built by Kisuke Shimizu II, the second head of the company, from the town of Rokunohe in Aomori Prefecture to the company premises in Shiomi, Koto-ku in Tokyo to preserve it (construction is scheduled for completion in 2023, as of August 2019).

This building, completed in 1878, is the only surviving example of wooden architecture built by Kisuke Shimizu II and it is of extremely high historical value.

We also hold a Chuo-ku Citizens' College featuring Shimizu employees as instructors. It is a course designed to encourage lifelong learning. We also implement activities with the theme of "the history of craftsmanship in architectural construction" to convey the cultural and artistic value of historical structures to people in the community.



### Shimizu Volunteer Academy: Aiming to create an inclusive society

Shimizu Volunteer Academy was founded in 2015 to train and develop volunteers with broad knowledge of people with disabilities and Paralympic sports.

Paralympians are invited to serve as instructors. The course consists of basic lectures to educate volunteers on actual conditions in Paralympic sports and equip them with the knowledge they need, and hands-on workshops on how to guide people who are visually impaired, assist people in wheelchairs, and provide other support. We have held numerous courses for local citizens in cooperation with many universities and local governments in the form of industry-academic partnerships and government partnerships. Shimizu will continue to hold these courses in the future to create an inclusive society in which everyone can shine.



Lecture on the basics by Paralympian invited as a guest lecturer

### COEXISTING WITH SOCIETY

Former Shibusawa Residence before relocation & reconstruction (Photo provided by Naruphoto)



Hands-on training in how to assist people in wheelchairs

### Development of Shimz Smart Site®, a next-generation building construction system enabling collaboration between human and robots in performing construction

There is concern over a large decline in the number of highly skilled workers in the construction industry and the industry must secure workers for the next generation, improve productivity, and improve the work environment. Shimizu developed Shimz Smart Site® as one initiative aimed at achieving those goals. The system links autonomous robots and assistive machinery and is based on BIM and ICT.

The robots that are part of the Shimz Smart Site system receive work instructions from tablet devices via the cloud called Robo-Master. The chief characteristic of this system is that multiple autonomous robots work together to complete tasks. The system consists of an all-weather cover which provides a lightweight roof cover; Exter, the world's first horizontal telescopic crane; Robo-Carrier, a horizontal conveyor robot which transports materials; Robo-Welder, a welding robot that welds steel frames; and Robo-Buddy, a multipurpose robot that installs ceilings and floors.

Topics

Exter works inside the job site under the all-weather cover to lift steel pillars and beams and suspend them in the designated location. Robo-Welder welds pillars while working on the frame. Robo-Buddy installs ceilings and floors as the final step, beginning from the lower floors. Robo-Carrier performs the core work of carrying materials to the floor where work will be performed via horizontal and vertical conveyor systems. After Robo-Carrier has placed the materials in the temporary staging location, they are transported to the location where Robo-Buddy will perform the work.

Shimizu will roll out these robots to large-scale job sites in stages, mainly in the Greater Tokyo Area, and will actively work to develop more robots to expand the types of work applications.



Conceptual image of Shimz Smart Site® An all-weather cover is placed across the top

### Robots that make up Shimz Smart Site





RDBD-CARRIER, horizontal conveyor robot



**RDBD-WELDER**, steel frame welding robot



RDBD-BUDDY, multipurpose robot for installing interior ceilings and floors

