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IHI Construction Materials Co., Ltd

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Corporate Profile

IHI Construction Materials Co., Ltd



Producing the Future of Urban Spaces as a Leader in **Concrete Products**

In each new urban space,

1

there exists a world visible only to those who consistently push to expand the frontiers of engineering. We will continue to focus mainly on segment development to fervently support the creation of future spaces in civil engineering, architecture, and other fields, and continue to create worthwhile urban spaces that are appropriate to their eras and coexist with the environment.

much more.

Message from the President

Creating New Value for Society

IHI Construction Materials Co., Ltd. has successfully created social infrastructure that meets the needs of society by staying true to the IHI Group management philosophies of "Contribute to the development of society through technology" and "Human resources are our single most valuable asset."

In the field of segments used in shield construction work, a form of urban tunnel construction, we supply concrete segments, steel segments, composite segments, joints, and a wide variety of other products that meet a diverse array of needs by drawing upon our ample experience and outstanding technical development capacity. Thus, we continue to contribute to the establishment and improvement of roads, subways, utility conduits, water and sewerage systems, and more.

We are also expanding our expertise in civil engineering and building business with the URT method used under railways and roads, the PCL method in which lining is used to repair and reinforce tunnels, the replacement of PC slabs on aging bridges, glass fiber-reinforced cement noise barriers and landscape walls for thermal power plants, and

Needs for social infrastructure continue to diversify as the working-age population declines, infrastructure ages, and other challenges present themselves in the current business environment. The incorporation of ICT into business quickly ushers in reform, and the frontier technology of artificial intelligence (AI) is rapidly spreading. We aim to confidently respond to these changes in the business environment, contribute to the development of a sustainably growing society, and create new business endowed with the new values that our customers seek. We strive to work together as one, and appreciate your support and cooperation.

> IHI Construction Materials Co., Ltd. President and Representative Director Hirohide Hashimoto

Constant Development of Technical Capacity

Our company has always continued to create new value in social infrastructure and other fields in response to the trends of the times and our customers' needs.

Here, we trace our company's history and development of technology.



1972

1965 Composite segments



1966



1967 Precast slabs



History of Technology **Company History**

1965.8

960

Ishikawajima-Harima Heavy Industries Co., Ltd. (currently IHI Corporation) received their first order for segment products (composite segments)



1985

1985

1989

PC-ATM

Pre-Cast Arch Tunnel Method

1981.7

1985.9

1988.3

1989.7

Established Chubu Segment Co., Ltd. as

a subsidiary in charge of manufacturing

Acquired shares of the manufacturing companies

Kanto Segment Co., Ltd. and Showa Kosan Co.,

Listed in the Second Section of the Tokyo Stock Exchange

Established Ishikawajima Construction Material

distribution of civil engineering and building materials

Corporation and expanded into the field of

Ltd., and made them into subsidiaries

SSPC (Steel segments with

Precast Concrete Lining (PCL) Method

pre-filled concrete)

1973 Established the standard segment for shield work

1978 Under Railway Tunneling (URT) Method



1979 Glass fiber-reinforced concrete (GRC) noise barriers



1974.12

Ishikawajima-Harima Heavy Industries Co., Ltd. (currently IHI Corporation) establishes Ishikawajima Construction Materials Co., Ltd. (currently IHI Construction Materials, Co., Ltd.) and opens the Osaka Sales Office (currently the Osaka Branch) and the Nagoya Sales Office (currently the Nagoya Branch)

1978.4 Opened the Fukuoka Sales Office

1990

Kandagawa River Balancing Reservoir (Double O-Tube [DOT] segments)



1992 Trans-Tokyo Bay Expressway





2007

1992 Plant materials (Ducts, stairs/passageways)



1993 Honeycomb segments



2009 Tokyo Metropolitan Central Circular

2001.9

Eco-friendly concrete

1995 Push grip joints

1997 Horizontal cotter joints

1990.5 Established IT Precon Co., Ltd. and expanded into the field of exterior wall materials for buildings

1997.3 Acquired shares of Livecon Engineering Co., Ltd. and made it a subsidiary company

1998.11 Earned ISO 9001 certification

99



manufacturing 2005.3

Acquired all shares of Kanto Segment Co., Ltd. and made it a wholly owned subsidiary

2006.6 Opened the Himeji Office

2007.4 Merged subsidiaries Kanto Segment Co., Ltd. and Toho Co., Ltd.

3







Shinagawa Route (steel beam lining [SBL])

Merged subsidiaries Kanto Segment Co., Ltd. and Showa Kosan Co., Ltd.

Acquired shares of Toho Co., Ltd. as a subsidiary in charge of

2010 Yokohama Circular North Route (steel fiber-reinforced concrete [SFRC])



2014 Koto Sewer Main (IKK composite [IC] segments)



2015 Tokyo Gaikan Expressway main routes

2016 Tokyo Gaikan Expressway ramps

2012.3

Ishikawaiima Construction Materials Co., Ltd. became a wholly owned subsidiary of IHI Co., Ltd. as the result of a takeover bid, and became delisted from the Second Section of the Tokyo Stock Exchange

2012.9

Started manufacturing and supplying beams and pillars

2013.10

Opened the Sendai Sales Office

2015.4

Absorbed subsidiary Kanto Segment Co., Ltd. and changed name to IHI Construction Materials Co., Ltd.

Segment Business

We supply RC segments, steel segments, and composite segments that are used in shield tunnel construction work in subways, road tunnels, sewer lines, underground rivers, and more. We are also devoting energy to developing new segment technology.



Segment Business

Segment Business **Segment Business**

> **Civil Engineering** Business **Civil Engineering Business**

New Business New Business

New Business

In addition to our past achievements and technology, we develop state-of-the-art technology to create the new business that will sustain us into the next generation.



New Business

Building Business Building Business

6 3 4 414

Building Business

We meet the intricately individual needs of our customers by capitalizing on our wealth of knowledge and experience in the energy sector and other fields for domestic and international building business.



Civil Engineering Business

We implement proposals that require advanced civil engineering technology to shorten construction schedules when constructing multi-level intersections and grade-separated railway crossings, taking measures to extend the lives of road tunnels, bridges, and more.



Civil Engineering Business





Building Business

Segment Business

Segment Business

Female metal

Steel Beam Lining (SBL) Steel Beam Lining

fixture

We develop a diverse array of segments to respond to the needs of the times.



IKK Composite (IC) Segments IKK Composite Segment Composite steel and concrete segments with reinforcement bars Concrete filling installed inside steel shells that comprise steel sheets on five sides. Adaptable to small-, medium- and large-section tunnels. Segment thickness can be made thin. Before placing concrete Main girder Rił Male metal fixture Transverse reinforcement bar Joint plate

Longitudinal rib Circumferential

reinforcement bar





After placing concrete

Surface of a segment joint

Composite main steel material Skin plate Bundles and concrete segments. Installed on outer surfaces to Members required to connect Segment thickness can be create a completely watertight the inner and outer surfaces of structure. Also effective at the segments. The shape must made thinner even under preventing tail brush friction be easily fillable with concrete particular load conditions. nner surface of a segment Segment joint Pre-attached horizontal cotters and other one-pass joints Steel with seal grooves Installing steel with seal grooves in Main steel material the corners of the segment cross-Ring joint Members that help the concrete bear the sections creates crack- and defectcross-sectional forces of the main body One-pass joint resistant, watertight structures.

Ultra Rapid Under Pass (URUP) Method Ultra Rapid Under Pass

The latest excavation method for the construction of multi-level intersections. The prominent feature is that the tunneling shield starts and finishes excavation at the ground level, which results in the shortest of possible underpasses.



Harmonica Tunneling Method

Tunnels and structures with large, rectangular cross-sections are divided into smaller sections A small excavator is used to excavate the smaller sections in succession, and then the large, rectangular structure is built within the total excavated section. This versatile method enables work under shallow earth coverings, in curved sections, and over long distances greater than 100 m. (JICE Technological Development Excellence Award)



Honeycomb Segments

All pieces are the same shape, which is ideal for automating assembly and reducing labor. All corners are 120°, which minimizes concern over sealant leakage during assembly and creates a highly watertight structure. Bolts span the oblique sides of the segments, which enables them to flexibly absorb longitudinal distortion, making tunnels extremely earthquake resistant.

(JICE Technological Development Grand Prize)



Push Grips

Pin joints that fasten segment rings together. During assembly, pin bolts push against and expand wedges as they are inserted. The serrations on the surfaces of the pin bolts cut into the wedges to maintain proof stress against drawing tension.



Push Grip 2

Pin joints that fasten segment rings together. As non-return pins on the male side are inserted, they push against and expand pressure-bearing locking parts supported by flat springs. The joints fit together when the reactive force of the flat springs causes the locking parts to mesh with the concave parts of the non-return pins.



TS Joints Tough and Smart Joint

Pin joints that fasten segment rings together. We achieved the compact size by using 60 mm-square steel on the joint surfaces, which accommodates low clearance. The joints comprise square pipes as well as cut length plates, springs, pins, and other members that are simple to manufacture



Grout Bag Segments

Segments that can prevent ground subsidence during construction work on curved sections. After assembly, grout is injected into bag-shaped sheets embedded in the outer surfaces of the segments, which causes the sheets to expand.

High Durability (HD) Tunnel Lining High Durability Tunnel Lining

Highly-durable segments with resin panels or resin coating on the inner surfaces. The lining eliminates the layer susceptible to corrosion, and segment thickness can be made thin.



Exfoliation Prevention (EXP) Segments Exfoliation Prevention Segment

Segments designed to prevent concrete from exfoliating. Lining the inner surfaces of segments with alkali-resistant glass fiber sheets as the segments are manufactured removes the need to install textile sheets after segment assembly.



P & PC Segments

PC steel is inserted into sheaths embedded in segments and then tensioned in order to prestress the segments. This makes it possible to reduce the weight of the reinforcement bar and member thickness in segments.



Four-partition, three-hinged segments integrated with grooved inner lining. The three-hinged, statically determinate structure is highly stable, and the lower number of partitions shortens segment assembly time.



Hook Joints

Segment joints with simple structures that comprise a combination of steel materials. The metal fixtures of the joints are also easy to manufacture and attach. These joints are also compatible with thin segments. Simply slide segments in the direction of the tunnel axis to complete the fit. The joints are also compatible with SSPC and composite segments.



Hook joint fitting

Cone Connectors

Segment joints that complete a fit when male metal fixtures are inserted into female metal fixtures. The complete lack of bolts and the smoothness of the inner surfaces accelerate construction work and eliminate the need for inner lining work



Three-Dimensional Measuring Instruments

In the past, segments were measured using slide calipers or inspection fillet gauges, which required a lot of time and effort. To improve the situation, we introduced a three-dimensional measurement system that enables rapid measurement and substantially reduces labor.



Horizontal Cotter Joints



Beam Structure (BEST) Joints Beam Structure Joint

The most proven bolt connections among segment joints. The metal fixtures feature a ductile structure that integrates the anchors with the smallest crosssection that provides the required strength. The same metal fixtures can be used for both single- and double-tier bolts. Cushioning is affixed to the metal fixtures to prevent cracking.



vil Engineering Business **Civil Engineering Business**



We offer a variety of construction methods that shorten schedules, and various products that are essential for maintenance and extending the lives of structures.

Bridge Deck Slabs/Roadbed Panels

(Image of Construction)



〈 Applications 〉







Structures >

PC Slabs (HSL Slabs)



Slabs made of prestressed concrete pretensioned perpendicular to the bridge axis. This category also includes HSL slabs with reduced weight due to the use of high-strength lightweight concrete.

 HSL Slabs: Acquired Construction Technology Review and Certification (for civil engineering materials, products, technology, and road maintenance technology) No. 0313 (Public Works Research Center)

RC Slabs



Used to reduce labor by shortening construction schedules. The use of highquality, high-strength, factory products can further improve durability

Composite Slabs



Precast composite slabs used to replace the decks of steel girder bridges. Pipe dowels welded to the steel plates on the bottom surfaces of the slabs integrate the plates with the concrete poured on the top surfaces. The steel plates are the main structural members; therefore, composite slabs can be made roughly 40 mm thinner than RC slabs.

Tunnel Floor Slabs/Center Walls

In addition to floor slabs constructed inside shield tunnels, we provide a variety of precast products, from pipe supports inside utility conduits and diversions in sewers to center walls used as vertical partitions for storing rainwater.



Precast Concrete Lining (PCL) Method Precast Concrete Lining

A lining method in which precast RC slabs are used to finish, repair, or reinforce the inner surfaces of tunnels. Our proprietary machinery assembles slabs that comprise the two parts of the upper halves of tunnels, which makes the work safe and guick. This highly reputable method has been used in many road and aqueduct tunnels. ARIC Registration 314



PC Walls Precast Concrete wall

A construction method in which precast RC slabs are used to finish the inner surfaces of tunnels. Slabs are divided into multiple parts according to the construction conditions, and can be assembled using our proprietary machinery or without any machinery, which makes the work safe and guick. This method has been used to repair the inner surfaces of railway tunnels, as decorative formwork of the inner linings of aqueduct tunnel convergences, and in a variety of other situations.



Parapets

Precast RC parapets for improving the railing of bridges on local railway lines. Our use of a ribbed structure makes the panels lighter, thinner, and easier to handle on work sites. Because they are molded concrete, the parapets can be made into virtually any shape, size, and design, and can be used in all conditions.





HOP Blocks

Precast RC medians with unique anchor structures capable of withstanding collision forces at expressway speeds. HOP blocks are not only safe, but easy to work with in the construction stage and very cosmetically appealing. They can also be used for green belts, safety barriers, and parapets.



Under Railway Tunneling (URT) Method Under Railway Road Tunnelling Method

A tunneling method in which shafts are dug on each side of a railway or road, and steel elements are inserted along the edges of the required tunnel cross-section to function as the lining of a box-shaped hollow. This economical method cuts down on auxiliary work and has been used to tunnel beneath many Shinkansen lines and expressways while they are in operation.



(3) Second concrete

injection

(4) Excavation of tunnel

interior

Sandwich Slabs

(1) Completion of element

Insertion of PC steel

outline tunnelina

Steel concrete composite slabs used as the upper slabs of box culverts. Pipe dowels welded to the steel plates installed atop and below the slabs integrate the plates with the concrete. This design removes the need for the earth covering required for conventional box culverts, and the slimmer upper slabs decrease the final heights of road surfaces. The ability to reduce embankment volumes of entire roadways has substantially reduced costs. NETIS Registration Number :HK-140004-A

(2) PC steel tensioning

First concrete injection

Sidewall anchors Sandwich slab Level difference Upper surface rection plate - Concrete input pipe splice plates Sidewall Lower surface Seal rubber splice plates Sidowall High-strength bolts Sidewall anchors Pipe dowels [Characteristics of Box Culverts] Minimum earth covering: 50 cm Pavement: 8 cn FH decreases approximately 1 m . Reinforced concr andwich slat upper slab

Reinforced concrete upper slab box culvert

Sandwich slab box culvert



Closure element

Pre-Cast Arch Tunnel Method (PC-ATM) Pre-Cast Arch Tunnel Method

A method of constructing arch culverts through the on-site assembly of arc-shaped precast concrete products, two of which form a transverse tunnel section. It is used for crossing structures, open-cut tunnels, arch bridges, tunnel entrances and more, and is compatible with severe conditions such as steep slopes, high embankments, and large sections.

NETIS Plus Registration Number : AC-150007-P







RC Drainage Well Construction Method

A method of constructing drainage wells using steel shoes and RC segments. The ability to choose between the self-sinking method and the inverted lining method makes it possible to change the construction method midway through drilling, and to drill safely, reliably and rapidly down to the planned depth of the well. RC segments can withstand earth pressure better than steel segments due to their greater sectional force; thus, this method has been used quite often to drill drainage wells over 50 m deep.



Elliptical Joint Strips for Jumbo Reefs

Precast RC is assembled to make these large reefs, which are outstanding at attracting fish in addition to being highly durable and practical The jungle-oriented structure enhances the fish attraction effects, and the triangular shape provides balanced weight distribution and makes the structure extremely stable. The straightforward member structure makes these reefs easy to assemble.





(3) Construction using proprietary movable scaffolding

Elliptical Joint Strips

These elliptical joint strips are made of mortar and used in the new construction and improvement of airport parking aprons and taxiways The product is shaped by pressing it into an elliptical steel mold, which creates an exterior that is extremely smooth and conducive to sliding.



Building Business

Building Business

Through the combination of past performance and cutting-edge technology, our building business exists to construct forward-looking facilities.



Noise Barriers/Landscape Walls

Environmental equipment has become important to the areas around thermal power plants because the liberalization of electricity has resulted in the appearance of many small, private plants in addition to corporate plants. In addition to conventional GRC, which is highly reputable for its light weight and sound insulation properties, our diverse array of noise barriers using composite materials are also quite popular for reducing various types of noise, protecting equipment, and preserving the environment.





Plant Materials

We provide all services required for everything from the detailed design to the manufacturing, coating, delivery, and even overseas transport of various structures of environmental facilities for power plants, including smoke tunnels, silencers, pipe racks, floor units (blocks), conveyor bridges for connecting boilers and various tanks, stairs, and corridors.



International Business

We are searching for new end users in Southeast Asia and the rest of the world. Our business related to the construction of energy plant infrastructure comprises offshore elements (design, management, guidance, and contracts) and onshore elements (manufacturing, inspections, maintenance inspections, and the like in the country of delivery).



New Business

New Business

We use various technologies that have contributed to social infrastructure for over 50 years and the technology of the IHI Group in various fields to promote further technological development. We intend to contribute to society with new business that will sustain us into the next generation and satisfy the needs of society.

Research and Test Center

The Research and Testing Center functions as our research and development department. Since its inception in 1976, the Research and Testing Center has constantly dealt with the latest themes and produced numerous achievements. We will continue to meet the challenge to develop better products while responding to the needs of the times.



Heavyweight Concrete

Using high-unit-weight concrete with a density 3.8 or higher as a radiation shield makes it possible to effectively use limited space and deliver the same effects as ordinary concrete even when wall thickness is reduced. Heavyweight concrete can serve as a radiation shield at nuclear power facilities, medical care facilities, research facilities, and more.



Eco-Friendly Concrete

Amid growing awareness of CO₂ emissions, we have successfully developed ecofriendly concrete. This concrete proactively uses industrial waste with a special admixture, which reduces the cement usage volume to an extent possible to substantially reduce CO emissions.





Neutron-Shielding Concrete

Adding colemanite creates neutron-shielding concrete that can block neutron beams. This concrete can fulfill the vital role of a shield protecting human bodies from various radiation used at nuclear power facilities and facilities that conduct research on advanced medical care, matter, and life.



Radioactive Waste Storage Containers

The steel and concrete composite structure with steel plates on the inner surfaces and the double-barrier structure create a highly watertight, durable structure that prevents the leakage of radioactive materials. Our containers store waste safely and securely for long periods of time, and can be moved. We offer large-capacity box-type containers as well as drum-type containers for easier handling.



High-Rise Building PC

Our precast concrete products are fully imbued with the production history of various high-strength concrete with compressive strength greater than 150 N, and meet the stringent construction speed and quality demands of skyscrapers and other highly advanced buildings.





13,500m^{*}

Plant/ 2537-16, Nakanoshima, Inadomi, Ono, Ibi District, Gifu Prefecture 501-0501

129,300m²

(Shared by Ibaraki Dai-ichi Plant / Ibaraki Dai-ni Plant)

129,300m²

(Shared by Ibaraki Dai-ichi Plant / Ibaraki Dai-ni Plant)

Head Office, Branch, Sales Office, Plant

Group companies

Subcontractors



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