

Feature

Resolving Expo challenges creates the future

Daiwa House Group was involved in the design and construction of some 20% of the total site area of Expo 2025 Osaka, Kansai, Japan (the Expo).

The keynote concept of the Expo, People's Living Lab, called for it to be a laboratory for future society. As such it provided us with assorted challenges.

Here we describe challenges we took on from three approaches: the environment, technology, and human capital.

Future applications

Approach

Our strengths

New challenges for the Expo

Environment

- Consequential pursuit of the 3Rs (reuse, reduce, recycle)
- Maintain a high recycling rate

- Circular design to reduce waste and facilitate reuse
- Building the *Myaku-Ichi!* Platform

- Circularity as the norm

» P004

Technology

- Implement digital transformation technology
- Ensure stable, high-grade construction capabilities

- Use BIM to realize complicated architectural forms
- Consolidate multiple ideas and skillsets into cohesive, executable construction plans

- Tech savvy accommodates diverse architectural forms

» P006

Human capital

- Well-designed internal programs (Daiwa House Industry) (FA, in-house job offer system, Multi-Experiential Career Support Program, etc.)
- The Daiwa Future 100 in-house initiative to encourage entrepreneurship

- Challenging unknown areas
- Challenging previously untried construction techniques and procedures

- A challenge-positive organizational culture

» P008



Environment

Circularity as the norm ①

The Daiwa House Group has long been working to shrink its construction-waste footprint and increase its recycling. With our involvement in the Jellyfish Pavilion, we challenged ourselves to take that engagement to the next level: We went all-in for circularity.

Did you know that post-demolition, the Jellyfish Pavilion can be reused?



The Jellyfish Pavilion ➤ EXPO2025 Playground of Life: Jellyfish Pavilion, Osaka-Kansai Expo

What a waste after just 6 months! Two approaches for saving the Jellyfish Pavilion from the trash heap

People involved in the Jellyfish Pavilion began exploring ways to realize circularity back in 2022.

Approach 1 Relocate to extend useful life
Relocate the building elsewhere

Approach 2 Reuse components
Employ components predicated on their reuse

Points

- Explored how to facilitate reuse of structural members, wood, tile, and other materials—40 items in all
- Opted for disassembly-friendly joining using rope, bolts, and other like fasteners
- Divided components finely to facilitate disassembly, transport, and reassembly
- Numbered components with reassembly in mind
- Developed a platform for connecting with the next user



It was designed to be relocatable, but . . .

The Group was involved in building the Jellyfish Pavilion. It became a public asset when handed over to the Expo Association on completion. But trading public assets is normally not allowed; so we started early on to work out a post-Expo reutilization scheme that enables the association to sell the pavilion's components.

Jellyfish Pavilion components chock-full of innovations for dis- and re-assembly



Wooden inside-roof members rope-secured to facilitate reuse



Components part and assembly-sequence numbered with indelible paint to enable easy reassembly



Bolted joints used to facilitate dis- and re-assembly



Plans foresee relocating the roof to Fukuyama, Hiroshima
➤ First Meeting of the Children's Future Center Preparatory Committee (tentative name) (Japanese text only)



Environment

Circularity as the norm ②

Jellyfish Pavilion was designed and built to be reused. To ensure that it would not simply be torn down and scrapped, people involved realized that something—a platform covering the whole Expo—was needed that would allow people or organizations that wanted to, to take over Expo assets after it closed. A consortium including the Expo Association was formed to put together a project plan. It bore fruit as the *Myaku-Ichi!*

MYAKU-ICHI!

EXPO CIRCULAR MARKET



* *Myaku-Ichi!* is an auction platform designed to enable post-Expo relocation and reuse of Expo assets—buildings, building materials, fixtures, and more

Some 760,000 t of construction waste forecast!*

Myaku-Ichi! facilitates reuse, reduces waste

* Initial Expo Association estimates

The consortium addressed three challenges to build a framework for resource circularity. The initiative came to embody the Expo's People's Living Lab theme, mobilizing the media and addressing legal and institutional deficiencies.

Challenge 1 Finding collaborators

One entity contacting another gets the ball rolling

Steps taken

- Collaboration with the Expo Association
- Formed a three-year consortium of 14 companies
- Thoroughly explored schemes for lively dealmaking
- Raised awareness by involving the media

Challenge 2 Supply-demand matching

Putting parties with something to sell in touch with parties looking to buy it

Steps taken

- Built a web-based auction platform
- Explored operational approaches
- Motivated participation with a diverse product lineup



Challenge 3 Erecting an institutional framework

Resolving deficiencies in existing legal, regulatory, and other frameworks

Steps taken

- Negotiated with multiple national regulators
- Achieved reuse-conducive changes to the legal and regulatory framework
- Achieved resolution of building-code issues

➤ Sustainability Action Plan of EXPO 2025 Osaka, Kansai, Japan (1st Edition) (draft) (Japanese text only)

➤ Sustainable Journey (Japanese text only)

* The consortium addressed challenges 1–3

MYAKU-ICHI! achievements

Driving reuse forward, the *Myaku-Ichi!* initiative contributed to resource circulation. It matched a massive supply of used Expo items—live plants, building materials, furnishings and fixtures, the Grand Ring, even whole pavilions—with demand from eager buyers.

Salient items that found reuse

- Plants **460 trees, 600 bushes**
- Materials and furnishings **Sold: Benches: 98.6%, Sanitary fixtures: 100%**
- The Grand Ring **Wood: 3,300 m³ (overall: 27,000 m³)**
- The initiative also handled transfer of miscellaneous furnishings, fixtures, and equipment as well as the relocation of signature pavilions.

Waste reduction

➔ **5,940 t**

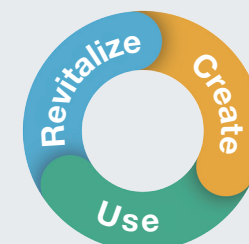
Bringing new possibilities to institutional frameworks

Rules governing reuse in newbuilds of JAS-conforming glued laminated lumber were non-existent. After talks, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) began permitting their conditional reuse.

Achieved circularities to continue beyond the Expo

The Daiwa House Group is committed to realizing a circular economy ("circularity") by creating a lifestyle-culture of valuing resources in line with the idea that used resources are still resources.

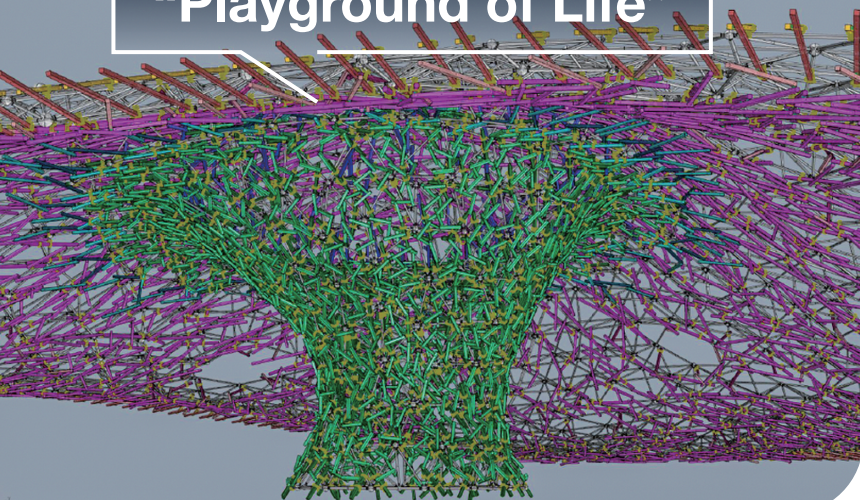
➤ Circular Economy



Technology

Tech savvy accommodates diverse
architectural forms..... ①

A strong shared commitment to creating something great among all involved in the Jellyfish Pavilion enabled them to construct a complicated, architecturally challenging building. They approached every hurdle positively, referred back to the keynote concepts when in doubt, and worked out optimal solutions through dialogue.

No “play” in the
exactness of the
“Playground of Life”

BIM rendering of the Jellyfish Pavilion interior

➤ “Feature: Playground of Life: Jellyfish Pavilion, Osaka-Kansai Expo,” *DX Annual Report 2024*, Daiwa House Industry (Japanese text only)

The condition for pulling off the “jellyfish” roof: 0 deviation!

From the early design stages, we brought in experts from partners in temporary and membrane roofs, lumber preparation, and other specialisms to augment our own construction and engineering units. Employing a process to preemptively identify challenges called frontloading, they uncovered several issues, one nearly insurmountable: precision of execution that precluded any deviation from spec. Team members’ solid mutual trust allowed them to exchange frank opinions on how to pull the Jellyfish Pavilion off, and pull it off they did!

Design Frontloading

Putting heads together to preempt issues

Points

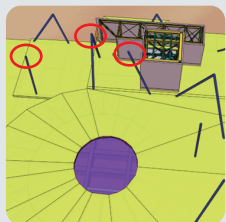
- Judgement call: Building the membrane key to achieving a fascinating Jellyfish motif
- 3,000 hours of exploratory deliberations between collaboration partners on some 20 topics
- Lightness to counter uneven ground settling
- Collaborators put their heads together to work out safe construction techniques for achieving the forms the blueprints envisioned

Execution Precise datum-point
management for adjustability

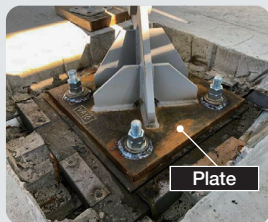
Ideas for keeping roof coordinates (datum points) exactly on spec

Points

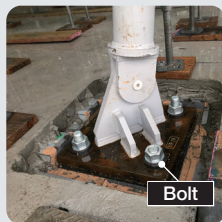
- Keeping execution deviation at 0 enabled membrane-roof installation
- Three roof supports’ top coordinates were set as datums on which precise measurements were made
- Plates can be inserted under roof-support footings to allow adjusting their height to deal with uneven ground settlement
- After talks with Design, bolt hole diameters were widened to allow for horizontal adjustment of the roof supports

Precision innovations for achieving
0-deviation exactitude

The three roof-support tops used as datum points



Uneven ground settlement-countering plates inserted under footings to adjust roof-support height



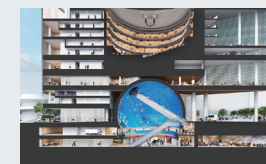
Diameter of bolt holes widened to allow horizontal adjustments



Assembly done while referencing over 1,000 drawings to allow for gravitational forces not in the drawings

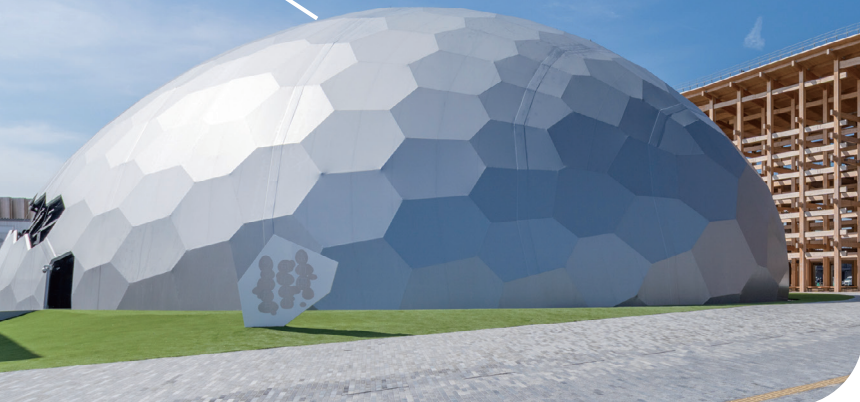
>>Our next
challengeErecting a new Osaka
landmark

In 2024 Daiwa House Group launched the Osaka Marubiru Redevelopment Project (tentative name) to erect a high-rise where the Expo’s bus terminal was. Standing on the site of the old Osaka Marubiru, the new high-rise will house a hotel, music hall, and other public facilities.



➤ Osaka Marubiru Redevelopment Project (tentative name) launched (Japanese text only)

Technology

Tech savvy accommodates diverse
architectural forms..... ②What technology
does this round
pavilion embody?

Electric Power Pavilion: Eggs of Possibilities

The technology for achieving the pavilion's shape

The Electric Power Pavilion's design concept was a half-buried egg—to create a huge indoor space within a tilted structure enclosed in a metallic-looking membrane. Achieving that feat required drawing on some very sophisticated technological capabilities.

Design Design thought out to the
finest detail

Design tech delivers gracefully complicated forms

Points

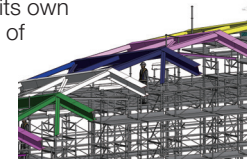
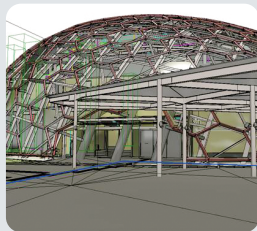
- Built a steel frame of contiguously tilted arches
- Developed substrate making the membrane look like a series of hexagonal steel plates
- Analyzed loads on the temporary supports holding up the arched steel frame before it was able to stand on its own
- Achieved visually pleasing structural beauty for visitors to the exhibition space

Execution Improvisations for precise work
execution

Flexibly adapted work to achieve unprecedented forms

Points

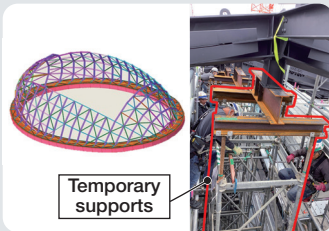
- Proposed work methods for assembling the arched steel frame before it could stand on its own
- Worked out optimal placement of temporary tilted steel-frame supports
- Details of complicated work procedures shared and checked using 3D renderings

Drawing on skilled construction expertise and digital tech
achieves egg shape

Digital solutions generated renderings too complicated for humans to draft



Workers confirm frame angles and work procedures as the test ways to achieve neat and clean attachment of the membrane



Temporary supports

Fifty-four temporary supports held the ceiling up during its assembly. They were removed once the ceiling was finished and the structure could stand on its own



We also pursued structural beauty in visible parts of the exhibition space

>> Our next challenge

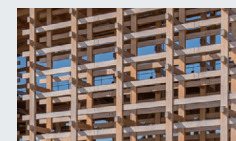
Future with Wood

Daiwa House Industry works hard to help achieve decarbonization and forest-resource circularity. An example is our extending to our use of wood framing and finishing materials, which provide physically and psychologically restorative spaces, to business, multi-family housing, and other larger buildings. In that vein, we will be reusing wood from the Expo's Grand Ring to erect post-disaster public housing in Ishikawa Prefecture.

➤ Future with Wood (Greater use of wood in construction) (Japanese text only)



Test wooden post-disaster public housing (Suzu, Ishikawa Prefecture)



Posts and beams of the Grand Ring

*1 BIM is a digital platform for creating building data-based 3D models. The technique draws on data amassed over buildings' full life cycle.

*2 The process of making full-scale models of building details to check quality and form a mental image of how they will look and work.

Human capital

A challenge-positive organizational culture

Challengers, assemble!



The Expo Promotion Office staff

Daiwa House Group was involved in construction for the Tokyo 2020 Olympic and Paralympic Games and the Osaka-Kansai Expo. Employees who saw this as an opportunity for personal growth and boldly took on the challenges, were exposed to diverse values in-house and out, helping them form new perspectives and a willingness to take initiative.

Transcending boundaries to tackle challenges

Employees of diverse backgrounds worked together to overcome architectural challenges presented by the Expo. Transcending differences in past experience and of age and gender, they birthed pavilions and other structures with wisdom and ingenuity. A sampling follows.

	Jellyfish Pavilion	Electric Power Pavilion	BLUE OCEAN DOME	EV bus stop
Team members' professional experience				
	Design skills • Apartments • Drug stores • Training centers Site skills • Training centers • Factories	Design skills • Exhibition spaces • Offices Site skills • Exercise spaces and gyms • Two-story steel-frame apartment buildings	Site skills • Reinforced concrete rental condominiums • Heavy-gauge steel-framed residential housing * Contracted with only construction of BLUE OCEAN DOME	Design skills • Mixed-use commercial properties • Banks Site skills • Single-family houses • Dormitories, warehouses

Expo experience



Kozue Saito
Chief engineer
Structural Design
Department
Tokyo Head Branch
Role: Structural
Design, Electric
Power Pavilion

I felt that the opportunity to be involved in designing an Expo pavilion was a once-in-a-lifetime opportunity, so I participated. As a structural designer, I pursued structural beauty with the mission of protecting human lives, buildings, and the assets within them. The time spent challenging myself with my colleagues was enjoyable and still motivates me.



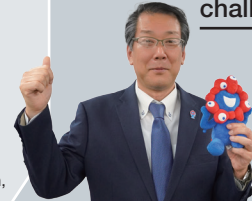
Sadaharu Morita
Chief
Architectural
Construction
Department
Head Branch
Role: Site foreman,
Electric Power
Pavilion

I participated in the Expo project because I wanted to take on challenging architecture. Through the Expo, we gained experience in digital implementation. I am now working on larger-scale projects than previously, and I feel that my experience in the Expo has helped me improve my skills.



Kazunori Watanabe
Architectural
Construction
Department
Osaka Branch
Fujita Corporation
Role: Site foreman,
Jellyfish Pavilion

I worked on the Jellyfish Pavilion, and everyone was highly motivated. We could discuss anything; we put forward and embraced various ideas. In the end, the pavilion embodied our passionate commitment to excellence. Going forward I want to maintain the positive attitude toward work I experienced there.



Hiroaki Ogawa
General
Construction
Division
Head Branch
Role: Manager,
Expo Promotion
Office

Faced with constructing a building unlike any we had undertaken before, there were many times when opinions clashed. But a strong solidarity evolved as team members learned to value listening to each other attentively in the knowledge that each of us was highly motivated. I think that this experience boosted everyone's confidence in themselves.

Backing up employees who take up challenges

Onward! To the next set of challenges!

The company offers numerous programs to support challenge-seeking employees

- "Free Agent" (FA) program, in-house job offer system  P082
- Multi-Experiential Career Support Program  P085
- Daiwa Future 100  P087

