

# Arup in Japan

A glimpse into Arup's global expertise in Japan



ARUP

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**On the cover**  
Mt Fuji World Heritage Centre, Shizoka  
**On this page (the tallest building):**  
CITIC Tower, Beijing









# We shape a better world

Arup is [the creative force at the heart of many of the world's most prominent projects](#) in the built environment and across industry.

We offer a broad range of professional services that combine to make a real difference to our clients and the communities in which we work.

We are truly global. From 88 offices in 33 countries, our 14,000 planners, designers, engineers and consultants deliver innovative projects across the world with creativity and passion.

Founded in 1946 with an enduring set of values, our unique trust ownership fosters a distinctive culture and an intellectual independence that encourages collaborative working.

This is reflected in everything we do, allowing us to develop meaningful ideas, help shape agendas and deliver results that frequently surpass the expectations of our clients.

The people at Arup are driven to find a better way and to deliver better solutions for our clients.

We shape a better world.





## Japan experience

We bring together staff with diverse backgrounds and experiences to work with clients on projects in Japan and overseas.

With a local office in Tokyo, Arup has been working in Japan for 30 years. We have successfully completed a number of high profile projects, and cemented a reputation for creative design, technical excellence and strategic management.

Kansai International Airport, opened in 1994, is our first monumental project locally. Since then, we have worked on a lot of iconic projects across the country. Our portfolio ranges from cultural facilities such as Mt Fuji World Heritage Centre, Shizuoka to landmark buildings like HIROSHIMA ORIZURU TOWER.

The Tokyo office is also active across Asia including China, Taiwan, Vietnam, Malaysia, India and the Middle East.

We understand the challenges facing our clients in an era of change, and we are always driven to find better solutions to meet clients' needs and exceed their expectations.

# Shaping the connected world

We realise our clients' ambitions, combining advanced technology to redefine the possibilities across the built environment.

## *Shaping, the future, present and past*

Arup made its name in the twentieth century as the designer and engineer behind some of the world's most ambitious structures. That creative strength and independence of mind continues to guide us as digital leaders in today's built environment.

## *Business transformation*

## *Perspectives*

Our experts consider how advanced technologies will continue to transform the way we live and work.



*At the forefront of change*

Our digital leadership is founded on more than 70 years of harnessing new technologies to solve our clients' biggest challenges. From advancing early computer design to redefining our relationship with spaces, we push boundaries to improve lives. By uniting design, engineering and technology under a single philosophy we call 'Total Design', we transform and shape the connected world.

*Human-centred design*

*Analytics and insights*

*Digital strategy*

*Shaping the connected world*

As digital leaders, we partner with our clients to transform how people engage with the built environment through technology. From masterplanning cities, to creating a renewable future, we bring seemingly impossible ideas to life.

### *Global experience, local presence*

As a global consultant, Arup has a proven track record in delivering quality projects around the world. Meanwhile, we have a strong local multi-disciplinary presence with extensive relevant experience. We seamlessly combine local insight with global expertise to provide the best teams, solutions and outcomes for our clients.

### *Independent*

Arup is owned in trust for our people and run for our people and clients. With no shareholders or external investors, we can offer independent advice for our clients. We provide clear recommendations that help our clients make the right decision and take the right direction.

### *Multi-disciplinary*

We can carry out the 'Total Design' concept introduced by our founder Sir Ove Arup – involving all professional design and engineering disciplines in the design process, in which all design aspects are considered thoroughly and integrated into a whole.





## A network of global experts

Arup brings together professionals from diverse disciplines and with complementary skills, on a uniquely global scale, to provide integrated solutions that fit local needs.

### *Expertise*

Arup is an independent firm of designers, planners, engineers, consultants and technical specialists, working across every aspect of today's built environment. The depth of expertise and the sheer number of specialists allow us to take on complex, strategic projects that no other firm could have delivered.



# Total design

## Buildings

- Accessible environments
- Architecture
- Building design
- Building information modelling
- Building physics
- Building retrofit
- Building services engineering
- Commissioning and building performance evaluation
- Electrical engineering
- Façade engineering
- Facilities management
- Fire
- Mechanical engineering
- Public health engineering
- Structural engineering
- Sustainable building design
- Vertical transportation design

## Planning

- Economic planning
- Environmental consulting
- Flood risk management
- International development
- Landscape architecture
- Master planning
- Planning policy advice
- Resilience security and risk
- Smart cities
- Smart mobility
- Town planning

## Infrastructure

- Airport planning
- Bridge engineering
- Civil engineering
- Infrastructure design
- Maritime engineering
- Rail engineering
- Sustainable infrastructure
- Tunnel design
- Waste management strategies
- Waste to energy solutions
- Water engineering

## Advisory services

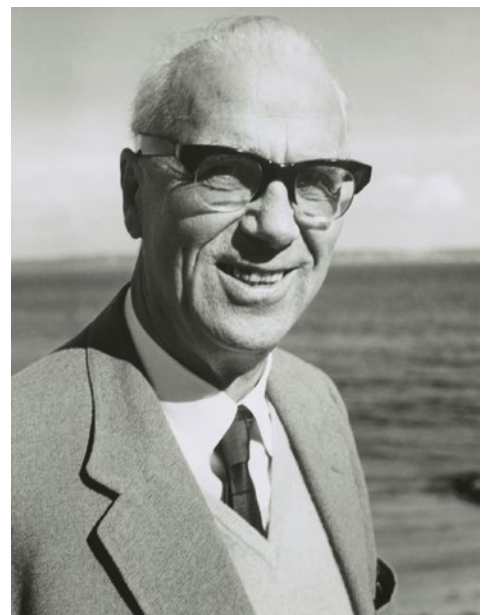
- Business and investor advisory
- Carbon management
- Data insight and analytics
- Digital
- Foresight
- Intelligent transport solutions
- Operational readiness activation and transition
- Operations consulting
- Organisational behaviour
- Programme and project management
- Research
- Sustainability consulting
- Transport consulting
- Visualisation

## Technical consulting

- Acoustic consulting
- Advanced technology and research
- Audio visual and multimedia
- Fluid dynamics
- Geographic information systems
- Geotechnics
- Hydrogeology
- ICT infrastructure design
- Lighting design
- Materials
- Product design
- Quantity surveying
- Seismic design
- Software products
- Technology operations and project management
- Theatre consulting
- Vibration engineering
- Wind engineering

Arup has an honest and open proactive culture, working to achieve the best total solution for our clients. Our range of skills and capabilities frequently go beyond the direct needs of an individual project but benefit all through the understanding and abilities they provide.

Sir Ove Arup was an engineer and a philosopher, the founder of Arup and the source of our firm's values. He believed wholeheartedly in total design and advocated the social usefulness of engineers. His lasting legacy is the positive impact Arup makes on the built environment and for us, this means to shape a better world.



## Building design

Arup unites a global network of inventive and highly skilled building engineers and design specialists. Together, we are best known for helping to shape ambitious buildings.

What defines a building's performance will depend on its purpose. Listening to the things that make an asset valuable to our clients, and to their buildings' users, gives direction to our designs. Behind the better performance of our building designs, lies Arup's sophisticated approach to building information modelling (BIM), building physics and fluid dynamics.

With world-class expertise – creative and technical – we help to realise buildings that are better because they are more useful and attractive to the people who own and inhabit them, more sympathetic to their context and more commercially sustainable.

### Image

Shogin Tact Tsuruoka (Tsuruoka City Cultural Hall), Yamagata





©MOUNT FUJI ARCHITECTS STUDIO

## Structural engineering

Arup has more than 70 years of experience in delivering the most challenging and iconic building structures worldwide. Our structural engineers optimise and combine loads (gravity, wind, seismic), materials and geometry to produce elegant, cost effective and buildable solutions that satisfy our client's needs and exceed their expectations.

Arup has advanced the use of 3D building modelling to design and test structural solutions virtually. This helps engineers, architects and clients see how all components of a design work together. Seeing that, we can optimise structural efficiency and also overlay the critical factors of cost and time to understand the implications of choices for project viability and sustainability.

To stay connected to today's evolving challenges, our structural engineers work closely with clients and collaborators and stay up to date with industry issues so that they can innovate in response to real-world challenges and constraints.



## MEP engineering

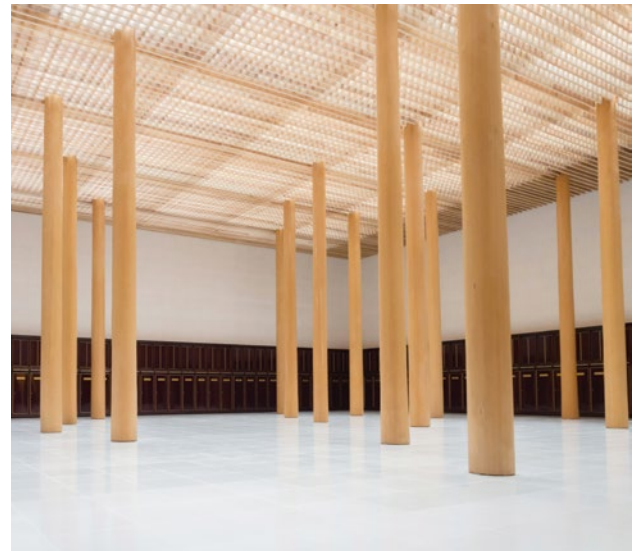
We have delivered comprehensive and integrated design of mechanical, electrical, and plumbing system (MEP) for various types of projects including commercial, governmental, and industrial buildings both in Japan and overseas. We are also leading in advanced environmental analysis and sustainability consulting that can materialise truly sustainable buildings and a low-carbon economy.

By leveraging our unique set of skills, international experience and knowledge, and deep understanding of the local market, we offer neat and innovative solutions, matching needs of our clients with good communication and passion for excellence.

## Sustainable buildings design

To make buildings sustainable, we design for better performance from every angle, creating buildings that are efficient with resources, affordable to build and operate, delightful to inhabit and appropriate to their context. Our global network and variety of inhouse specialists can add value to our client's sustainable vision.

We will provide a holistic service including an innovative solution using cutting-edge technology, a master planning or concept making for a sustainable development, and a support of getting the certification of LEED, WELL, and the like.



**Top**  
Konan Ward Government Office, Kanagawa  
**Bottom**  
Myoenji Columbarium, Fukuoka

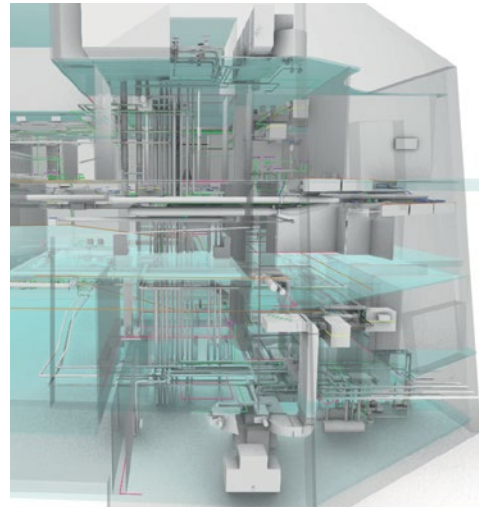


## Building information modelling (BIM)

Building information modelling (BIM), is transforming the way that we design cities, buildings and systems to perform throughout their entire life cycle.

We build on Arup's long history of integrated working to shape BIM as a positive collaborative method. At its best, this method allows information to flow freely – between architects, engineers, technical specialists, owners and operators – to promote productive, open working relationships.

Using modelling for more joined-up working is helping our teams worldwide to reduce design conflicts, to produce more efficient designs and to fast-track schedules, to optimise layouts, even in tight spaces and to align efforts to achieve greater energy-efficiency.



## Façade engineering

A building's skin can define its value, performance and architectural expression. Façades and building envelopes – which form the outer skins of buildings – are not only expressing the project image and creative intent but also influencing significantly the building's embodied energy and operational energy consumption. A thoughtfully designed skin can make a new building work more effectively for its owners, occupants and environment.

Arup's approach is based on ingenuity: everything we do, from concept design to implementation and renovation, is designed and underpinned by technical rigour such as advanced 3D modelling technology and energy, thermal or daylighting simulations. Arup works with building owners and architects to develop façades that encourage productive building occupants by providing comfortable internal environments. We also collaborate with contractors and manufacturers to develop new façade technologies and products.

**Top**  
New Matsubara City Library, Osaka

**Bottom**  
Generali Tower, Milan

## NICCA Innovation Centre, Fukui



The laboratory is located in a region of heavy snowfall with short sunshine duration all year round. As the climate of the site is not always pleasant, our structural and MEP solutions were designed to make the best use of daylight, prevailing wind and groundwater to create a comfortable space by blending nature and technology. At the centre of the building are spacious atriums together with huge quakeproof RC walls. The skylight is designed to maximise daylight from the north and it faces the direction of the prevailing wind to drive the natural ventilation throughout the building. Abundant groundwater is used for radiant air-conditioning to cool the rooms. After using, the water is returned to the earth through a reductive well.

**Project owner:**  
Nicca Chemical Co., Ltd.

**Architect / client:**  
Tetsuo Kobori Architects

**Arup services:**  
Structural engineering  
MEP engineering  
Environmental consulting

## Art Museum & Library, Ota, Gunma



This museum and library project is designed to revitalise the historical city of Ota.

Arup proposed a cost-effective three-dimensional building and simplified construction of the structural slope with a simple RC core and steel beam / composite deck. We also realised the clear glass façade, a key feature of the building that opens to allow for views, natural ventilation and daylighting. We conducted a series of studies on heat load verification to ensure occupant comfort while retaining the design intent of glass façades.

**Project owner:**  
Ota City

**Architect / client:**  
Akihisa Hirata Architecture Office

**Arup services:**  
Structural engineering  
MEP engineering

## Kyoto University of Foreign Studies – Building 4, Kyoto



Located at the centre of the campus, the 4<sup>th</sup> wing has been rebuilt to act as a hub that connects and welcomes all to explore interdisciplinary collaborative work.

We proposed a simple and elegant structure system to free up space at ground level – a triple core + pin column structure with a floating up foundation. In collaboration with the architect, we realised the characteristic glass curtain wall that provides total visibility and openness to the academic building. Our lighting design highlights the cores with exposed structures to illuminate the feature structural system.

**Project owner:**  
Kyoto University of Foreign Studies

**Architect / client:**  
CAI

**Arup services:**  
Structural engineering  
MEP engineering  
Façade engineering  
Lighting engineering

## Mitaka Data Centre EAST, Tokyo



The state-of-the-art data centre for NTT Group is a 4-storey building with a base-isolation system, constructed in two phases.

Working closely with the client, Arup helped realise an efficient free cooling system for servers. The outside air cooled by the seismic isolation pit is taken from the ‘cold patio’ located between the server buildings into the air conditioner inside the building; and then the hot air is exhausted from the chimney-shaped outer wall ‘hot patio’. The façade shape is designed considering the airflow accumulation from lower floors. With significant energy savings, the building has achieved LEED-Gold certification.

**Project owner:**  
NTT DATA Corporation

**Architect / client:**  
NTT FACILITIES, INC.

**Arup services:**  
Structural engineering  
MEP engineering  
Façade consulting  
Project management  
Security consulting  
LEED consulting/commissioning

## Shibata City Hall, Niigata



The new Shibata City Hall acts as a catalyst to revitalise the downtown area of the historic city in Niigata Prefecture. The 7-storey building features a triple-height open space for various events at the lower part which is switchable as an internal or external area by controlling the large sheet shutters.

To realise a voluminous space with a large opening, isolation devices were installed in the mid-storey, and a suspension bridge principle was adopted for the upper floors. A cogeneration system was adopted as the air conditioning heat source and the waste heat from the generator is used to power absorption chillers and pre-heat domestic water. The building also boasts numerous passive features to maximise daylighting and natural ventilation, providing a sustainable and comfortable environment.

### Project owner:

Shibata City

### Architect / client:

aat+makoto yokomizo architects, Inc.

### Arup services:

Structural engineering  
MEP engineering  
Façade engineering

## Mt Fuji World Heritage Centre, Shizuoka



The Mount Fuji World Heritage Centre is the latest landmark project delivered by Pritzker Prize winner Shigeru Ban Architects in collaboration with Arup to celebrate Mt Fuji's recently attained status as a UNESCO World Heritage site. The building's dynamic funnel-shaped latticed structure and its reflection onto the water feature pay homage to the symbolic shape of the mountain.

Our early stage research found that the abundant spring water that cascades down the mountain maintains a temperature of 15°C all year around. By effectively utilising its temperature potential in the building's heating and cooling systems we managed to reduce energy consumption by 20% – an elegant engineering solution for an equally elegant structure.

### Project owner:

Shizuoka Prefecture

### Architect / client:

Shigeru Ban Architects

### Arup services:

Structural engineering  
MEP engineering

## Shenzhen Victoria and Albert Museum, Shenzhen



Situated at the heart of Shekou peninsula of Shenzhen, China, this V&A museum, known as Design Society, comprises a museum space, four art galleries, multi-functional theatres and other cultural-commercial spaces with a total GFA of 71,000m<sup>2</sup>.

Arup's global involvement in this project started with the Tokyo office, working closely with celebrated architect Fumihiko Maki on the building's structural schematic and façade design. The Shenzhen and Hong Kong teams provided building physics and security design for the museum as well as galleries. We also drew expertise and support from the London office to help the client tackle the complex challenges and ensure the design met specific indoor environmental requirements for art conservation.

**Project owner / client:**  
China Merchants Group

**Architect:**  
Maki and Associates

**Arup services:**  
Structural engineering  
Façade engineering  
Security  
Building physics  
Lighting design

## Shibuya Stream, Tokyo



The 180m tall Shibuya Stream building is part of the redevelopment project around Shibuya station. The building features random-look white panels which provide a unique visual expression, setting it apart from surrounding structures. The outside air taken from vertical slit holes on the side panels are used for night purge ventilation in the ceiling space and air intake for facility equipment.

Arup optimised the quantity, arrangement and size of the panels considering façade details and environmental simulation results. We also designed the supporting frame structure for some other facilities adjacent to this high-rise building including the 'urban core' building, the façade of Shibuya Stream Hall and an arched glass roof over the footbridge. We delivered an efficient design with integrated façade and structural engineering.

**Project owner:**  
TOKYU CORPORATION

**Architect / client:**  
Tokyu Architects & Engineering INC

**Arup services:**  
Façade engineering  
Structural engineering (Urban core, Roof of connection bridge)

## Technical consulting

Arup has developed an unparalleled range of specialist technical services to help meet business objectives and to support corporate responsibility and sustainability agendas.

Our teams include leading thinkers in acoustics, advanced technology and research, audio visual technology, fire engineering, IT and communications, lighting design, material science, product design, seismic design, vibration and theatre consulting.

These specialist technical services can not only bring a tight focus to niche problems, but also pool expertise in new ways to develop highly original, improved responses to complex multifaceted situations, delivering unparalleled consultancy packages for our clients in Japan and surrounding countries.

### Image

Shanghai Lujiazui Harbour City Exhibition Centre, Shanghai



©Kingsley Architectural Photography



©Hutton-Crew



©Koji Fuji / Nacasa &amp; Partners, Inc.

## Lighting design

In skilled hands, lighting enhances, sculpts and inspires. We understand the interplay of structural form and lighting, and work with architects and artists to provide original conceptual designs. Our technical knowledge ensures that concepts become viable solutions. We also know how lighting affects people at work, at home, at school and at play from day to night – not just inside but for outside spaces too. This equips us to shape solutions that are as positive for people as they are sustainable for the environment and for businesses.

Arup helps clients think about lighting strategically – whether their goal is to use the visual and emotional impact of light to strengthen brand experiences or to lower carbon emissions and save on energy bills. Our truly global team of designers create expressive, sustainable and award-winning concepts in light.

**Left**  
The Broad, Los Angeles  
**Right**  
Ribbon Chapel, Hiroshima

## Seismic design

Arup has become a global leader in seismic engineering through the innovative approach we have adopted in our design projects and in promoting the societal benefits of improved resilience.

Our engineers are especially fluent in cutting-edge seismic engineering technologies such as base-isolated structures and seismic dampers. We have delivered some of the most challenging projects from concept to completion in Japan, a country prone to natural disasters.

## V&A Dundee, Dundee, UK



V&A Dundee, designed by Japanese architects Kengo Kuma & Associates, features a unique and complex structure with twisting, folding exterior walls. Arup brought to the project unique solutions based on its broad experience gained from museums and art galleries across the world and in particular from the V&A in London.

Our lighting consultants provided design for internal, façade and external areas including the galleries, foyer spaces and the Scottish Design Galleries. The integration of daylight creates an open and naturally lit environment without compromising sensitive exhibits and careful use of lighting controls achieves significant energy saving.

### Project owner / client:

Dundee City Council

### Architect:

Kengo Kuma & Associates

### Arup service:

Structural engineering  
MEP engineering  
Facade engineering  
Lighting design  
Fire  
Maritime engineering

## Aga Khan Centre, London



The Aga Khan Centre is a new home for the Aga Khan Foundation, the Aga Khan University and the Institute of Islamic Studies. Influenced by Islamic architecture and materials, the building is arranged around a 9-storey atrium that brings light deep into the building.

The electric lighting was designed to create continuity throughout the building. The linear lighting elements provide a visual unity and connectedness from the inside to the outside, enhancing the glowing effect of the building after dark. The design also incorporates six outdoor spaces of varying sizes and styles, where lighting is integrated to celebrate each distinct character for all users to explore and relax.

### Project owner / client:

Aga Khan Foundation

### Architect:

Maki and Associates  
Allies and Morrison

### Arup service:

MEP engineering  
Facade engineering  
Lighting design  
Acoustics design  
Sustainability consulting and BREEAM assessor  
Commissioning supervision

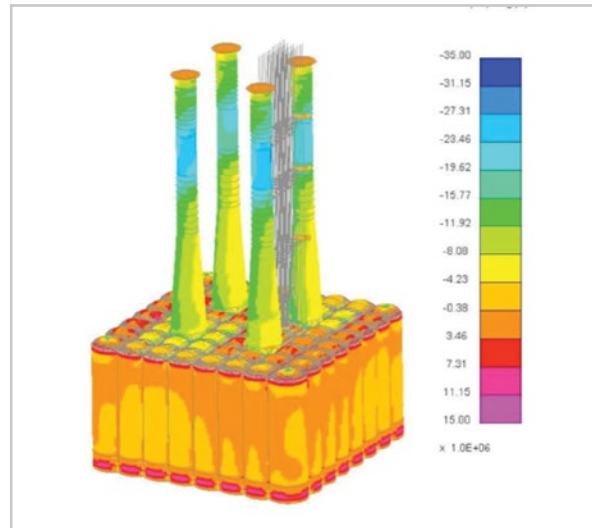


## HIROSHIMA ORIZURU TOWER, Hiroshima



©Sambuichi Architects

## Better solutions using special analysis



Located next to the Atomic Bomb Dome registered as a World Heritage and the Peace Memorial Park, HIROSHIMA ORIZURU TOWER has become a new symbol of the City of Hiroshima. The landmark building was renovated and seismically retrofitted from an existing building completed in 1978.

Arup was involved in the survey and seismic assessment of the existing building as well as the design and site supervision of the renovation works.

The building was extended both laterally and vertically, while attaining seismic performance 1.5 times as what is required in the current building code. With careful CFD analyses, Arup created a natural ventilation scheme to fully utilise the prevailing wind of the region and create energy efficient office spaces.

**Project owner:**  
Hiroshima Mazda

**Architect / client:**  
Sambuichi Architects

**Arup service:**  
Structural engineering  
Sustainable building consulting

Arup provides innovative and logical solutions for wide-ranging clients and advanced technology and research (AT+R) plays a central role in Arup's engineering and technical leadership around the world. We bring top specialists together to develop inventive, practical and cost-effective solutions to complex problems, serving a wide range of fields including building design, infrastructure, automotive, rail and energy sectors.

AT+R covers various fields including wind, seismic and vibration engineering, damping systems, accident simulations, offshore engineering, rehabilitation of existing structures, blast and impact engineering, and value engineering and optimisation.

**Arup services:**  
Total or partial special analysis and related consulting

# Advisory services

We help organisations to unlock value, create efficiencies and stay focused on their core activities during key transitions.

Advisory services is our way of taking a 360 degree view of client objectives. From asset and portfolio management, to business planning and economic forecasting, we work with clients in every industry to generate valuable longterm outcomes. Our strategic and operational advisory services complement our long history in design and engineering. By drawing on a huge breadth of professional disciplines and insights derived from wide global experience, we're able to help clients in every sector to run more effective businesses.

We analyse, adopt and champion new ideas; and our internal global skills network means we can help clients identify relevant opportunities and plan investments wherever they are in the world. In this way we're able to engineer more valuable and far-sighted outcomes than traditional advisory services providers.

## Image

Queen Elizabeth Olympic Park, London





©Nacasa &amp; Partners

## Programme and project management

We understand the value of each project and they are very often the catalyst of change to your business. The right project management leads to ongoing success and this is what Arup is capable to do.

Arup aims more than just delivering a project on time or within a sound budget or quality. We think creatively so as to generate innovative solutions for our clients.

Our project managers have strong technical backgrounds. With well-developed interpersonal and leadership skills, we add values, not bureaucracy. We link corporate objectives to project-level activities, align programme management and business activities with change initiatives. Arup provides comprehensive service to benefit clients' businesses.

**Left**  
Prada Ginza, Tokyo

**Right**  
Workshop for Foresight



©Paul Garbars

## Foresight

Foresight at Arup specialises in identifying and analysing the trends that are shaping the future of the built environment. By understanding key drivers of change and the implications of this change, we aim to make a business or project 'future-proof'.

We developed the concept of 'foresight by design', which uses innovative design tools and techniques to bring new ideas to life and engage clients and stakeholders in meaningful conversations about change. Key methodologies, including horizon scanning, trend research, scenario planning and visioning, are employed to map out our evolving future context and assess what trends are most relevant to us today.

Over the past decade we have helped clients from all over the world to rethink their business, identify future markets and develop new ideas.

## IKEA Nagakute, Aichi



©SS Co., Ltd.

This mega store in the Aichi's suburb was surprisingly demanding as Arup had to maximise the balance between Japanese construction practices and the market climate with the client's high expectation for both innovation and efficiency. After the schematic design stage, we developed the procurement strategy and a tender for design-and-build contract as the best method. This engaged the general contractor at an earlier stage to bring their ideas and construction techniques into the actual design while minimising risks of cost and schedule during detailed tender stage.

We effectively managed all the project members – 10 client teams as well as 9 consultants/contractors from the general contractor to the slab consultant.

**Project owner / client:**  
IKEA Japan KK

**Arup service:**  
Project management

## Coca-Cola (Japan) Headquarters Building, Tokyo



©Coca-Cola (Japan) Company Limited

As the building sustainability consultant, Arup played a key role in achieving the LEED Platinum rating for Coca-Cola's new headquarters building, making it the first office building in the food and beverage industry of Japan to obtain the highest green building rating.

Our structural and MEP engineers also provided schematic design and advisory services during detailed design and construction phases. In collaboration with the architect, Arup defined the 'wind catchers' inside the building – the zig-zag façade shape – and together with the internal stair cases, they act as a chimney to maximise natural ventilation.

**Project owner / client for LEED consulting:**  
Coca-Cola (Japan) Company, Limited

**Architect / client for engineering works:**  
Jun Mitsui & Associates (client for engineering works)  
Taisei Design Planners Architects & Engineers

**Arup services:**  
Structural engineering (schematic design)  
MEP engineering (schematic design)  
LEED consulting

## Toyota Stadium Renovation, Aichi



©Toyota city

Completed in 2001, Toyota Stadium was designed for a ball-game stadium with a retractable roof, a natural turf and a seat capacity of 45,000 people. Arup was originally in charge of the structural design. Since its completion, Arup has continued to provide technical advisory and consulting services, leveraging our global expertise in a range of specialist fields. From maintenance and management to renovation planning to accommodate future needs, we are continuously providing innovative and value-added solutions for the client to optimise operation and minimise repair and renovation costs.

**Project owner / client:**  
Toyota City

**Arup services:**  
Project management  
Architectural design  
Structural engineering  
MEP engineering  
Facade engineering  
Lighting design  
Acoustic design

## Drivers of Change



Arup's Drivers of Change programme investigates the key global issues and trends driving change in our societies and markets. The findings are summarised and presented in carefully-designed knowledge cards to initiate conversations, provide a foundation for further study and serve as an input for strategy and innovation processes.

Over the years, we have identified different 'drivers' or topics that prompt change, with input from a wide variety of stakeholders. These topics have been organised into five categories, or lenses, based on their main area of impact: Social, Technological, Economic, Environmental, and Political, collectively referred to as STEEP. The issues chosen for inclusion in each set of cards are the result of a rigorous process based upon feedback aggregated from interviews, knowledge gained from research, and hundreds of workshops across the globe.

**Arup service:**  
Workshop for new businesses

# Infrastructure

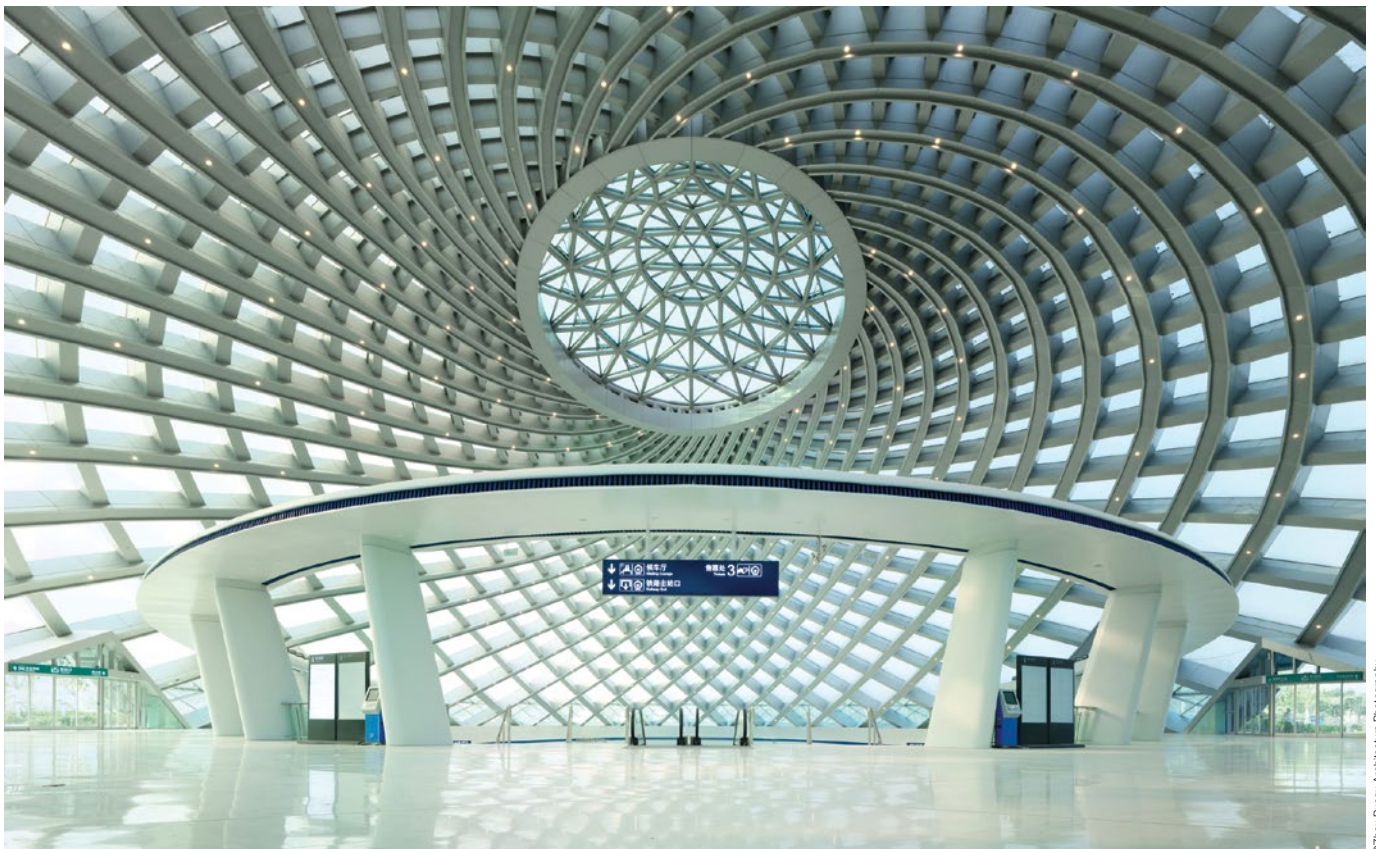
Arup has worked with a range of clients to deliver innovative solutions to world-leading infrastructure design projects across the globe.

Clients rely on our breadth of skills, experience and excellence in major project delivery. The firm pushes the boundaries of thinking in design to create increasingly innovative project solutions, thereby increasing client outcomes.

Infrastructure design brings together many of the skills and services available across Arup, from geotechnics, water engineering, bridge design and tunnels, to site development, rail, mining, resource and waste management, highway design, and procurement. It also brings together truly capable and influential people with wide project experience and interesting and inspirational stories to tell.

Major infrastructure projects by their very nature involve significant investment. Arup has solutions that are cost-effective, efficient, sustainable and delivered in an environment in which risks are managed.

Image  
Yujiapu Traffic Hub, Tianjin





## Rail engineering and advisory

Arup's offering is unique in the rail consulting market. We provide a comprehensive consultancy covering the whole infrastructure lifecycle from financing to concept, project, operation and asset management.

We are able to provide strategic and management consulting, financial advisory and engineering domain services as a one-stop-shop solution, supporting our clients in every aspect of their business. We work with institutions and governments, rail asset owners, operators, contractors or any other type of stakeholders.

An in-depth knowledge of the industry with a reputation for working at the cutting edge enables us to deliver appropriate solutions to clients from a full spectrum of public and private sectors, addressing whole-life issues including safety, reliability, operability and maintenance.

Critical interfaces between the engineered solution and the human element for operators of the system, users, and third parties are always considered.

Our rail experience covers all forms of guided transport systems and associated facilities. The projects we undertake range in scope from total rail infrastructure improvement programmes requiring a multidisciplinary team to the application of specialist domain skills including track alignment, bridges, tunnelling, station design, signalling, rolling stock, communications and traction power.



## Maritime engineering

Changes in global trade, sea level rise and stretched resources mean that ports, coastal industry and communities must constantly adapt.

To meet the challenge of adaptation, we bring specialist understanding to the entire range and lifecycle of maritime structures, infrastructure and projects.

Wind energy is the fastest growing energy technology in the world. Arup is a leading multidisciplinary consultancy with extensive experience in the planning, design and management of onshore and offshore wind energy projects. Our services encompass supply to demand and, in particular, the connecting infrastructure, making use of existing skills developed over many years for other markets that are ideally suited to renewable energy applications.

### Left

Factory acceptance test for a new Hong Kong International Airport APM (Automated People Mover) vehicle

### Right

Offshore wind firm

## Shenzhen Line 4, Shenzhen



The first ‘build-operate-transfer’ railway project in mainland China, the extension comprises a 6km underground section with two underground stations, and a 10km elevated section with eight stations. Arup led the detailed design for all aspects of the extension – the underground section, elevated section, train depot, trackwork and railway systems, delivering performance-based engineering for our client. We also assisted in contract award and provision of engineering expertise during construction.

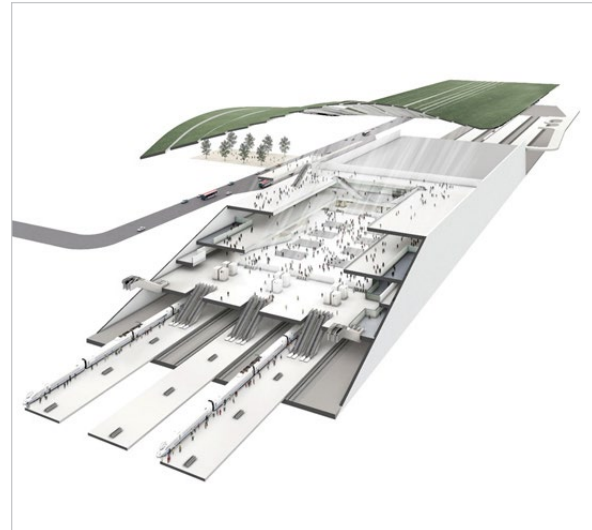
### Client:

MTR Corporation (Shenzhen) Limited

### Arup services:

Project management  
Civil engineering  
Alignment & trackwork  
Structural engineering  
Architecture  
Fire  
MEP engineering  
Railway system  
Transport consulting  
Urban planning

## Feasibility study of the Kuala Lumpur –Singapore high-speed rail



Arup carried out the feasibility study for the Singapore section of the high-speed rail linking Malaysia and Singapore. The study covered the high-speed rail link within Singapore, the terminal station and the Custom Immigration Quarantine planning.

We provided full engineering services and acted as a commercial adviser on structuring, analysis and a subsequent market sounding exercise of the proposed commercial models for this major cross-border project. The commission also involved several workshops with the client to define the project risks and commercial drivers and the subsequent impact on commercial models including PPP structures.

### Project owner / client:

Singapore Land Transport Authority

### Arup services:

Advisory services (Architecture, civil, structural and geotechnical engineering, tunnelling, track alignment, electrical and mechanical system, rail systems and rail operation, security and environmental assessment)



## Kowloon East Environmentally Friendly Linkage System, Hong Kong



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Arup's role involves full financial feasibility analysis, including preparation of a detailed financial model, determining the funding gap and recommending project risk allocation and structure.

We are also providing continuing advice on project structuring and potential concession structure and delivery timeline, technical advice on system and structures, and economic advice on the operation of the proposed light rail system.

**Client:**

Government of Hong Kong S.A.R.

**Arup services:**

Feasibility study

## Offshore wind farm project



Arup has a history of successful and established technical expertise in offshore wind foundations (OWF). These include floating offshore foundations and moorings, as well as a range of fixed solutions including monopiles, jackets and self-installing gravity foundations. We have delivered OWF projects across the full structural lifecycle, going beyond design to site selection, environmental planning, detailed design and decommissioning.

We have a breadth of experience in the European, American and Asian markets. While with strong knowledge of primary design codes used globally, we also work with certifiers in growing markets to meet local codes and requirements.

**Arup service:**

Feasibility studies  
Due diligence  
Site / route selection advice  
Project planning / management  
Technical & Business Investment Advisory  
Foundation design and other engineering / consulting

# Planning

We plan for cities of the future that aligns with the United Nations' Sustainable Development Goals (SDGs).

Arup's specialists marry global factors such as climate change with local needs to develop strategies that are efficient, smart and practical. We are uniquely positioned to create places for the 21<sup>st</sup> Century.

We foster close collaboration among the central government, key regional agencies, local planning authorities and developers and leverage our expertise in interconnected urban systems such as transport, energy, waste and information to help create economically, environmentally and socially sustainable cities.

Arup's economic and planning skills offer three key responses to the challenges of the future:

- Providing our skills in economic strategy, impact assessment, social-economic profiling and project assessment to realise a circular economy supported by enough human resources and improved productive capacity.
- Advise stakeholders on environmental planning, resilience building and public engagement to improve safety and eco-friendly living, and create vibrant local communities.
- Strategic planning and framework development for local communities to move towards decarbonisation and achieve net-emission societies.

## Image

Shape a better urban development environment; one that is better for its inhabitants while also being sustainable and affordable



## Infrastructure and systems export advisory



As part of the Japanese government's strategy to boost infrastructure exports, Arup works with the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) on the development planning for government-business collaboration in the export of infrastructure systems.

In particular, Arup plans environmental projects to make sure they are well harnessed to contribute to energy security concerning railways, airports, renewable energy and telecommunication systems. We develop successful stories to facilitate infrastructure export and maximise economic effect. We also support the Japanese private sector to pursue overseas business opportunities using Arup's global network.

### Project owner / client:

The Ministry of Land, Infrastructure, Transport and Tourism  
The New Energy and Industrial Technology Development Organization

### Arup services:

Infrastructure advisory  
Integrated planning

## Ninh Thuan Province development strategy, Ninh Thuan, Vietnam



Arup was appointed by the Ninh Thuan Government to deliver a masterplan to develop the province to 2030. It was the first time a Vietnamese provincial administration had engaged an international consulting firm to create a long-term development plan.

Our masterplan focuses on sustainability and capitalises on Ninh Thuan's natural resources, exploring its huge potential for development in eco-tourism, agriculture and industries such as mineral water and salt production. The project analyses the organic upgrade and mix of different industries, optimises urban space and increases land-use efficiency and structure in order to improve the lives of local people and the environment where they live and work.

### Project owner / client:

Ninh Thuan Government

### Arup service:

Urban design and planning  
Sustainability consulting  
Infrastructure and transport consulting  
Environmental and energy consulting

## Total Design in the digital age

Engineering is central to human progress – almost nothing is invented without it – and our founder, Sir Ove Arup, was an extraordinary engineer who was deeply concerned with that progress.

His vision for the role of engineering in design and of design in engineering was shaped by humanistic, rather than simply technical, principles. This breadth of vision has inspired generations to pursue the art and science of Total Design in our firm.

The purpose of the firm founded by Ove has remained constant over the ensuing 70 years. Today, by uniting design, engineering and technology under the ‘Total Design’ philosophy, we continue to transform and shape a better world.

**Right**  
Sydney Opera House, Sydney  
**Bottom**  
Bay area in Singapore





\*Use of the Sydney Opera House image under licence from Sydney Opera House



1 Centre Pompidou, Paris, 1977



**Project owner / client:**  
Etablissement Public du Centre Pompidou

**Architect:**  
Piano & Rogers

**Arup services:**  
Structural and MEP engineering

2 Beddington Zero Energy Development, London, 2001



**Project owner / client:**  
Peabody Trust

**Arup services:**  
MEP engineering

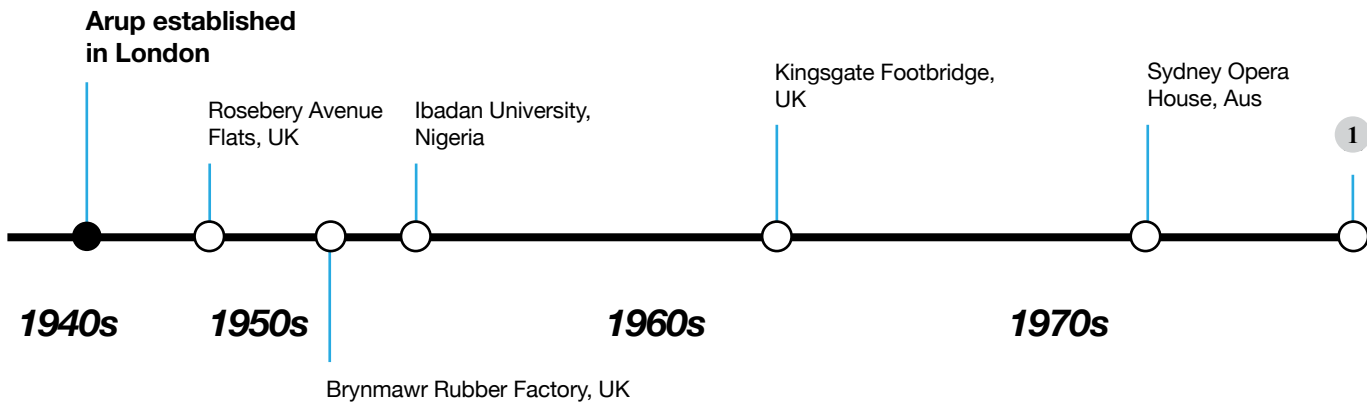
3 30 St Mary Axe, London, 2003



**Project owner / client:**  
Swiss Reinsurance Co (UK) Ltd

**Architect:**  
Foster + Partners

**Arup services:**  
Structural, fire, security and wind engineering and transport



4 National Aquatics Center, Beijing, 2006



**Project owner / client:**  
Beijing State-owned Assets Management Co

**Arup services:**  
Structural and façade engineering, and building physics

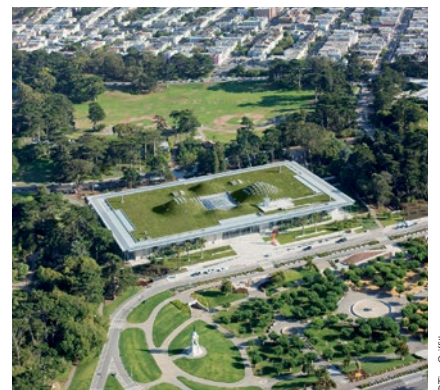
5 High Speed 1, London-Paris, 2007



**Project owner / client:**  
Union Railways construction client for London & Continental

**Arup services:**  
Infrastructural design, planning and multidisciplinary engineering

6 California Academy of Sciences, San Francisco, 2008



**Project owner / client:**  
California Academy of Sciences

**Architect:**  
Renzo Piano Building Workshop  
Stantec Inc.

**Arup services:**  
Structural engineering, MEP engineering, fire consulting, façade engineering, lighting design, sustainability consulting, acoustics consulting and pedestrian planning

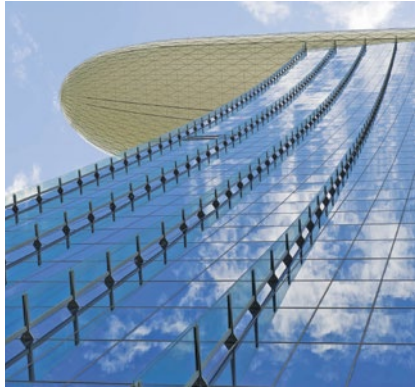
7 Canton Tower, Guangzhou, 2010



**Project owner / client:**  
Guangzhou New TV Tower Construction Co Ltd

**Arup services:**  
Masterplanning and urban design, architecture, seismic design, lighting design, civil engineering, geotechnics and cost management

8 Marina Bay Sands, Singapore, 2010



**Project owner / client:**  
Marina Bay Sands Pte Ltd

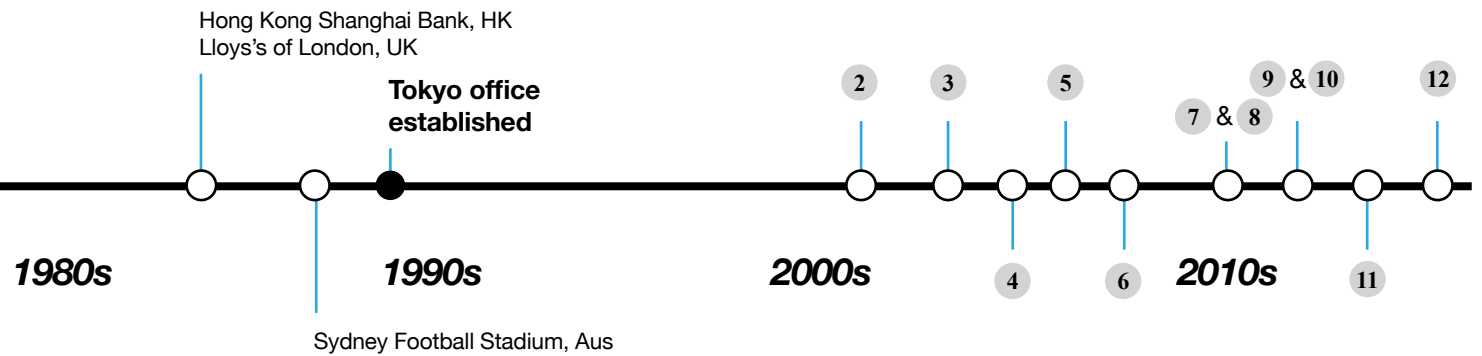
**Arup services:**  
Civil, structural, geotechnics, traffic, façade and fire engineering, acoustics and audio visual, security and risk, building modelling (3D)

9 The King's Cross station redevelopment, London, 2012



**Project owner / client:**  
Network Rail Ltd

**Arup services:**  
Lead consultant, multidisciplinary engineering design including design coordination, planning assistance, bespoke BREEAM assessment, security threat and risk analysis, heritage advice, 'Realtime' walkthrough 3D modelling



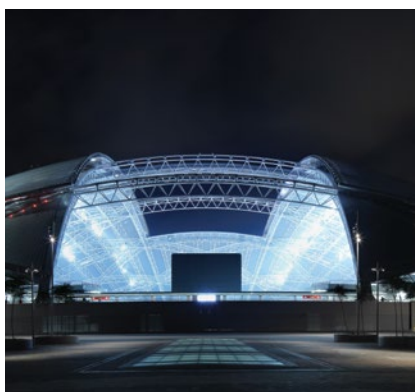
10 The Al Bahar Towers, Abu Dhabi, 2012



**Project owner / client:**  
Abu Dhabi Investment Council

**Arup services:**  
Structural, MEP and façade engineering, geotechnics, fire strategy, civil/transportation engineering and logistics, IT security and lighting design

11 Singapore Sports Hub, Singapore, 2014



**Project owner / client:**  
Dragages Singapore PTE Ltd

**Arup services:**  
Sports venue design, civil, structural, fire and maritime engineering, geotechnics, acoustics, audio visual and multimedia, building physics and environmentally sustainable design, security and risk consulting, lighting design

12 National Taichung Theatre, Taichung, 2016



**Project owner:**  
Taichung City Government

**Architect / client:**  
Toyo Ito & Associates

**Arup services:**  
Structural engineering

**1** Kansai International Airport Passenger Terminal Building, Osaka, 1994



**Project owner:**  
Kansai International Airport Company

**Architect / client:**  
Renzo Piano Building Workshop

**Arup services:**  
Structural, MEP and fire engineering

**2** Fukushima Convention Centre, Fukushima, 1998



**Project owner:**  
Fukushima Prefecture

**Architect / client:**  
Atsushi Kitagawara Architects

**Arup services:**  
Structural and fire engineering, lighting, and acoustics consulting

**3** Maison Hermes, Tokyo, 2001



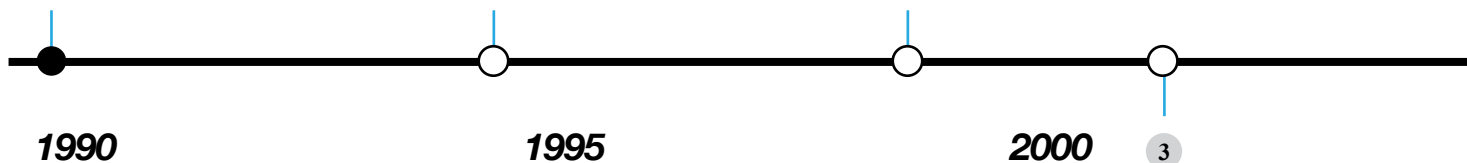
**Project owner / client:**  
Hermes Japan

**Architect:**  
Renzo Piano Building Workshop

**Interior:**  
Rena Dumas Architecture Interieure

**Arup services:**  
Structural and MEP engineering

**Tokyo office established**



**4** Chubu Centrair International Airport Passenger Terminal Building, Aichi, 2005



**Project owner:**  
Central Japan International Airport

**Collaborators (JV partners):**  
Nikken Sekkei Ltd  
Azusa Sekkei Co., Ltd.  
HOK

**Arup services:**  
Structural and façade engineering

**5** Sony City, Tokyo, 2006



**Project owner:**  
Sony Life Insurance Co., Ltd

**Architect / client:**  
Plantec Architects Inc.

**Arup services:**  
Structural engineering and façade consulting

**6** Nicolas G. Hayek Center, Tokyo, 2007



**Project owner:**  
Swatch Group Japan

**Architect / client:**  
Shigeru Ban Architects

**Arup services:**  
Structural engineering



**7** Inujima Seirenscho Art Museum, Okayama, 2008



©Sambuichi Architects

**Project owner:**  
Soichiro Fukutake

**Architect / client:**  
Hiroshi Sambuichi/Sambuichi Architects

**Art:**  
Yukinori Yanagi  
Operated by Fukutake Foundation

**Arup services:**  
Structural engineering, environmental consulting and building physics

**8** MODE GAKUEN Cocoon Tower, Tokyo, 2008



**Project owner:**  
MODE GAKUEN

**Architect / client:**  
Tange Associates

**Arup services:**  
Structural engineering

**9** Multi-story Container Temporary Housing, Miyagi, 2011



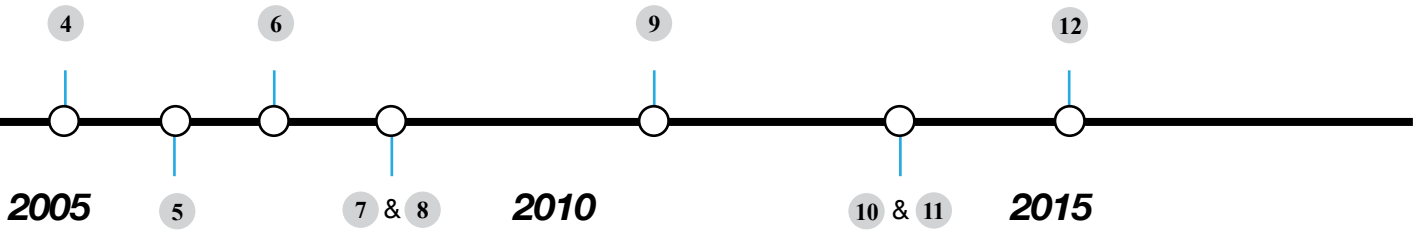
©Hiroaki Hira

**Project owner:**  
Onagawa-cho in Miyagi

**Client:**  
TSP TAIYO Inc.

**Architect:**  
Shigeru Ban Architects

**Arup services:**  
Structural engineering



**10** ROKI Global Innovation Centre, Shizuoka, 2013



©Kenji Kobayashi

**Project owner:**  
ROKI Co., Ltd.

**Architect / client:**  
Tetsuo Kobori Architects

**Arup services:**  
Structural and MEP engineering

**11** Silver Mountain and Red Cliff, Kanagawa, 2013



©Nacasaa & Partners Inc.

**Project owner:**  
Senzoku Gakuen University

**Architect / client:**  
k/o design studio + KAJIMA DESIGN

**Arup services:**  
Façade consulting

**12** 'Minna no Mori' Gifu Media Cosmos, Gifu, 2015



©Hiroshi Taniyama

**Project owner:**  
Gifu City

**Architect / client:**  
Toyo Ito & Associates, Architects

**Arup services:**  
Structural engineering and MEP consulting

## Social usefulness

As a firm, we aim to shape a better world. The United Nations' Sustainable Development Goals (SDGs) help us define what 'better' looks like.

Arup has always recognised that great design includes a responsibility to the future. We help clients across the world to become more sustainable while investing in research that can improve our own industry's environmental impact.

# SUSTAINABLE DEVELOPMENT GOALS

In 2017, we made a formal commitment to align our business with the 17 SDGs – expanding our capacity to create value for our clients and protect our planet. The SDGs act as a unifying thread for us. Whatever we do, we share the same purpose: using our professional expertise to contribute to sustainable development.

From providing disaster relief to building much-needed community facilities, we also support our people in a wide variety of community activities in areas of the world that need the most assistance.

### Relevant SDGs



Image  
Shibata City Hall, Niigata



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