

Feature: Creating Value through Environmental Leadership



Counter Global Warming. Use Resources More Effectively. Preserve Biodiversity.

These are among the environmental issues that have emerged across the globe. The Japanese government has set the target of cutting greenhouse gas emissions to 25 percent below 1990 levels by 2020. Amid mounting concern over the local and global environment, we see growing needs for private companies to tackle environmental issues and help achieve a sustainable society.

From Protection of the Environment to Creation

As a construction company, Kajima does not simply plan, design and construct buildings and other structures. We are committed to helping to create a sustainable future by providing optimal solutions during construction and throughout the post-construction life cycle of buildings and other structures using advanced technology.



Kajima Technical Research Institute

Meeting Society's Environmental Needs with Superior Design and Engineering

As a member of local communities and a global citizen, our mission is to best meet growing environmental needs through our businesses and contribute to society, whether local or global.

In 2009, the Japanese government announced its target of cutting greenhouse gas emissions to 25 percent below 1990 levels by 2020 to help combat the problem of global warming. The law was amended in April 2010 to reinforce regulation of CO₂ emissions. This has led companies to look for appropriate and effective solutions to strengthen environmental management. Skyscrapers in metropolitan Tokyo, which emit a comparatively large volume of CO₂, are a particular focus, as are office buildings that now require renovation of various facilities.

Early on, we identified the importance of responding to environmental problems as one of our top management priorities and concentrated on developing environment-related technologies. Today, we are the only general contractor participating in ZEB* development research, which was initiated in 2009 by Japan's METI (Ministry of Economy, Trade and Industry). While promoting ZEB, we will continue to develop unique, next-generation technologies.

We are using our superior technological base to deepen our presence in the construction market, particularly the building renovation market. Through providing unique solutions to our customers, we intend to increase our contribution to society.

*ZEB: zero-energy building. The concept is to reduce the annual primary net energy consumption of a building to zero or nearly zero through means such as introducing various energy conservation technologies and using renewable energy including solar or wind power.

A New Research Laboratory at the Tobitakyu Research Center of the Kajima Technical Research Institute

A Workplace with a Wide Variety of Leading-Edge Technologies

A variety of research and experiments formerly performed in different buildings was brought together in the new research laboratory building. A wide range of research is conducted in areas such as countermeasures for global warming, environmental remediation, biotechnology and new energies. The building itself serves as a functional research laboratory that gives us the opportunity to refine our leading-edge technologies, thus speeding practical application. More than ten leading-edge technologies were applied to the building, including a solar

powered heat pump system, PV solar air panels that incorporate solar cells, ceiling radiant cooling and heating systems that use underground water and geothermal heat and a roof garden to reduce the heat island effect.

Capitalizing on this new research laboratory, we are exploiting further progress in technological development. We will help lighten environmental loading in a broad range of fields and continue to deliver on our environmental commitment as an industry leader.



PV solar air panels



Roof garden

ZEB

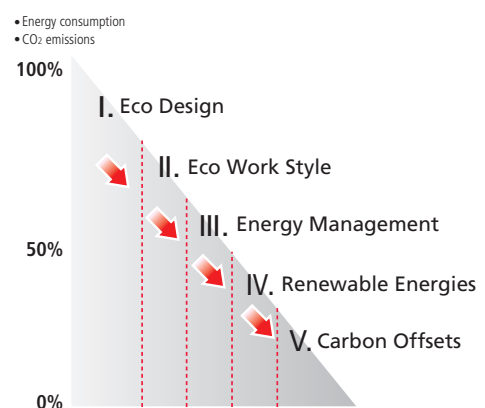
Zero-Energy Buildings that Dramatically Reduce Environmental Loading

The ZEB concept entails reducing the amount of energy that a building consumes in ways such as conserving energy and employing renewable energy technologies so that the net energy consumption is zero or nearly zero. Japan's METI is currently taking the initiative in research with the target of realizing the ZEB concept for all new building construction by 2030.

The practical application of ZEB involves completely transcending the conventional technological approach of conserving energy through

ecological building and facility design. This requires application of a broad range of ideas including redesigning the work style of building occupants, optimizing energy management, effectively deploying solar power and other renewable energy sources, and employing carbon credits and other economic offsets.

We are making steady progress toward becoming a one-stop provider of solutions that can design all processes needed to help make ZEB a reality by 2020.



Zero Energy: to reduce energy consumption and CO₂ emissions to zero by implementing steps I through IV.
 Zero Carbon: to reduce CO₂ emissions to zero by implementing steps I through V.



Tokyu Toyoko Line Underground Construction

Meeting Society's Environmental Needs at Construction Sites

Exercising leadership during construction to further enhance environmental contribution, we are meeting needs for environmental protection measures that cover the entire life cycle of buildings and other structures.

While acknowledging the importance of cutting CO₂ emissions from buildings and other structures during use, we are also focusing on incorporating environmental measures at construction sites, especially for office buildings, from the perspective of managing their entire life cycle.

Since 2003, we have been employing the four key environmental policies of combating global warming, resource recycling and effective use, hazardous material management and preservation of biodiversity. In 2009, we set a target of reducing annual CO₂ emissions during construction 30 percent below 1990 levels per construction executed by fiscal 2020. A number of initiatives have been taken to meet the target.

Previous moves to heighten environmental awareness and save energy have included putting a stop to vehicle idling, reducing the volume of soil carried out of construction sites and shortening transportation distances. We are now working even more aggressively to lighten environmental burden by strengthening cooperation with the machinery and energy industries to rationalize construction and raise productivity. Moreover, we continue to review our construction methods to display stronger leadership in the construction industry.

Technology for Moderating Environmental Burden and Speeding Up Construction

The Potential of the APORO-Cutter Tunneling Method

In 2008, we worked jointly with Kawasaki Heavy Industries, Ltd. to develop the APORO-Cutter Tunneling Method, a breakthrough technology that can handle a wide array of sectional excavation.

Construction of a subway line is underway in central Tokyo with this epoch-making technology.

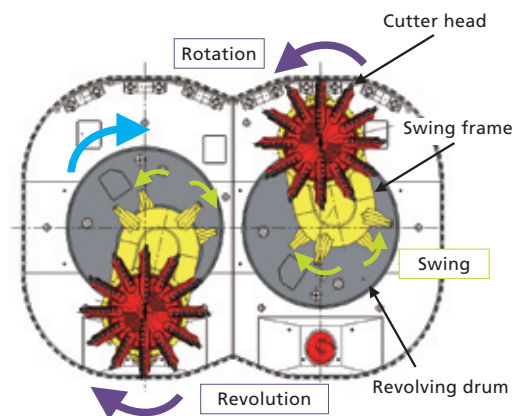
Conventional tunnel construction involved the use of a shield machine in a circular section. Excavation of square sections for projects such as subways required partial refilling of circular sections. With the APORO-Cutter Tunneling Method, however, excavations of any shape, whether rectangular, horseshoe-shaped, or circular,

are possible. The machine can operate against a wider range of soil types, including hard soil. With this method, we expect to rationalize the construction process and reduce excavation cost. Its extraordinary versatility will also serve to mitigate the environmental burden. Going forward, we intend to flexibly tailor this method to fit multiple customer needs at various construction projects.

With the APORO-Cutter Tunneling Method, changing the angle of a revolving drum in a swing frame enables sectional excavation of various shapes. Moreover, the cutter head excels operating against hard soil because it is small and revolves at high speed.



APORO-Cutter Shield Tunneling Machine



Enthusiastic Recognition for Environmental Friendliness

Reduced CO₂ Emissions at Construction Sites

As environmental needs soar in both the private and public sectors, customers are positively recognizing our environment-friendly proposals. The government office building construction contract for the City of Machida in Tokyo is one example. The customer appreciated our proposals that maintain the environmental quality of the construction site and the surroundings.

We are executing a number of initiatives to reduce CO₂ emissions at the construction

site, including purchases of green electricity produced from biomass and other renewable natural resources and the use of solar panels to promote energy self-sufficiency. By using the "Kajima Solar Monitoring System," we are monitoring and controlling the volume of electricity generated and consumed on a real-time basis at the website of the project. We intend to introduce this system at various construction sites to further promote the use of renewable energies.



Machida City Government Office Building



Solar panels used at construction sites



Shimane Nuclear Power Plant Unit 3
(under construction)

Meeting Society's Environmental Needs with Our Technologies and Experience in Nuclear Power Plant Construction

We use our unparalleled technological capabilities and experience in the field of nuclear power plant construction to ensure the highest levels of safety and quality.

Nuclear power is at the center of attention as an effective method for combating global warming. As a nation of few natural resources, Japan sees nuclear power as an efficient form of energy that supports energy security and reduces the environmental burden. The nation has therefore been developing nuclear power facilities since the 1950s.

Over more than half a century since constructing Japan's first nuclear reactor in 1956, we have accumulated extensive technical expertise and experts. We are the leader in Japan's nuclear power plant construction with a track record of constructing more than 60 percent of all plants, thus having established a powerful reputation for safety and quality.

We are building all four nuclear power facilities that are currently underway in Japan, including Shimane Nuclear Power Plant unit 3 (The Chugoku Electric Power Co., Inc.). Moreover, we have been conducting numerous evaluations of the earthquake resistance of power plants following the Niigataken Chuetsu-oki Earthquake in 2007.

Going forward, nuclear power is expected to further grow in importance. As a leader in this sector, we will continue to deliver buildings of the highest standard and make a significant positive contribution to society.

Construction of the Ohma Nuclear Power Plant

Japan's First Full MOX-ABWR*

We are constructing the 1,383 MW Ohma Nuclear Power Plant (Electric Power Development Co., Ltd.), which fully uses MOX fuel, making it the first full MOX-ABWR plant in Japan. As one of Japan's largest nuclear power plants, it will play a major role in the stable supply of electricity and the effective use of resources.

Located in Ohma, Aomori Prefecture in the northernmost part of Japan's mainland Honshu, it is crucial for the project site to contend with high winds, snow and cold during the winter. We are employing the "Kajima All-weather

Construction Method," in which we cover the reactor building being constructed with curing roofs and walls to minimize the negative impact of adverse weather conditions. Moreover, some parts of the buildings are being fabricated in factories or at the site and are being installed using a large rotating crane. This advanced construction method enables us to expedite construction, improve the quality of the buildings, and raise the safety of the site.

*MOX-ABWR (Mixed Oxide Fuel Advanced Boiling Water Reactor): a type of reactor loaded with mixed oxide fuel made up of recycled fuel.



Installation using a large rotating crane

Our Experience in Nuclear Power Facility Construction

The history of nuclear power in Japan tracks our history of continuously building experience in this field, developing and establishing new technologies with the aim of advancing to the next generation.

Today, Japan has 61 units, including those under construction or being decommissioned, in 20 nuclear power plant sites. Among them, the number of units constructed by us is 38, giving us a dominant presence with a 62 percent share (not including the Rokkasho Reprocessing Plant).

For a safe and secure energy cycle, we integrate planning, design and construction with retrofitting to reinforce the earthquake resistance of existing power plants and research and development covering waste disposal and future dismantling. Our ongoing technological development will support the life cycle of nuclear power facilities.

Nuclear Power Facility Construction Track Record

