# Responding to the Needs of Society with Our Technologies

**We have striven to enhance the benefits for society as a whole through devoting our efforts to construct buildings and structures utilizing various technologies. In other words, we have helped deliver value and quality through our work to improve safety, comfort, and convenience in modern society. We believe that an environment can be changed by making an ordinary building into a landmark which serves as a hub for the daily activities of the surrounding communities. By creating buildings conscious of the environment and ecosystem, local surroundings can also be further enriched. Moreover, by building infrastructure, such as bridges and roads, we create revolutionary change in the transportation system that enables travel at even faster speeds and in safer manners than before. Buildings, once they are occupied and utilized, may be taken for granted, but their existence, which improves peoples' daily surroundings and convenience, helps enhance the quality of life of society as a whole.**

# Start with Today
# Efficient Use of Our Limited Energy Resources
# —From Energy Saving to Energy Efficiency—

While an important theme, combating global warming may have been perceived as an issue that lacks a sense of tangible results or achievements. In 2010, the Law Concerning the Rational Use of Energy was revised, while the Tokyo Metropolitan Government also enacted an ordinance aimed at reducing the total amount of greenhouse gas emissions by large business locations and announced its plan to institute even tighter regulations in 2015. All building owners will inevitably need to act to address impending changes in laws, ordinances, and regulations with an approach that embodies comprehensive technologies suited to the entire lifecycle of a building. Amid this, the Great East Japan Earthquake struck, causing a significant change in the circumstances surrounding the supply of energy, most notably electricity. Kajima is committed to reducing and rationalizing its use of energy and helping achieve energy efficiency while maintaining a comfortable lifestyle and work environment through its next generation technologies.

## Realizing ZEB by 2020

Kajima participates in zero-energy building (ZEB) research and development, which aims to reduce the annual primary net energy consumption of a building to zero or near zero by 2020, and has established a roadmap for incorporating technologies that reflect the ZEB concept in 80% of its projects, including the design and construction stages, by 2025. In order to meet this target, around 10 specific sub-themes have been identified to address a broad range of challenges, from design and construction to engineering, which will be tackled to help make ZEB a reality as early as possible.

» ZEB

**Response to the Great East Japan Earthquake**

Immediately following the Great East Japan Earthquake, Kajima established a disaster response headquarters at its Head Office and Tohoku Branch. This organization confirmed the safety and whereabouts of employees and ascertained conditions at factories in operation. In addition, it began damage-related surveys on production facilities and structures based on client requests. In response to a request for assistance from the Tohoku Branch, we organized the shipment of relief supplies including water, food, and blankets from both the Tokyo Head Office as well as each branch office throughout Japan. By the end of March 2011, approximately 250 truck loads of relief supplies had been shipped to disaster-affected areas. With almost 2,800 requests for damage-related surveys by the end of April, some 5,000 engineers from the Tokyo Head Office and branch offices were dispatched to the disaster zone to assess the extent of damage and restore production facilities and infrastructure, such as the Tohoku Shinkansen (bullet train) line and highways. Furthermore, the General Manager of the Tohoku Branch also spearheaded the recovery and reconstruction efforts by leading the industry as the director of the Japan Civil Engineering Contractors Association's* Tohoku branch. Kajima is firmly committed to building a platform for the recovery effort in order to help restart operations at manufacturing facilities that supply parts to major manufacturers and avoid a prolonged downturn in the Japanese economy.

*The Japan Civil Engineering Contractors Association was renamed the Japan Federation of Construction Contracts on April 1, 2011.

## The Path to Achieving Our ZEB Vision

Kajima has categorized the four concepts of "eco design," "eco work styles," "energy management" and "renewable energy" as key areas that must be tackled in order to achieve its ZEB vision. As indicated by the roadmap noted below, today we are pushing forward with initiatives to examine and apply these concepts primarily in our company-owned buildings.

Specifically, we are attempting to reduce $CO_2$ emissions from offices in the Kajima Head Office Building and the Kajima Akasaka Annex completed in 2007, and today we continue to monitor the amount of energy used in these buildings. In addition, we have conducted reviews of eco work styles that foster the creative talents of our researchers, the primary users, in the new laboratory at the Kajima Technical Research Institute that opened in 2009. This building also employs a heat pump system that utilizes renewable energies, such as a heating and cooling system that uses ground water and geothermal heat as well as PV solar air panels, a hybrid system incorporating both solar power and heat. As of May 2011, Kajima is currently proceeding with construction on the Kajima Technical Research Institute's Main Building and the AKASAKA K-TOWER, and is incorporating new technologies in their design based on each of the aforementioned concepts. In order to examine not only new buildings but also the remodeling of existing buildings using eco-friendly and energy saving designs, we plan to use a section of the KI Building in fiscal 2011 to verify actual technologies.

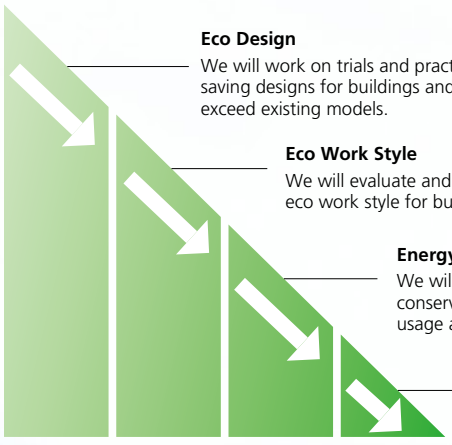
After completion and once in use, typically 50% and 25% of a building's energy consumption is accounted for by its air conditioning system and lighting, respectively. Today, Kajima is working under the belief that additional technical prowess and reviews of eco work styles and energy management are required to effectively utilize and reduce a building's energy usage, as well as maintain the daily comfort of the people that work there. Under these initiatives, we will continue to verify and undertake technological research and development aimed at achieving our targets set out for 2020.

Kajima Akasaka Annex

The new laboratory at the Kajima Technical Research Institute

Kajima Technical Research Institute's main building

### Kajima's ZEB Concept



**Eco Design**
We will work on trials and practical applications of energy saving designs for buildings and facilities that significantly exceed existing models.

**Eco Work Style**
We will evaluate and propose an eco lifestyle and eco work style for building users.

**Energy Management**
We will support the effective management of energy conservation through monitoring of operations, adequate usage and improvements.

**Renewable Energy**
We will promote the utilization of photovoltaic power generation and geothermal energy.

## AKASAKA K-TOWER — Aiming to Reduce $CO_2$ Emissions by 40%

The AKASAKA K-TOWER is currently under construction on the site of Kajima's former Head Office building in the Minato Ward of Tokyo. Kajima has positioned this as a model project for future large-scale tenanted buildings to be constructed in a low-carbon society. By combining generally accepted eco-friendly technologies with cutting edge energy conservation technologies, we expect to reduce $CO_2$ emissions from this building by 40%.

From the perspective of eco design, we have integrated the structure and building frame in the design, and plan to employ a newly developed window blind control system. This system, which incorporates controls for the effective use of natural energy, will maintain brightness during the daytime with natural sunlight, and balance the load of air conditioning equipment using solar heat. In addition, using human detection sensors developed based on sensors employed at the Kajima Head Office Building, we will create a lighting environment that reduces lost light. Moreover, we are developing and employing a multi-advanced system that varies between four different operating modes based on the overall load of the air conditioning system. Each of these solutions illustrates our commitment to create offices that are both comfortable and eco-friendly.

By reviewing these solutions from the design phase, we expect to be able to further raise the efficiency of energy used in buildings. We also plan to create new eco work style-related solutions based on the results of monitoring programs. Furthermore, we are committed to undertaking eco-friendly solutions involving photovoltaic panels in the construction phase based on our wide ranging experience and track record.

AKASAKA K-TOWER

## Reducing $CO_2$ Emissions by 50% through Eco Remodeling

Kajima plans to remodel a section of its KI Building completed in 1989 in August 2011 in order to reduce the building's $CO_2$ emissions by 50%. Leveraging our experience in new building construction, this will become a model project for realizing our ZEB vision through the remodeling and upgrading of existing buildings. Plans call for half of one floor to be remodeled in this eco-friendly manner, which will enable us to easily draw comparisons and create expectations in the verification process after the remodeling is completed.

Specifically, this project seeks to shift the building to a new eco design that employs an LED-based task ambient lighting system, foster new eco work styles based on behavioral analysis, implement renewable energy solutions using a photovoltaic generating system and achieve energy management using a system that optimizes the control of electricity. We plan to verify the effectiveness of each during all phases of the project and apply the results in efforts to further rationalize our use of energy.

Kajima KI Building

## Working toward the Goal of Zero

Through its technologies, a zero energy building, or ZEB, is capable of controlling energy needs as well as contributing to energy security. The key to addressing the needs of society lies in these efforts and innovative developments ahead of their time. Through technological development conducted at Kajima as well as working together and collaboratively with leading manufacturers and energy companies, our aim is to combine expertise from across a wide spectrum and address challenges faced by society.

**External Evaluation — CASBEE**

The Comprehensive Assessment System for Built Environment Efficiency (CASBEE) is a widely utilized assessment tool in Japan. This system provides a comprehensive evaluation of each building's environmental quality and performance, including the capacity to reduce environmental stress and consideration placed on the interior comfort and overall appearance of the building, and is comprised of a five tier ranking, ranging from class S (excellent), A (very good), B+ (good), B- (somewhat poor), to C (poor). At Kajima, major projects need to meet the requirements of class A or higher. In fiscal 2010, 13 projects received a class S ranking.

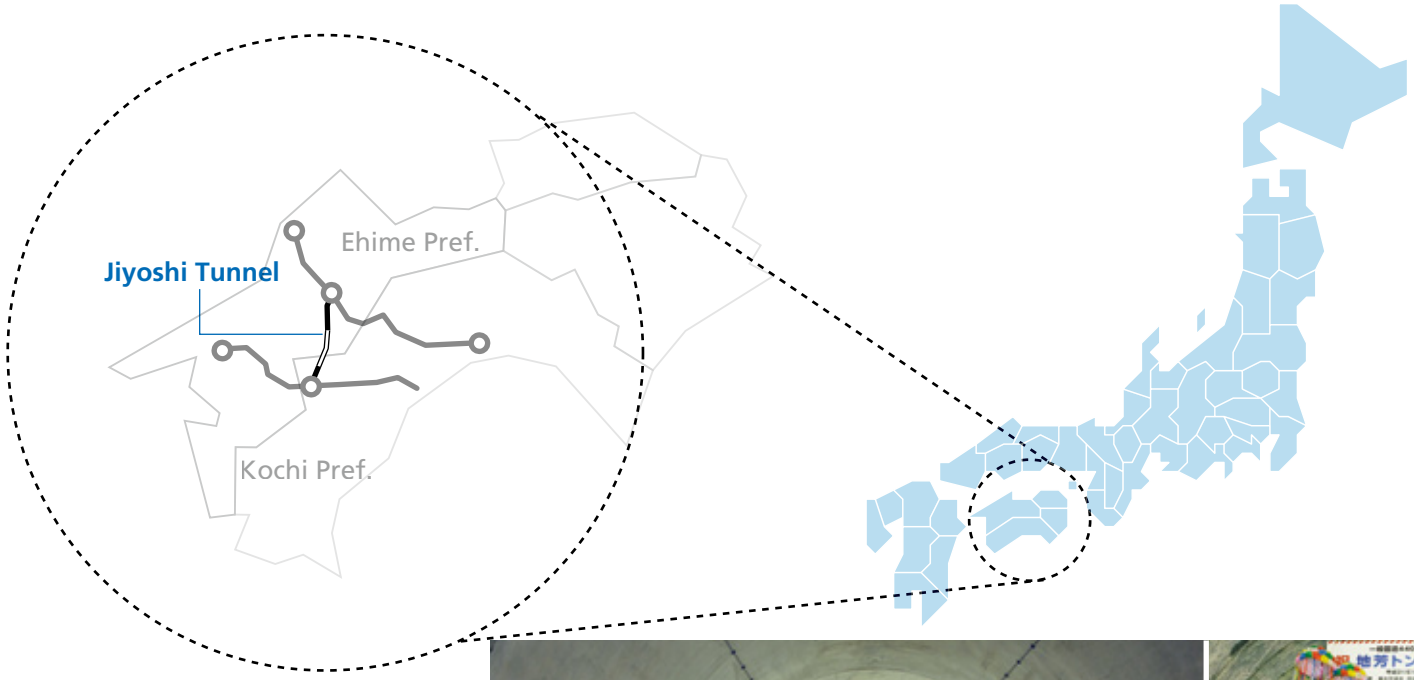
In terms of the BEE value, which indicates a building's environmental efficiency, AKASAKA K-TOWER received its highest office building environmental performance assessment result to date at 4.4, while the main building of the Kajima Technical Research Institute was certified with a score of 8.3, the highest in Japan.

# Connecting the Road of Life
# 10 Years of Working against Water

On the island of Shikoku, a steep mountain region separated two districts of Ehime and Kochi Prefectures. A Kajima joint venture was in charge of construction team 1 on the Ehime side, building a 2.9-kilometer tunnel which was completed in 2010. This tunnel, an essential infrastructure development, forms part of the 8.9-kilometer Jiyoshi Road connecting the two districts along National Route 440.

## A Much-Awaited Opening after 10 Long Years

When the project began in 2000, it was expected to be completed within three years. The construction zone, however, not only overlaps with the Shikoku Karst Plateau as well as large, high volume natural springs, but also a vulnerable fault zone, making the project extremely challenging. Nonetheless, given that local residents had long awaited a tunnel to serve their transportation needs, Kajima employed the most cutting-edge construction methods and technologies to overcome these hurdles. The Jiyoshi Road development project was first launched in 1992, but was temporarily suspended in 2009 due to concerns about cost effectiveness. In light of disaster prevention and medical emergency considerations, construction was eventually restarted due to the compelling needs of local residents and authorities in the area of the project, which overrode cost effectiveness concerns. From start to finish, the overall construction spanned a period of 10 years. Thanks to the long-awaited opening of the road, a trip that used to require 45 minutes now only takes 11 minutes, significantly improving transportation convenience and road safety. This being a region where a large number of elderly people reside, the completion of the road was much appreciated, and for some it has even garnered the name “Road of Life.” Civil engineers who took part in this project under a longstanding mission also felt a strong sense of pride with the road’s final completion.





### Today and Looking Ahead to Tomorrow

The Great East Japan Earthquake struck on March 11, 2011. Coming face to face with this unprecedented natural disaster has once again made us aware of just how difficult it is to defy the will of natural disasters with human technology. Yet, Kajima has gained a deeper conviction that it can use even higher standards in its mission as a construction company to provide people with a safe, secure and comfortable lifestyle through its technologies. Under the “enterprising spirit” that forms the backbone of its 170-year history, Kajima is committed to taking up immediate challenges as well as exploring solutions in environmental symbiosis with a long-term perspective.