Energy Saving Technology Towards ZEB and SLEB as a Private Construction Company in Singapore

9th February 2023

Kajima Technical Research Institute Singapore



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- **1. Introduction of Kajima Corporation**
- 2. Solutions for Zero Energy Building
- 3. Our new building "The GEAR" in Singapore



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1. Introduction of Kajima Corporation

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Company Name	KAJIMA CORPORATION		
Head Office	Tokyo, Japan		
Established	1840		
Incorporated	1930		
Revenues	¥2,079Billions (~US\$15B, FY2021 consolidated)		
Number of Employees	8,080 (As of March 31, 2022)		
Business Domain	Construction (Civil Engineering and Building Construction), Real Estate Development, Architectural Design, Civil Engineering Design, Engineering, and Other		



Name	Kajima Technical Research Institute (KaTRI) -			
Established	In 1949 as the 1 st research institute among construction industries in Japan			
Number of employees	290 (As o Researc (includin	f April 1, 2020) h engineers: 242 g Ph.D. holders: 86)	hucinoss	
 R&D Development of pioneering basic technologies Technology development and deployment for practical use 		Technical cooperation • Technical support and consultation for D&C divisions	Education & Promotion • Seminars & Workshops • Technical promotion	
PORATION				



Kajima Technical Research Institute Singapore (KaTRIS)

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as a truly global Research innovation hub for the built environment sector, smart city innovation, and construction tech.





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Kajima Environmental Vision Triple Zero 2050

- We have formulated the "Environmental Vision: Triple Zero 2050" to realize a sustainable society that balances the environment and the economy.
- We will actively work with customers to develop not only our own business activities such as construction sites but also environmentally friendly construction materials and CO₂ reduction from long term operation of buildings. We are aiming for zero in three fields of carbon, waste and impact for nature.
- For "Zero Carbon", we will promote the spread of ZEB by our design and construction.



Solutions for Zero Energy Building (ZEB) for Sustainable Society

ZEB (Zero Energy Building) is the idea of reducing energy consumption at the building operation stage by saving energy and using renewable energy, and making it as zero as possible.

Companies are beginning to adopt the idea of integrating environmental initiatives and corporate management, such as SDGs and ESG investment.

In response, KAJIMA will broadly strengthen environmental proposals along with ZEB proposals.





ZEB is realized by 4 categorized technologies







Expanded definition of ZEB

- In order to realize and promote the spread of ZEB, not only "net ZEB" with net energy consumption of less than 0% but also expanded "ZEB series" is defined.
- Recently, it has become possible to apply "ZEB Oriented" to large buildings.







O1 Eco design







By incorporating the structural frame into the exterior design, we have realized a façade design that not only achieves both structural performance and design, but also balances solar radiation control and a good view.







Evaluation of thermal performance of facades

- We developed window models that can evaluate both thermal loads and the thermal environment near the windows.
- The accuracy of the window models has been verified through a comparison with tests and measurements.
- Use this method to optimize facade performance.





Application examples in Japan



Double-skin Façade (T project)

Low-E Double Glazing with Small Solar Transmittance (HQ building)



Natural Ventilation (P project)





O2 Eco work style







We aim for the ZEB that achieves both energy saving and intellectual productivity.

- We propose offices that support the improvement of intellectual productivity by ABW.
 ※ ABW : Activity-Based Working, Work style to choose a place to work according to the content of work
- We propose eco-work styles that reduce CO₂ emissions by optimization of lighting and air conditioning according to work style and encouragement of energy-saving behavior.





Energy management



Reduction of energy consumption during operation



Real-time energy visualization and energy-saving control management



Energy

Image of IP integrated network "B · OA net" (KI-ZEB renovation) ©2023 KAJIMA CORPORATION





Platform for optimizing building management "KAJIMA Smart BM[®]"

KAJIMA and affiliated company operate the cloud-based building management platform "KAJIMA Smart BM" in collaboration with Microsoft Japan.



System configuration of "KAJIMA Smart BM"

- Operating status of air conditioning, lighting, etc.
- Indoor environment such as temperature and illuminance
- Energy consumption, etc.

- Reduction of running costs by optimal adjustment of equipment
- Early identification of equipment abnormalities etc.





Renewable energy





Solar power generation



PV modules integrated with roofing materials of the existing factory

©2023 KAJIMA CORPORATION (F project)



Top light integrated with PV panels (A project)



04 Renewable energy

"ReHP[®]" that integrates and optimizes multiple renewable energies









Hybrid air conditioning system combined with ceiling fan and conventional AC unit



Collaboration research with National Universy of Singapore (NUS)

- Inprovement of thermal comfort
- 20-30% energy saving
- Reduction of COVID-19 infection risk



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The GEAR

The GEAR (Kajima Lab for Global Engineering, Architecture & Real Estate)

- Kajima Group's Asia Pacific Headquarters / Global R&D Hub & Innovation Center
- Utilize as testbed for R&D and open innovation





The **GEAR**











KAJIMA TECHNICAL RESEARCH INSTITUTE EINGAPORE

Digital Twin Platform in The GEAR





The GEAR SLEB achievement

GreenMark SLE certification on June 2022





Radiant air contitioning system



PV system



KAJIMA TECHNICAL RESEARCH INSTITUTE EINGAPORE

Exploring today, building tomorrow.

Thank you!