Bentley®

Case study

PT Wijaya Karya (Persero) Designs Presidential Palace for Indonesia's New Capital

A digital twin created with Bentley applications helped bring the ambitious design to life, saving time and money

A national symbol for a new capital

Jakarta, the current capital of Indonesia, faces a unique challenge—it is the world's fastest sinking city. For over a decade, the weight of city development has pushed the area down below sea level, with some areas dropping as much as 25 centimeters per year. Jakarta has also experienced growing pollution and traffic congestion, with traffic alone causing up to USD 5 billion in losses per year. To relieve the pressure on Jakarta, as well as to reduce developmental inequality between the island of Java, home to Jakarta, and other islands in Indonesia, the government is working to move the capital to the new city of Nusantara on the island of Borneo.

Creating a new capital city from scratch requires an enormous amount of development, including new government facilities. Among the first wave of development in Nusantara is Garuda Palace, which is designated the official residence and office for the president of Indonesia. To reflect the building's status as the center of the nation's government, it features a façade of the Garuda, a mythical bird that serves as the nation's national emblem. PT Wijaya Karya (Persero) (WIKA) assumed development responsibilities for the IDR 10.5 trillion project.

Unique design in tough terrain

Design companies such as WIKA face challenges when designing typical large facilities. But this is the only one with a Garuda façade featuring a wingspan of 177 meters and sitting 100 meters above sea level, which makes it stand out as the highest structure at Nusantara. WIKA also had to accommodate high standards for the design of the new capital. "Nusantara development is not only about building physical structures, but also about creating the best services, operations, and maintenance of government buildings. We focused on quality, sustainability, resiliency, and high aesthetics based on the latest technology and science," said Rizky Yusuf Ramadhan, BIM lead strategist at WIKA. The government wanted to achieve green certification, smart technology, and net zero emission target.

In addition, WIKA faced challenges with the project site. "Overall, the presidential complex is on an extreme slope, so it has several critical elevations along its center line," said Davin Pradipta, BIM project coordinator. As a result, the design needed to incorporate a funicular lift to move people and materials up the building. Despite the challenges, the palace absolutely had to be finished by June 2024 in time for the 79th Indonesia Independence Day celebration to be held at Nusantara. Meeting that deadline required WIKA to go beyond traditional design methods.

Project summary

Organization

PT Wijaya Karya (Persero) Tbk

Solution

Facilities, Campuses, and Cities

Location

Nusantara, Indonesia

Project playbook

Bentley LumenRT™, iTwin®, iTwin Capture, iTwin IoT, LEGION®, MicroStation®, OpenBridge®, OpenBuildings®, OpenRoads™, PLAXIS®, ProjectWise®, ProStructures™, STAAD®, SYNCHRO™

Project Objectives

- Garuda Palace in Nusantara is the official residence and office for the president of Indonesia.
- Development was especially complex due to the steeply sloped site and the need to incorporate sustainable technology and practices.
- WIKA used Bentley applications to create a digital twin of the project, enabling them to detect clashes, improve efficiency, and plan construction sequences.

ROI

- Creating a digital twin reduced the risk of errors, saved USD 18 million in labor costs, and accelerated the design phase by 33 days.
- Careful analysis with ProStructures helped reduce the need for 138.8 tons of structural steel, and integrating detailed data into 3D models lowered resources needed by 40%.
- In total, digital design reduced resource hours for the palace's development by 13.6%, and accelerated the pace of construction by 6%.

Overcoming challenges with a digital twin

WIKA determined that they could quickly design the complex, unique project by going digital with Bentley applications. They first conducted an aerial survey of the nine-hectare site, then used iTwin Capture Modeler to process imagery and lidar data into a reality mesh. Within that digital environment, they used OpenBuildings Designer to create 3D models of structural, architectural, and landscape details. For road access to the site, they created models with OpenRoads and OpenBridge.

To combine the individual models and geospatial data into a unified digital twin, WIKA federated them into MicroStation, then synchronized the models in iTwin Design Review. “From that, we gathered clash and analysis reports based on the actual site and conditions to the design planning consultant. We used ProjectWise 365 with iTwin Design Review to better examine clashes, including the integration of road designs in the presidential complex area,”explained Octob Bhayu Hanggoro Putro, BIM building coordinator. With clashes resolved, teams used SYNCHRO to plan out the construction process using the lean construction approach, and Bentley LumenRT to create project animations that assisted with the erection of the steel structures and managing traffic at the site.

Meeting the deadline with enhanced efficiency

The team’s clash detection and resolution within iTwin reduced the risk of errors, saved USD 18 million in labor costs, prevented USD 45 million in construction mistakes, and accelerated the design phase by 33 days. PLAXIS helped the team to limit the structure’s settlement to a maximum of 0.412 centimeters, while STAAD’s analysis of the structural vertical vibration shows it meets the standard for serviceability during operations. “The result [is that] the building performance stands well against earthquake response in withstanding maximum earthquake shocks, which increases building resilience,” said Pradipta.

WIKA helped reduce the project’s cost and environmental impact wherever possible. For example, careful analysis with ProStructures helped them reduce the need for 138.8 tons of structural steel, and integrating detailed data into 3D models lowered resources needed by 40%. In total, digital design reduced resource hours for the palace’s development by 13.6%, and accelerated the pace of construction by 6%, all while including locally sourced materials and energy-efficient technology. Thanks in part to the design and construction enhancements, WIKA helped deliver a new national symbol in time for Indonesia’s Independence Day.

> “Bentley’s BIM technology enables massive benefits over the constructability review, helping us accelerate construction by 6% per month to meet the deadline. It provided the tool to optimized energy up to 40%, helping fulfil Nusantara’s vision as an inclusive, green, and sustainable city for everyone. ”
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> -Rizky Yusuf Ramadhan, BIM lead strategist,
> PT Wijaya Karya (Persero) Tbk

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