

COMPANY

**CECI Engineering Consultants, Inc.,
Taiwan**

PROJECT

**Construction of Jakarta Mass Rapid Transit
Project Underground Section CP106**

LOCATION

Jakarta, Indonesia

TYPE

**Public Infrastructure Project and Design -
Build Mode**

SCHEDULED TIME OF COMPLETION

2018

“BIM ensures efficiency and quality. It gives us competitive advantages during submission of tender documents.”

— **Shen Chia-Ray**

Deputy Manager, PE
Department of Rapid Transit
Engineering at CECI

BIM PARTNERS INVOLVED

Project Owner:

**PT MRT Jakarta - CMC: Oriental
Consultants Global Co., Ltd.**

Other Consultant:

THI Consultants Inc.

Main Contractor:

SMCC HK JO

BIM Boosts Precision and Safety in MRT Project Design

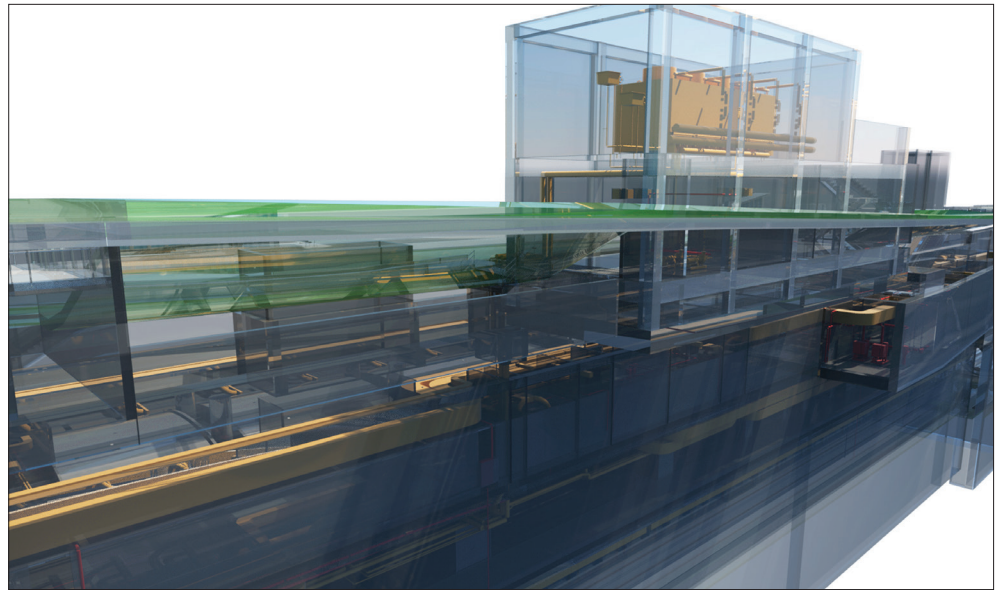


Image courtesy of CECI Engineering Consultants, Inc., Taiwan

To solve chronic traffic problems, the government of Jakarta, Indonesia, since 2013 has invested in a project to construct an MRT system, scheduled for completion in 2018. This is Indonesia's first MRT project, and was ranked as among the world's best infrastructure projects by World Finance Magazine last year.

Jakarta's MRT system has a total length of 15.7km, including 13 stations. CECI is responsible for detailed design of section CP106, including Bunderan HI station, Dukuh Atas station and two tunnels.

The section is in a crowded downtown area with limited space. Making the design and construction even more challenging, tunnels must be created below rivers and existing train tracks and between many closely packed buildings. CECI chose BIM as a project platform to enhance collaboration and design quality.

Communication and coordination for best decisions

Many stakeholders are involved in the Jakarta MRT project, and there may be communication

gaps between professionals. CECI utilises BIM technology to design station access, ventilation and cooling towers. Software such as Autodesk Revit and 3ds Max is used to build 3D models. 3D visualisations have significantly improved communication and coordination between the government and landowners, while using Autodesk Navisworks enables different disciplines to work together. Models from architects, civil engineers, structure engineers, tunnel engineers, mechanical engineers and environmental control engineers have been integrated in Revit, to identify potential design conflicts and resolve them as early as possible.

Alignment data determine the precise location of each station. If locations are along curved sections of track, it is critical to ensure correct clearance between trains and the platform edge for operation and safety. CECI used BIM to consider multiple spatial limitations as well as functional requirements.

“Limited space is one of the main challenges in the Jakarta MRT project, especially since the section is in a central business district,” says Ricky Kurniawan, engineer, CECI. “BIM is a

great tool. Alignment data in Civil 3D can be imported to Revit, to decide on track routes and platform location. This enables us to verify there will be appropriate spaces between trains and platforms, to ensure operations and safety of passengers, including those with physical disabilities.”

Shen Chia-Ray, Deputy Manager, PE, Department of Rapid Transit Engineering at CECI, adds: “Although the turnkey contractor in this project uses a 2D design process, it requires high standards of detail and precision. Fortunately, the data could be imported to a BIM model, maximizing technical support and achieving the quality requirements.”

Achieving value engineering

In value engineering studies, smaller stations save building materials, energy consumption and emissions. After deciding on the initial design, CECI introduced BIM technology to simulate station and tunnel works, in order to carry out value engineering as well as to reduce space, materials and construction time.

“With BIM technology, we finished value engineering studies on station deployments and alignment reviews,” says, project engineer

Ricky Kurniawan. “Take underground stations Bunderan HI and Dukuh Atas, for example. Cooperation between project architects and engineers reduced the length of Bunderan HI from 439 metres to 429 metres, and Dukuh Atas from 220 metres to 200 metres.” Shen notes that, “In addition to assisting the turnkey contractor with reduce station lengths, BIM also saves costs, time, and unnecessary space. In future, there will be lower electricity bills – achieving a win-win scenario for the turnkey contractor and government.”

Passenger simulation enhances safety

To ensure operational safety, THI Consultants, commissioned by CECI, used data from the BIM model to conduct passenger simulations and analysis. These included potential emergency scenarios, to eliminate some potential failures in the first place, and can also evaluate station deployment and evacuation capabilities. These simulations are especially important given one station has three storeys underground, along with connections to the

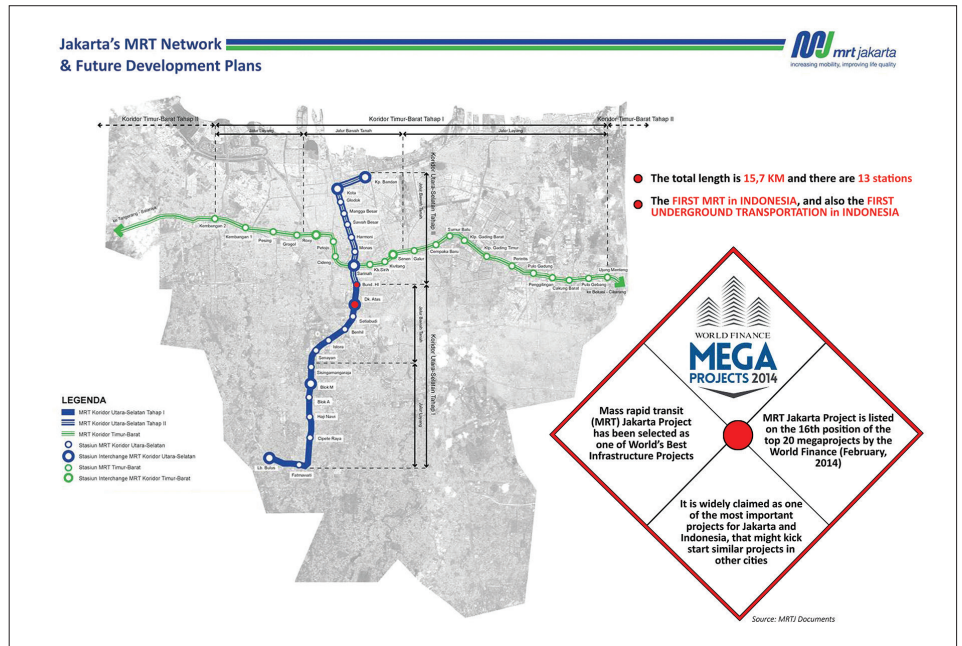


Image courtesy of CECI Engineering Consultants, Inc., Taiwan



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existing train station and a future high speed rail station.

“We used station models developed in Revit to simulate various scenarios in the event of emergencies,” says Ir Kurniawan, “Both station planning and passenger flow simulation in the same model can avoid communication gaps.”

CECI fully utilises BIM models in civil engineering projects, finding efficient project management is possible, even in “fast-track” projects such as the Jakarta MRT. Coordination and resource sharing among various disciplines offer the turnkey contractor comprehensive support for construction planning and decision.

“In the CP106 project, BIM ensures efficiency and quality,” says Ir Shen. “This is an important international case for CECI. With value-added services achieved by utilising BIM tools, the Japanese turnkey contractor in Indonesia has recognised CECI as the best design consultant in the Jakarta MRT project. Hence, BIM gives us competitive advantages, and they are willing to pay for our participation in other projects.”

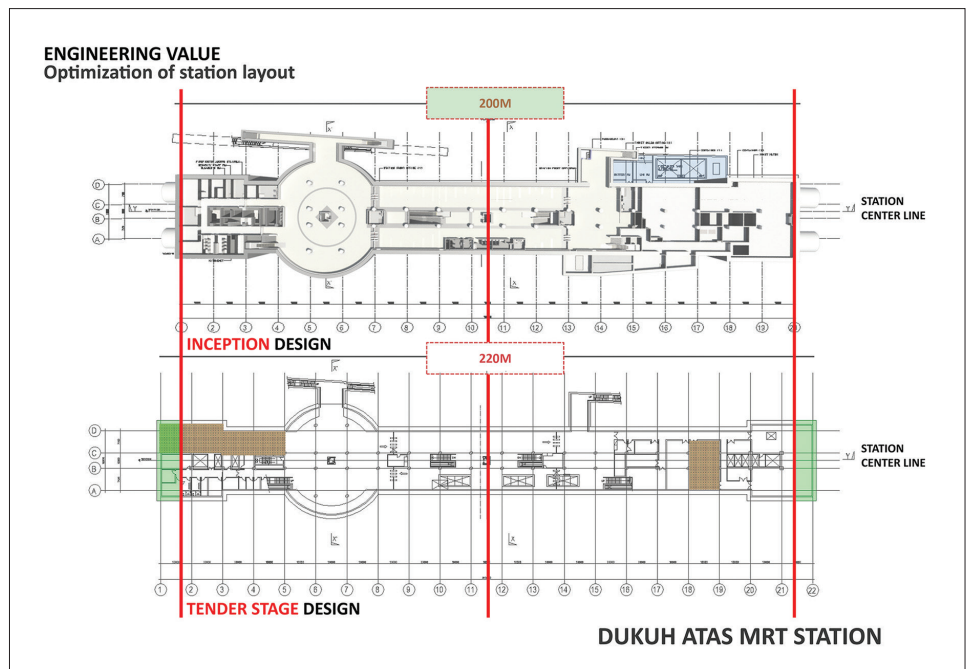


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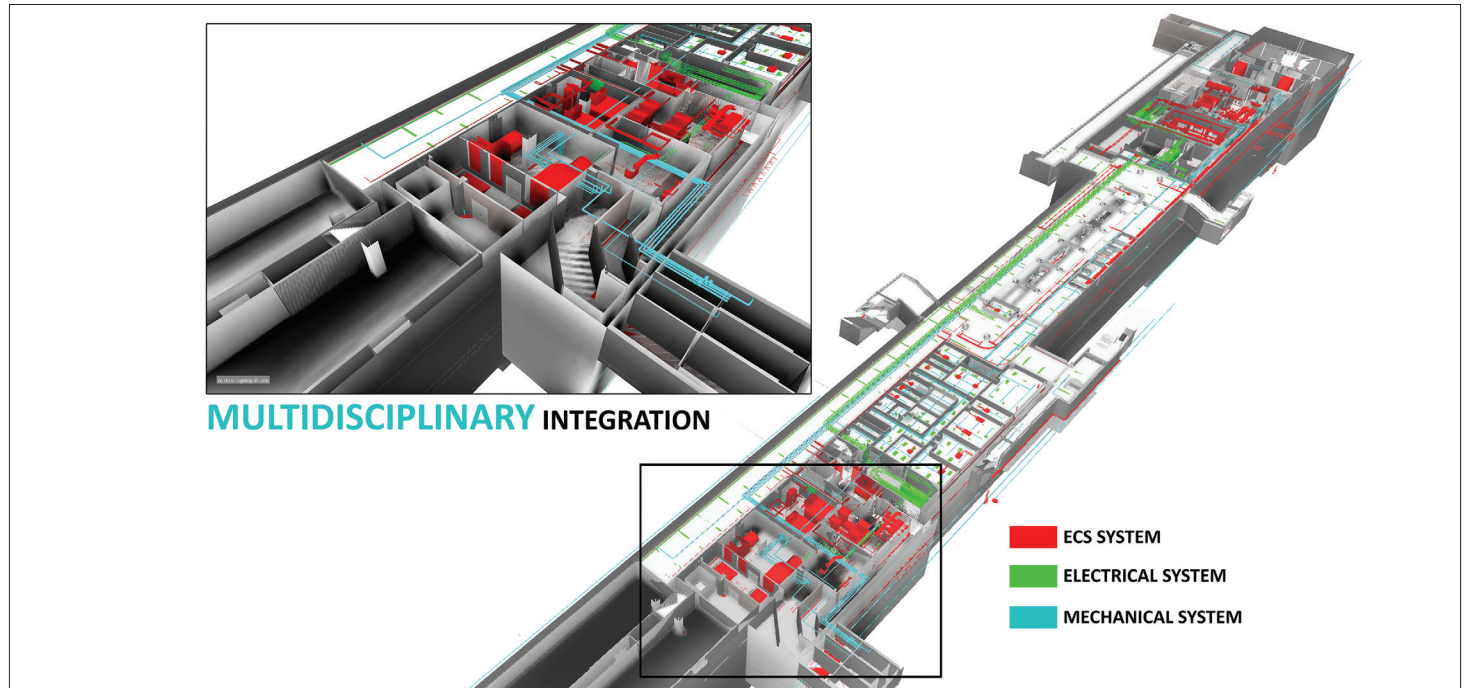


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About CECI Engineering Consultants, Inc., Taiwan

CECI was established in 1969 primarily for the purpose of upgrading Taiwan's engineering technology and assisting in the economic development of Taiwan and other developing countries, and has been awarded ISO certification for planning, design, construction supervision, construction management, information technology and system engineering as well as numerous other accreditations.

With its sense of entrepreneurship, CECI has rendered the opportunity to participate in the nation's most important projects and be a part of the economic miracle which transformed Taiwan and brought about advanced transportation infrastructure including the nation's first freeway, the world's biggest High Speed Railway BOT project, world class metro systems, and the famous hi-tech corridor of science and technology parks which are home to some of the world's top researchers, developers and manufacturers of cutting edge industries.

Furthermore, with the emergence of the information age, CECI has been actively expanding its scope of services into new technologies and areas of work, including Building Information Modeling (BIM), Geographical Information Systems (GIS), Global Positioning Systems (GPS), Intelligent Transportation Systems (ITS), e-Ticketing and other types of applications which answer to the tendencies and trends of technological advancement.

With a staff of over 1,700 professionals representing virtually all engineering design disciplines, their hard working dedication and support enable us to provide cost-effective solutions with superior quality of service and at the same time collaborate with other partners, organizations and societies that we have demonstrated our goal becoming an internationalized firm to assist in the economic development of other countries and share in our commitment to keep a harmonious relationship with nature while using our precious natural resources safely and wisely.