Best Indonesia Metro

jakarta mass rapid transit

中國土木水利學會BIM會刊研討會

27 September 2017

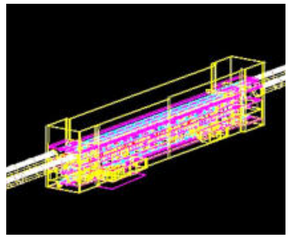
Speaker:
Seng Chia-Ray | Ricky Kurniawan

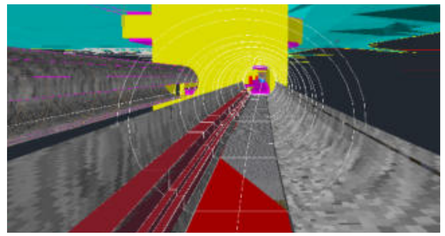
DUKUH ATAS MRT STATION | BUNDARAN HI MRT STATION

mrt jakarta
increasing mobility, improving life quality

HK
Inovasi Untuk Solusi

CECI
ENGINEERING CONSULTANTS., TAIWAN





KEYNOTE SPEAKER

Seng Chia-**Ray**

PROJECT DIRECTOR

PROFESSIONAL EXPERIENCE

- Deputy Manager at the Department of Rapid Transit Engineering, CECI
- PM – Jakarta MRT Project, CP106, Indonesia
- PM – Taipei MRT Design Project of Circular Line, Taiwan
- Special Consultant – Railway Improvement Project, Vietnam
- Design Coordinator, Bangalone Metro Rail UG-2, India

KEYNOTE SPEAKER

ricky kurniawan

ARCHITECT I BIM Design Engineer

FORMAL EDUCATION

Master of Architecture **2012 - 2014**
National Taiwan University of Science and Technology (NTUST)

Bachelor of Engineering
Petra Christian University (PCU), the best private university in Indonesia **2007 - 2012**

PROFESSIONAL EXPERIENCE

- Construction of Jakarta Mass Rapid Transit Project Underground Section CP106 in Indonesia
- Basic Design of China Sonangol (Indonesia Satu Building) MRT Entrance
- A14 Station – Taoyuan International Airport MRT Station
- Circle Line Taipei's MRT Line (Taiwan)
- MRT Sungai Buloh - Serdang - Putrajaya Line, Kuala Lumpur, Malaysia

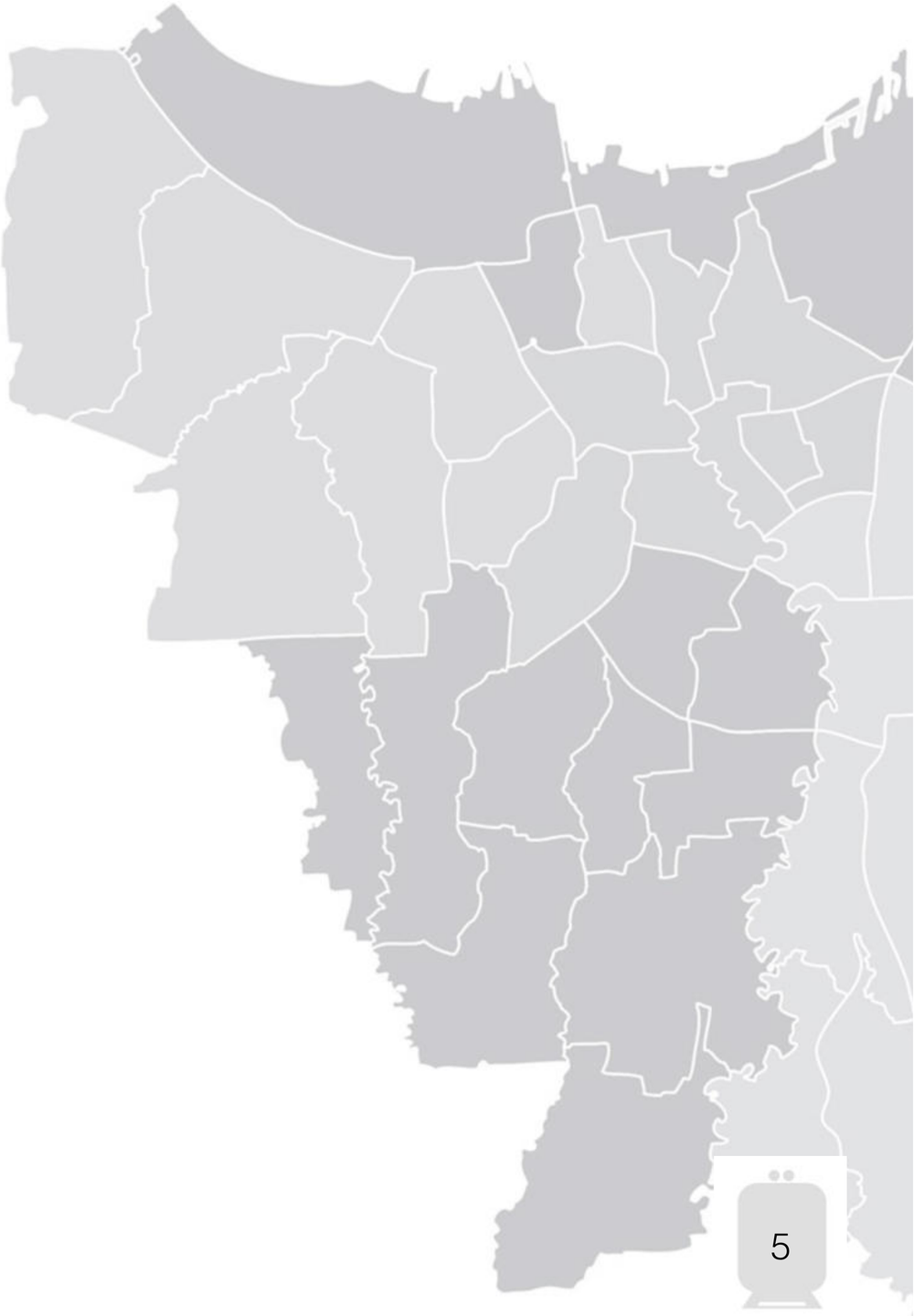
OUTLINE

- 計畫概述
- 挑戰與機會
- 創新的解決方案
- 豐盛的收獲
- 結論與建議

- PROJECT BACKGROUND
- CHALLENGES AND OPPORTUNITIES
- INNOVATIVE SOLUTIONS
- FRUITFUL RESULTS
- CONCLUSIONS AND SUGGESTIONS

PROJECT BACKGROUND

計畫概述




TAKSI
B 1256 SOJ
SELNAJAYA RECRUITMENT


The most severe evening rush hour traffic
1. Bangkok, Thailand
2. Mexico City, Mexico
3. Bucharest, Romania
4. Jakarta, Indonesia
5. Moscow, Russia

Cities with the worst stop-start traffic:

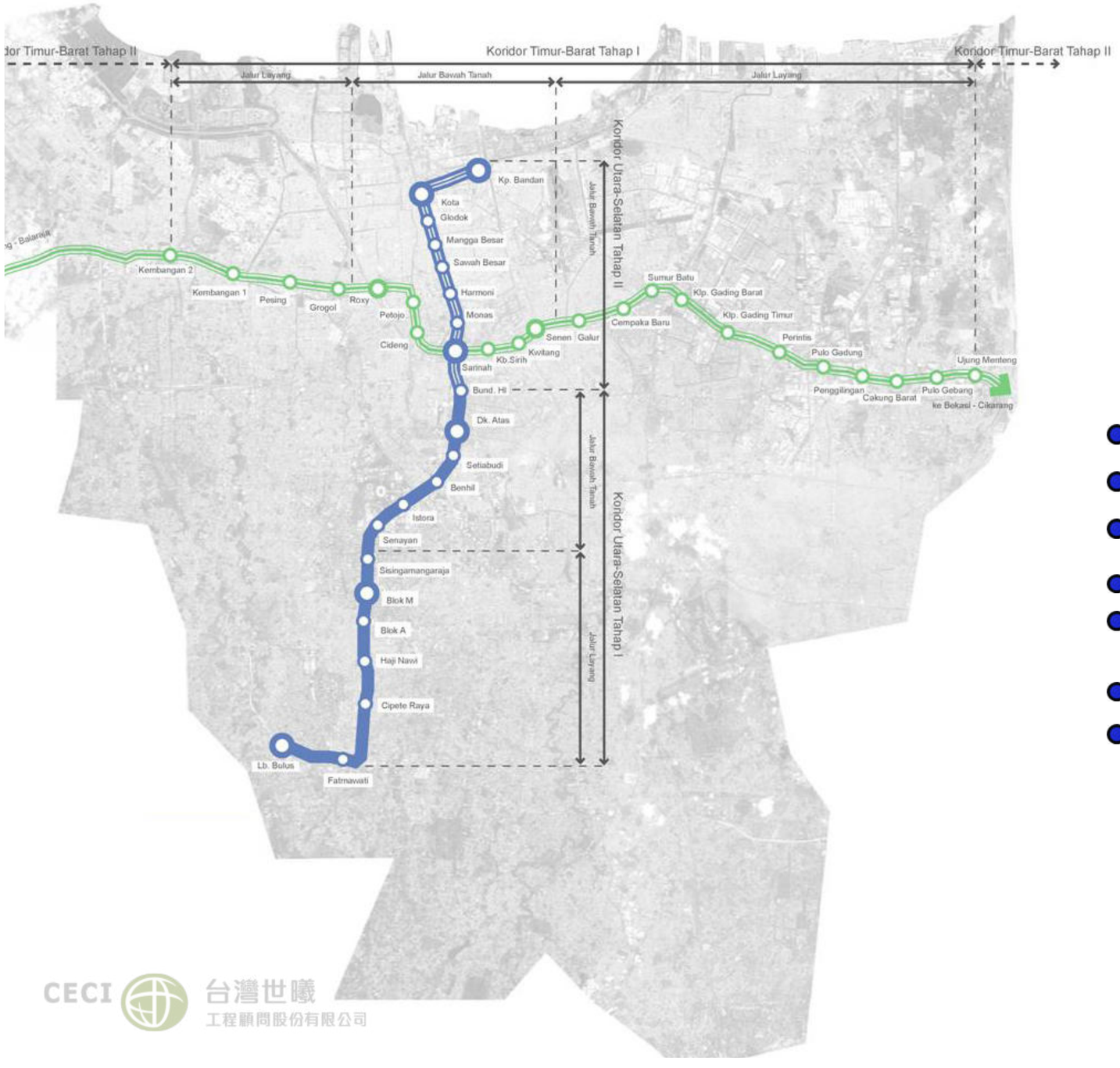
1. Jakarta, Indonesia (33,240)

2. Istanbul, Turkey (32, 520)

3. Mexico City, Mexico (30,840)

4. Surabaya, Indonesia (29,880)

5. St. Petersburg, Russia (29,040)



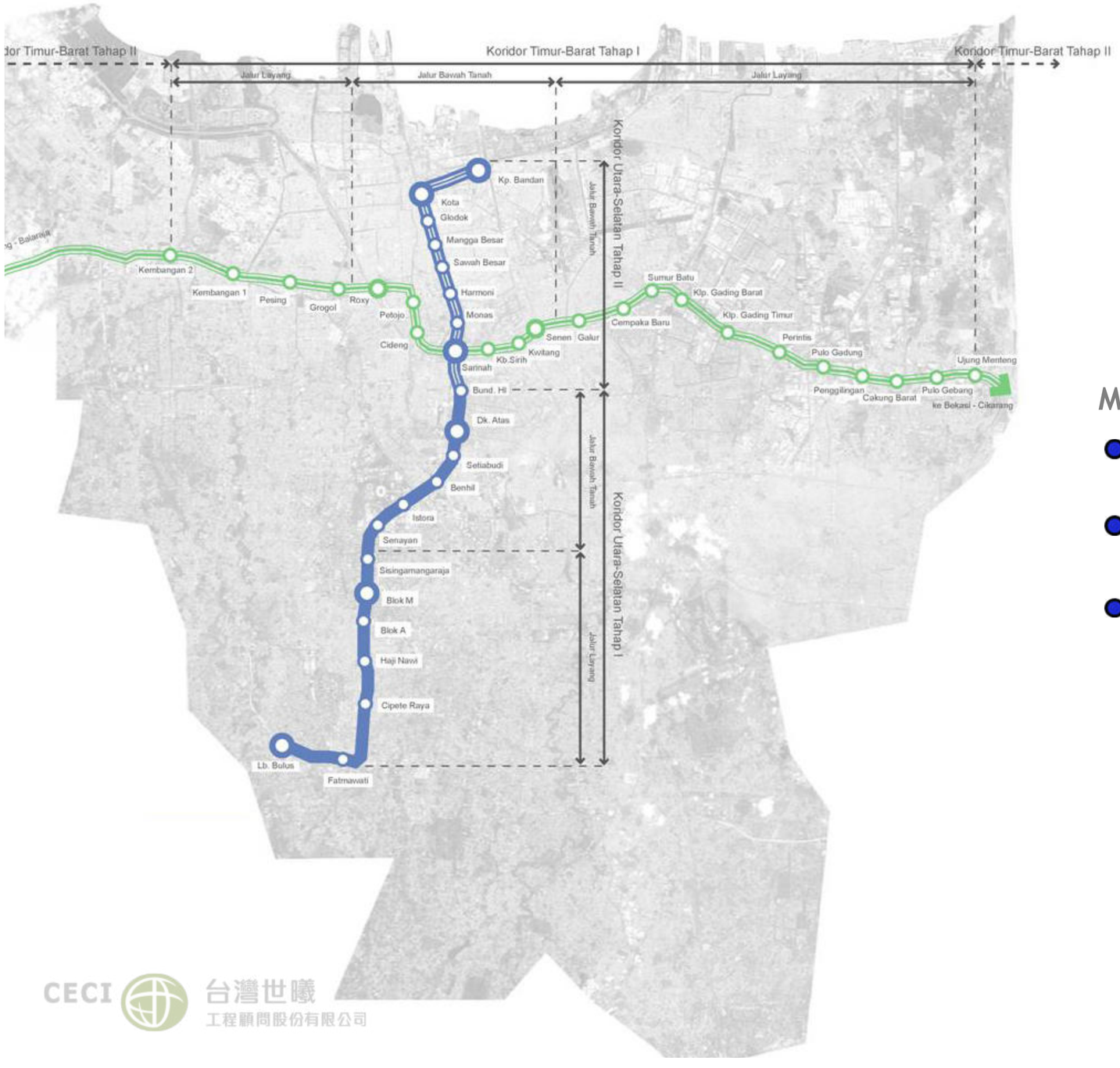
Be 1st Metro

jakarta mass rapid transit

- **Location** : Jakarta City, Indonesia
- **Design Consultant** : CECI Engineering Consultant, Inc., Taiwan
- **Year of Completion** : 2018
- **Owner/ Client** : MRT Jakarta/ SMCC HK JO
- **CP106 Project** : Two underground station and Tunnel between stations
- The total length is **15,7 KM** and there are **13 Stations**
- The **First MRT in Indonesia**, and also the **first underground transportation in Indonesia**

CP106 標工程全長 2.5公里，包括兩座地下車站、一座明挖覆蓋轉轍軌結構及兩段潛盾隧道結構

CECI 台灣世曦 工程顧問股份有限公司



Be 1st Metro

jakarta mass rapid transit

MRT Jakarta: One of World's Best Infrastructure Projects

- Mass Rapid Transit (MRT) Jakarta Project has been selected as one of world's best infrastructure projects.
- MRT Jakarta Projects is listed on the 16th position of the top 20 mega projects by The World Finance (February, 2014)
- It is widely claimed as one of the most important projects for Jakarta and Indonesia, that might kick start similar projects in other cities.

CHALLENGES AND OPPORTUNITIES

挑戰與機會

From Split to Zip

Jakarta Mass Rapid Transit


Land acquisition problems


Tunnel passing under river/ railway


Tunnel near adjacent building


Station at curved alignment

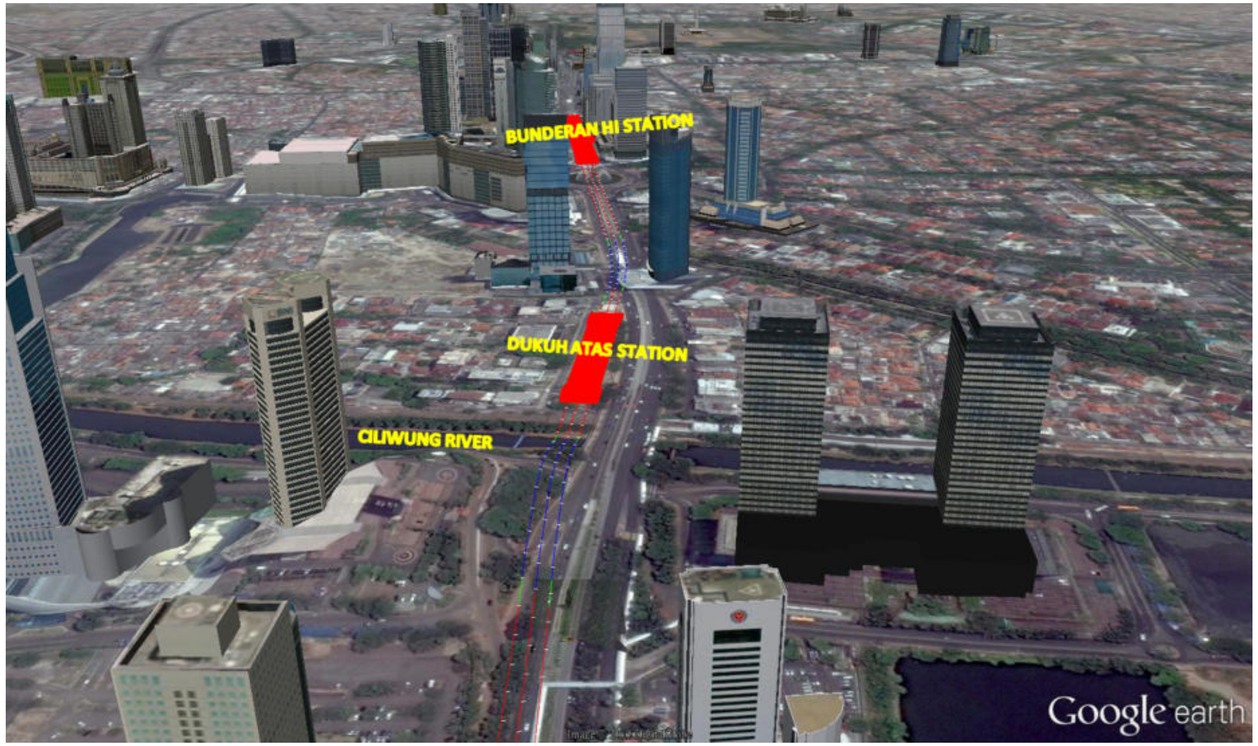

Fast – track (construction driven) design approach

BIM + PFS

- Efficiency
- Collaboration
- Safety

Alignment Goes Through Central Business District

jakarta mass rapid transit
From LINE to REAL...



The **MRT route** goes through Jakarta CBD (Central Business District), where the available land space is limited and have lot of challenge

JAPANESE EMBASSY

PULLMAN HOTEL JAKARTA

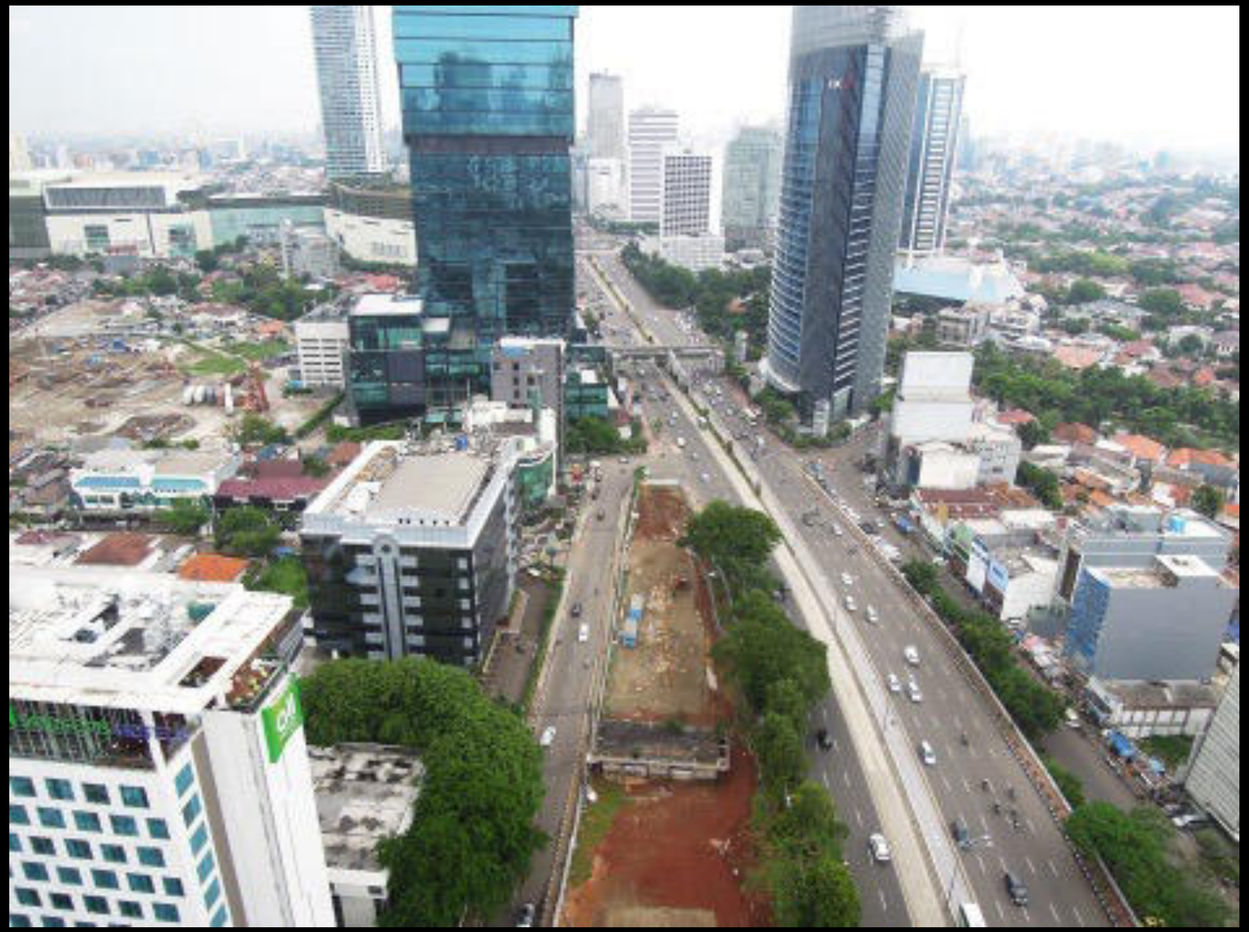
SINARMAS GROUP

INDONESIA SATU BUILDING

Land acquisition problems

The MRT Route is close to many important buildings, such as **Japanese Embassy** and **Five-star Hotel**

Tunnel Passing Under River/ Railway



The tunnel section crosses the existing railway system and river, with the distance only 0.7 meter from nearest obstacles (building).

LOCAL AUTHORITY REVIEW

TPAK

INDONESIA
ARCHITECTURE
LOCAL AUTHORITY

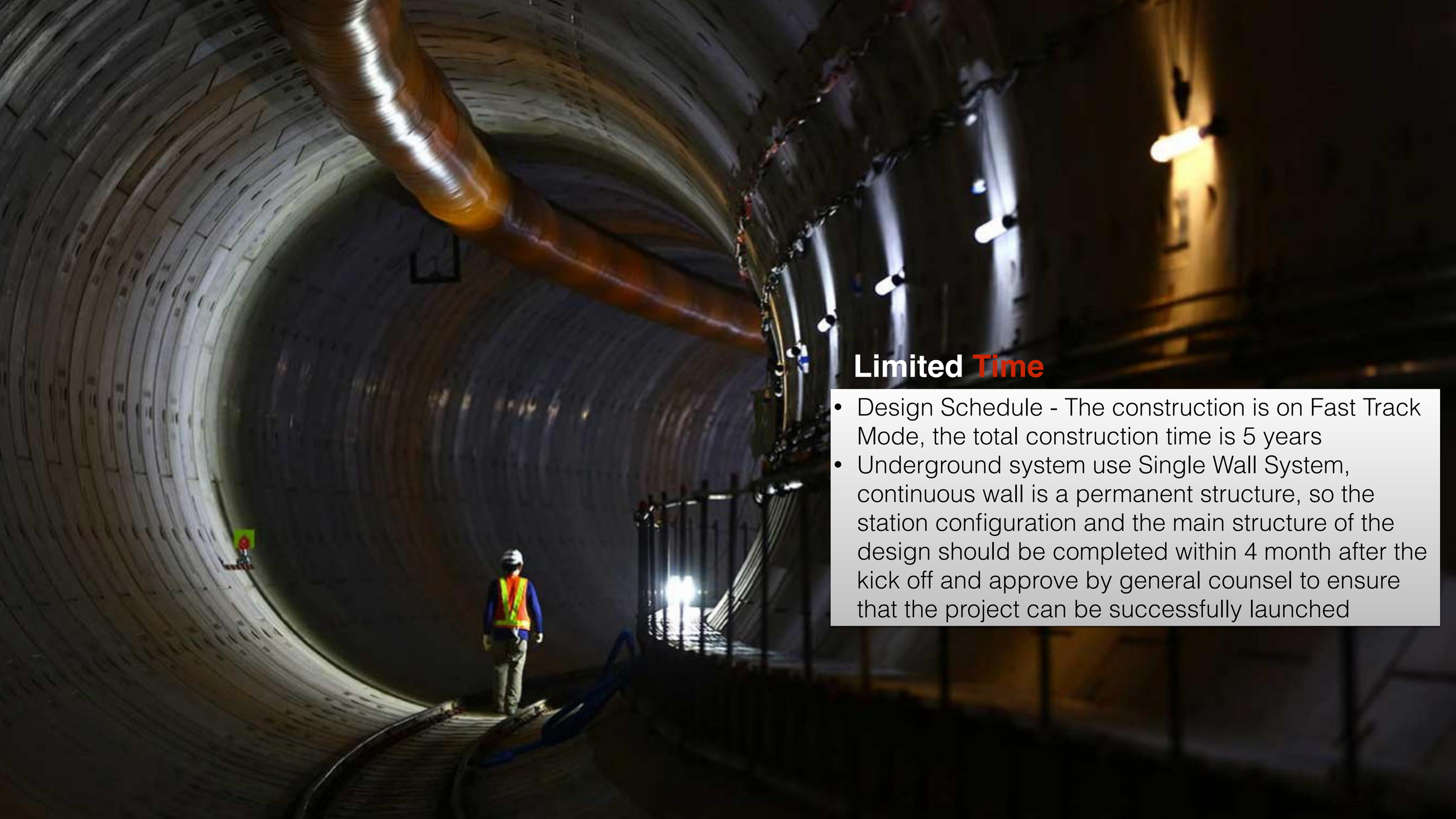
TPKB

INDONESIA
STRUCTURE
LOCAL AUTHORITY

TPIB

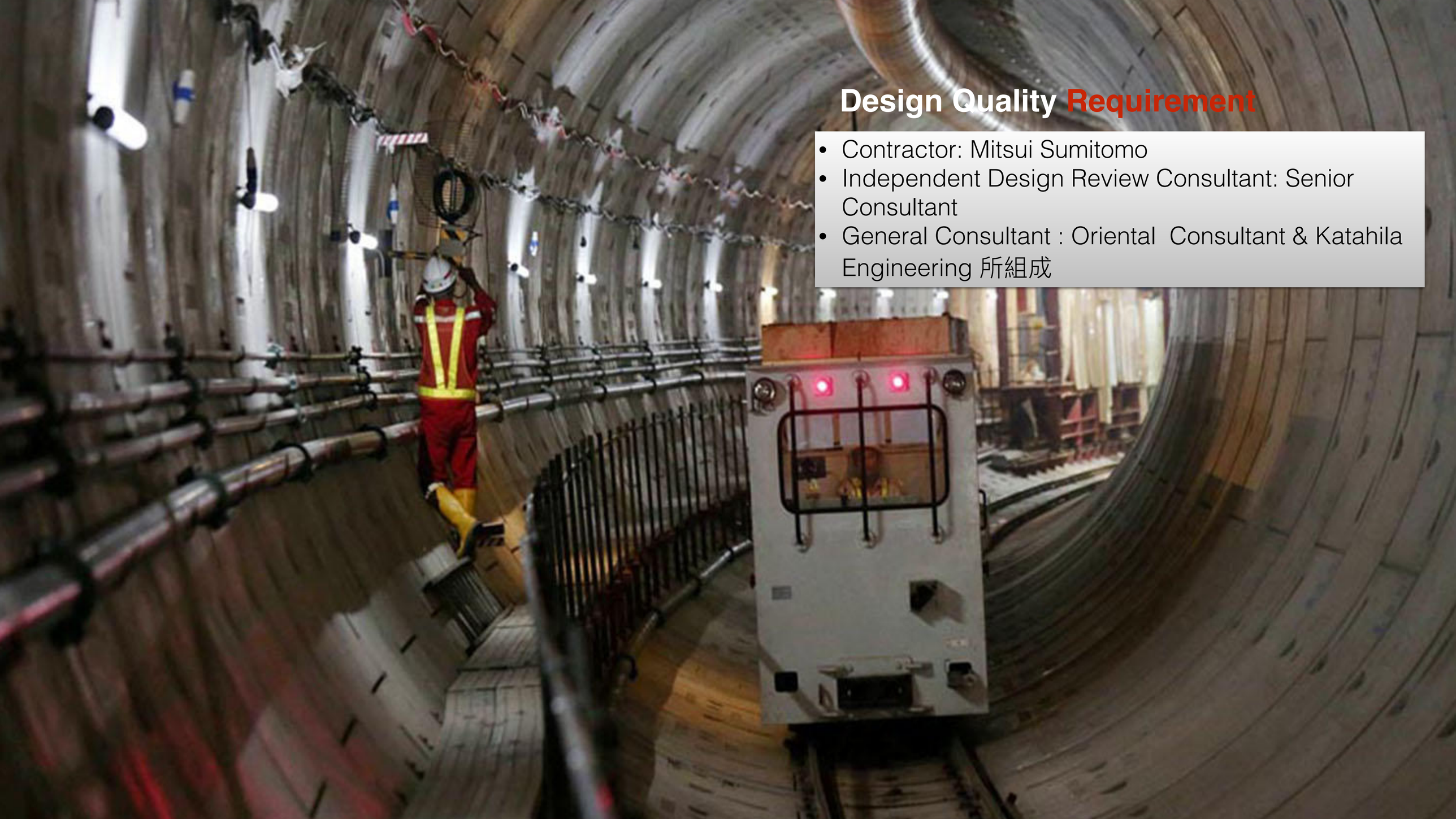
INDONESIA
MECHANICAL ELECTRICAL
LOCAL AUTHORITY

設計與施工採用日本鐵道構造物標準，但同時需符合當地相關法規，通過都市設計審議(TPAK)、結構地工外審(TPKB)及水電環控消防外審(TPIB)等三大外部審查。



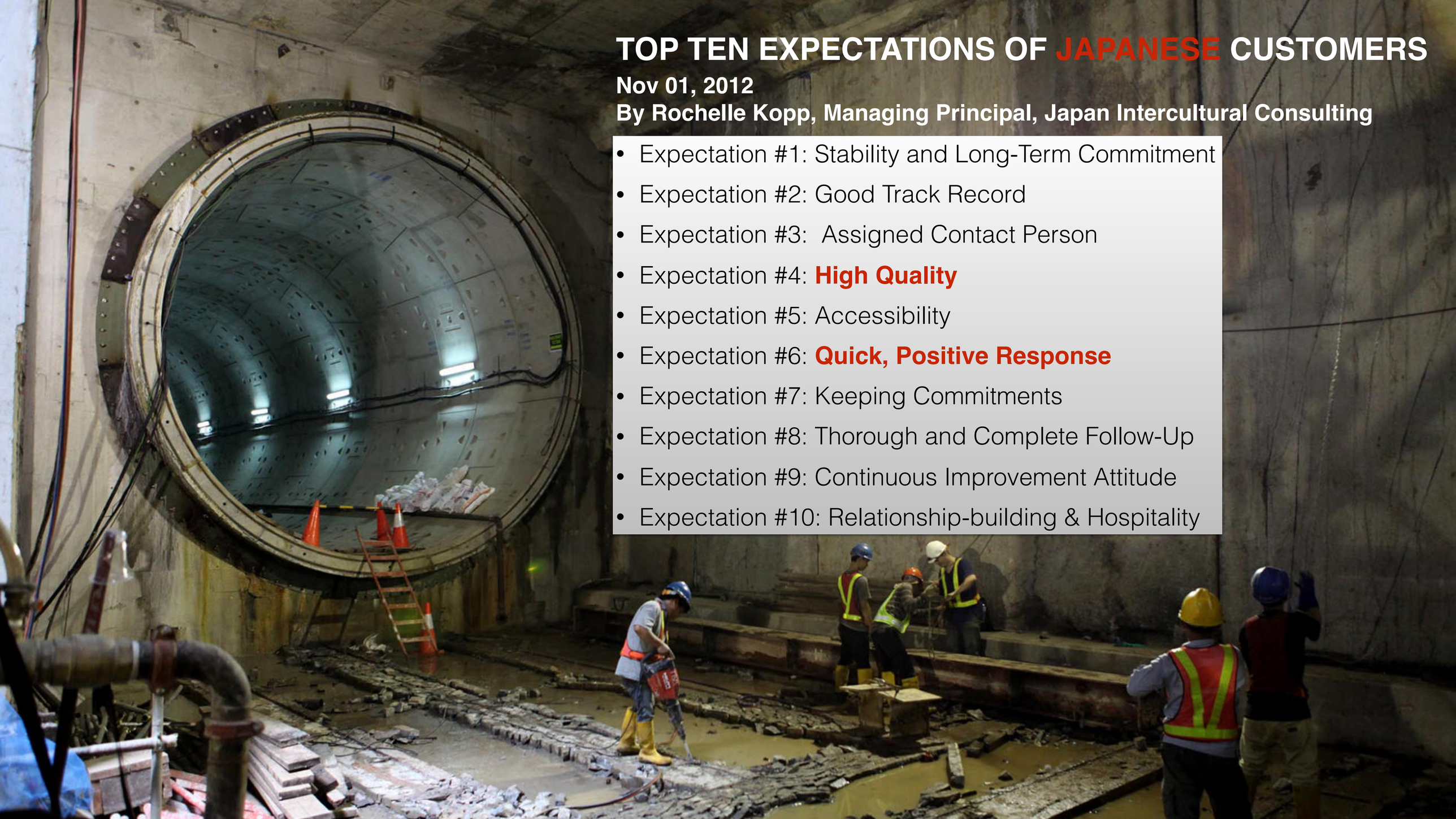
Limited Time

- Design Schedule - The construction is on Fast Track Mode, the total construction time is 5 years
- Underground system use Single Wall System, continuous wall is a permanent structure, so the station configuration and the main structure of the design should be completed within 4 month after the kick off and approve by general counsel to ensure that the project can be successfully launched



Design Quality Requirement

- Contractor: Mitsui Sumitomo
- Independent Design Review Consultant: Senior Consultant
- General Consultant : Oriental Consultant & Katahila Engineering 所組成



TOP TEN EXPECTATIONS OF JAPANESE CUSTOMERS

Nov 01, 2012

By Rochelle Kopp, Managing Principal, Japan Intercultural Consulting

- Expectation #1: Stability and Long-Term Commitment
- Expectation #2: Good Track Record
- Expectation #3: Assigned Contact Person
- Expectation #4: **High Quality**
- Expectation #5: Accessibility
- Expectation #6: **Quick, Positive Response**
- Expectation #7: Keeping Commitments
- Expectation #8: Thorough and Complete Follow-Up
- Expectation #9: Continuous Improvement Attitude
- Expectation #10: Relationship-building & Hospitality

A Complain Letter at Tender Stage

Dear ○○○○ san,

I don’t understand why you take too long time to check your drawings.

Anyhow what I can do now is only to await.

If the bidding date was not extended we have to do "hara-kiri".

I was so surprised at your e mail last night regarding the size of road deck beam.

How come H-900*300 for only 7.6m span?

I don't have power to complain you more.

Best regards,

○○○○

Culture, Language, and Business scale disadvantages

- Jakarta MRT Consultant are 100% International Consultants. Including AECOM, Mott Macdonald and many others.
- CECI is the only consultants from Non-English Speaking Countries and there is no branch office.
- In the language, culture and business scale are disadvantages for this project, but we only want to provide highest quality design services in the competitive international engineering environment.

The Pressure of Competition

- Detailed Design Consultants from neighbor ALWAYS CONTACTED our client to provide VALUE ENGINEERING DESIGN SERVICES
- Willing to help contractor to push the construction price.

主旨	收到日期
RE: For the station Layout	2013/9/21 (週六) 上午 9:53
RE: Fw:CP106 VE Service	2013/8/30 (週五) 下午 2:16
FW: Fw:CP106 VE Service	**2013/8/30 (週五) 上午 10:25**
FW: Fw:CP106 VE Service	2013/8/30 (週五) 上午 10:23
RE: Fw:CP106 VE Service	2013/8/29 (週四) 上午 11:49
FW: Fw:CP106 VE Service	2013/8/29 (週四) 上午 9:16
FW: VE Workshop- visit to Dr. Chauy of Mott today	2013/8/27 (週二) 下午 6:52
VE Workshop- visit to Dr. Chauy of Mott today	2013/8/27 (週二) 下午 6:16
FW: VE workshop- Mott	2013/8/26 (週一) 上午 8:27
Jakarta MRT CP101 & CP102	2013/8/25 (週日) 上午 11:05
Meeting with Mott today	**2013/8/23 (週五) 下午 11:14**
CP106- current status	2013/8/22 (週四) 下午 11:51
RE: Fw:Conf Call Facility for CP106 VE Service	2013/8/17 (週六) 下午 8:49
RE: CP106 Notice of The Commencement Date	2013/8/15 (週四) 下午 12:24
RE: CP106 meeting with Mott	2013/8/14 (週三) 下午 5:34
RE: CP106 meeting with Mott	2013/8/14 (週三) 上午 11:24
RE: CP106 meeting with Mott	2013/8/13 (週二) 下午 9:14
FW: My stay in Jakarta	2013/8/13 (週二) 上午 11:23
Jakarta- August	2013/8/2 (週五) 下午 5:59
RE: Re:VE & track work	**2013/7/24 (週三) 下午 9:02**
VE & track work	2013/7/24 (週三) 下午 3:56
RE: Re:CP106 VE Service	2013/7/24 (週三) 下午 2:16
FW: Re:CP106 VE Service	**2013/7/24 (週三) 下午 12:07**
FW: Re:CP106 VE Service	2013/7/24 (週三) 上午 11:14
RE: Re:CP106 VE Service	2013/7/23 (週二) 下午 6:35
RE: Re:CP106 VE Service	2013/7/22 (週一) 上午 10:16
已接受: SMCC & MOTT Visit for CP106 VE Proposal Work Shop Meeting	**2013/7/21 (週日) 上午 8:52**
RE: Re:CP106 VE Service	2013/7/18 (週四) 下午 1:07
FW: Fw:RE: Re:CP106 VE Service	2013/7/17 (週三) 下午 6:30
RE: Fw:RE: Re:CP106 VE Service	2013/7/16 (週二) 下午 1:40
RE: Fw:RE: Re:CP106 VE Service	2013/7/11 (週四) 下午 3:19
RE: Re:CP106 VE Service	2013/7/10 (週三) 下午 3:17

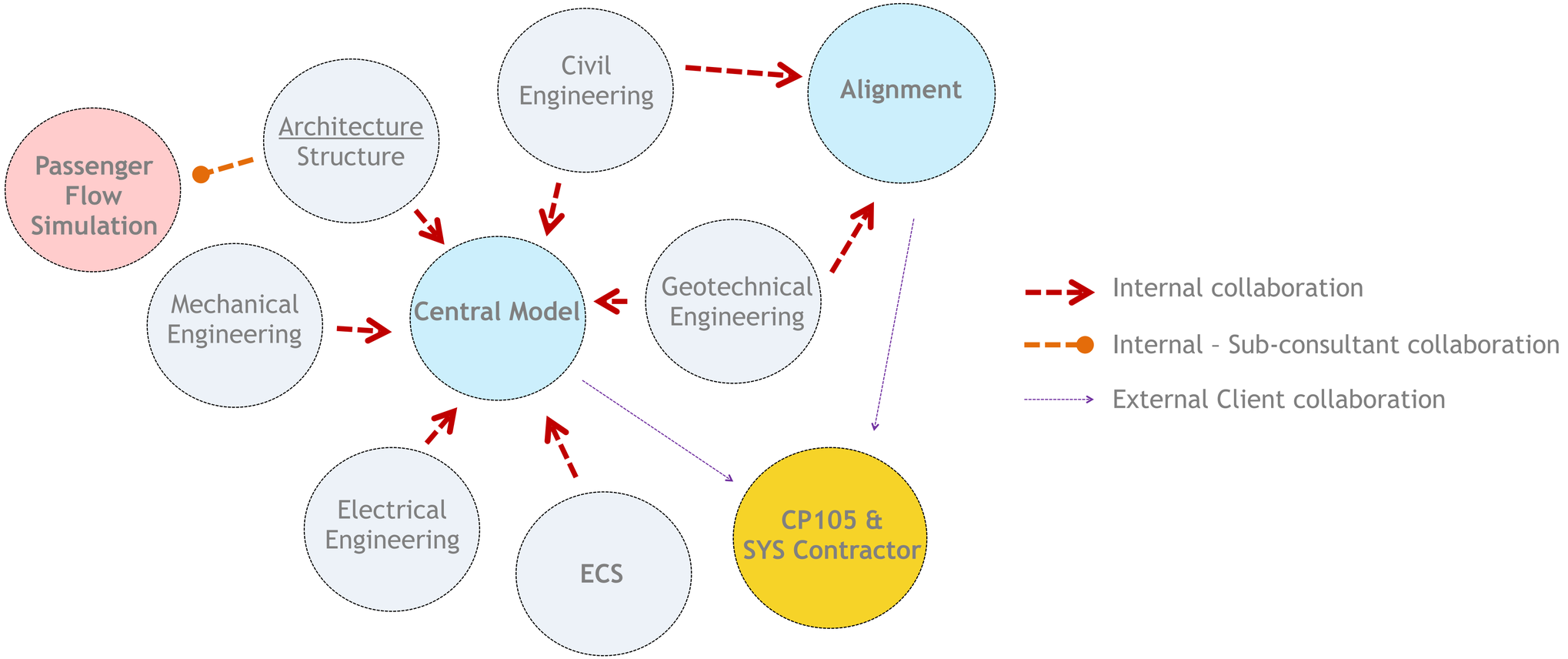
INNOVATIVE SOLUTIONS

創新的解決方案

BIM as Design and Management Tools

How BIM was used to solve the challenges and give benefits to the organization?

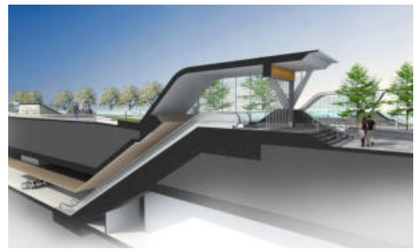
Use several BIM software to get the optimum efficiency and also easy collaboration between internal, outsourcing, and client.



By combining several design principles (Architect, Civil Engineering, Geotechnical Engineering, Electrical Engineering, and Mechanical Engineering), the error in actual design can be avoided and benefit from it can be obtain.

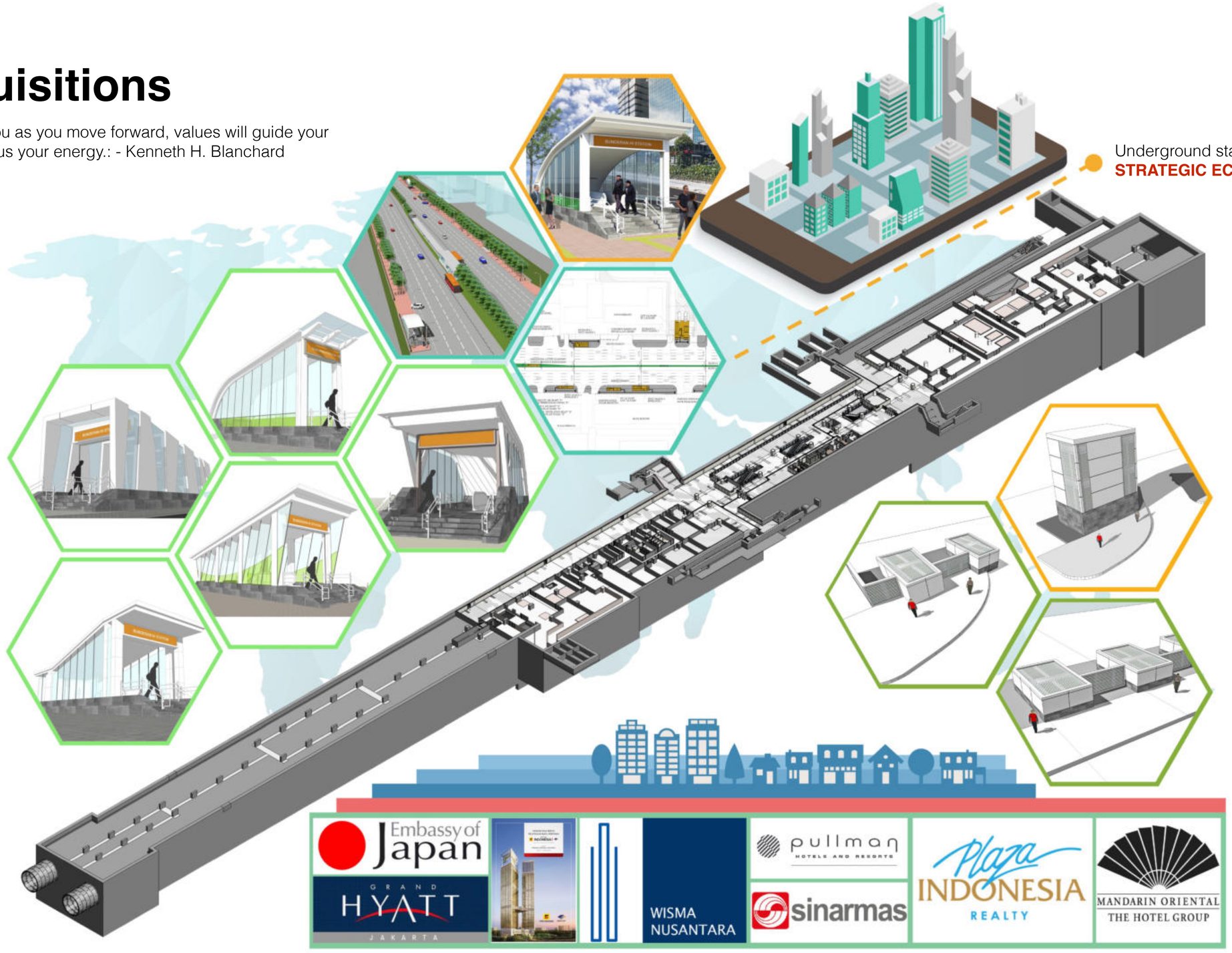
Visualisation

Entrances/ Ventilation Shaft Studies

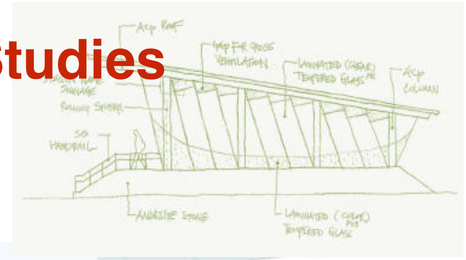


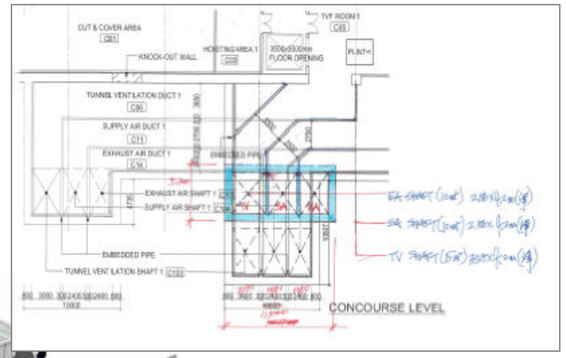
Land Acquisitions

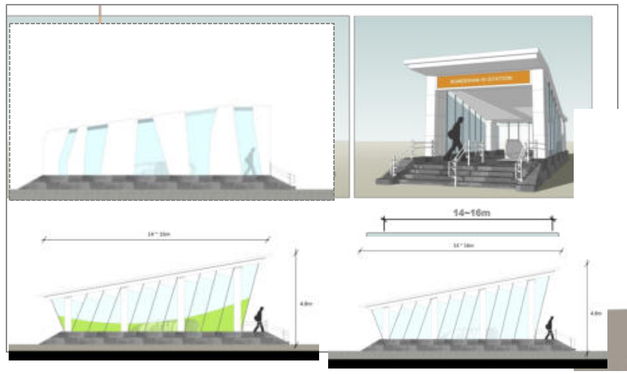
"A clear purpose will unite you as you move forward, values will guide your behaviour, and goals will focus your energy.: - Kenneth H. Blanchard

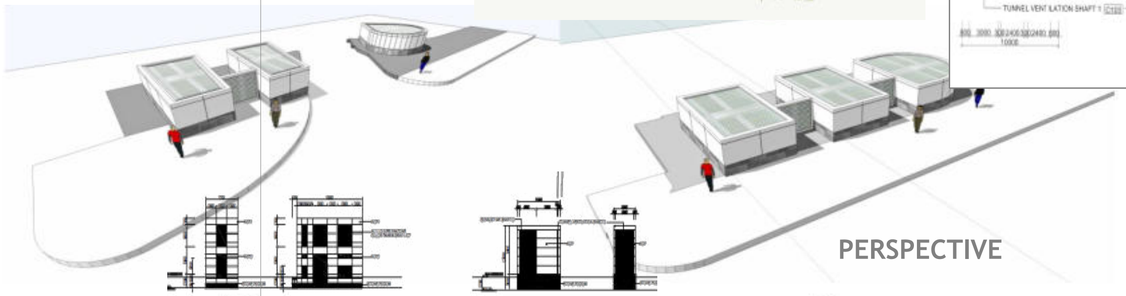


Study and Studies

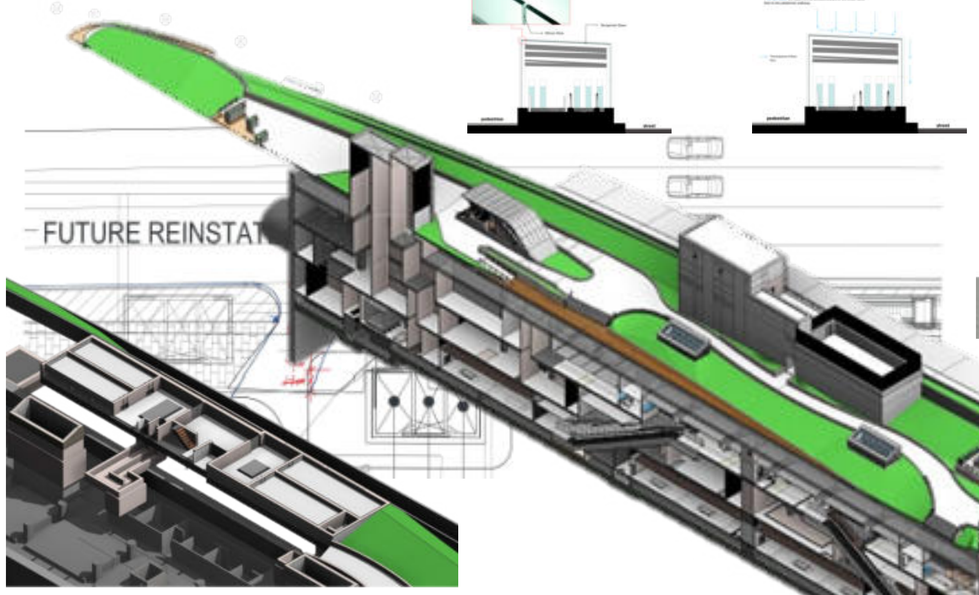




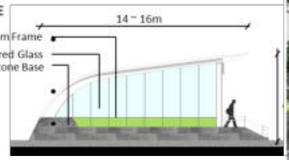


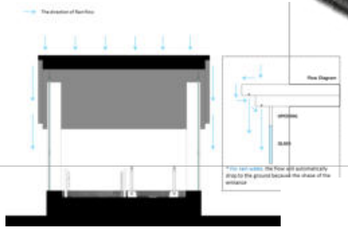


PERSPECTIVE

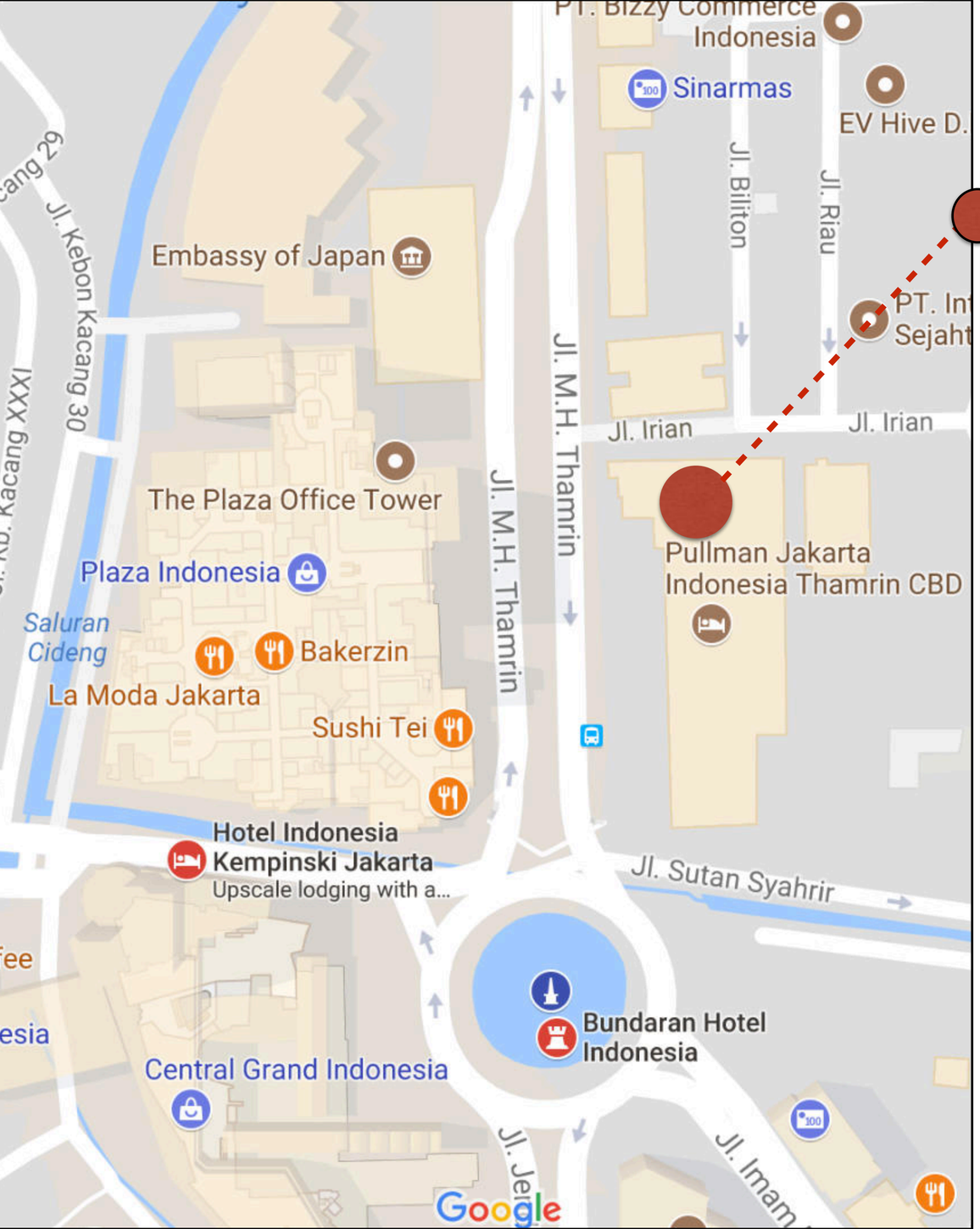


Photoshop Simulation for Client's understanding about "Real Situation" on the construction site





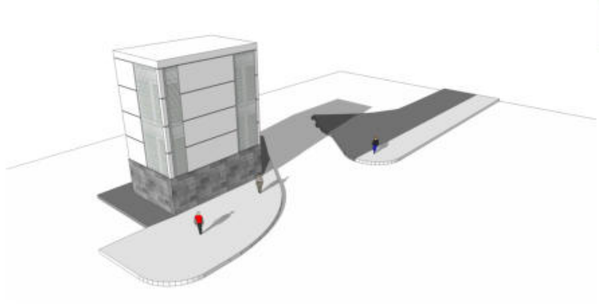
PULLMAN HOTEL JAKARTA



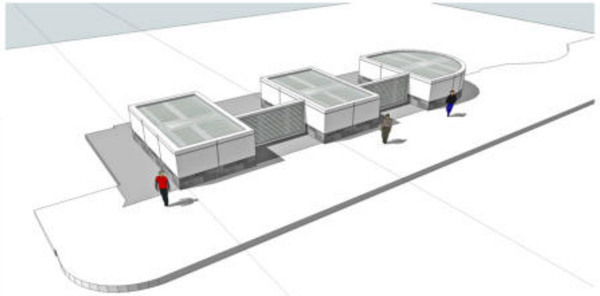
BASIC REQUIREMENT

SECURITY
SAFETY
PRIVATE LAND
COMMERCIAL AREA
ECONOMICAL VALUE

Pullman Cooling Tower and Ventilation Tower

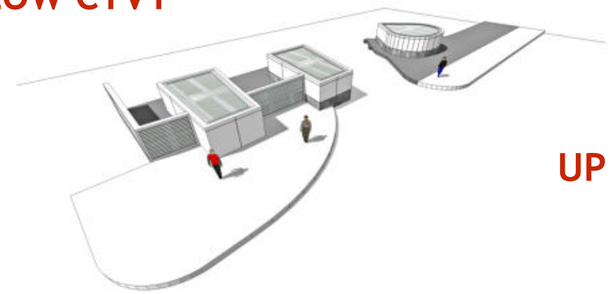


Bundaran HI CTVT Alternatives Design 1



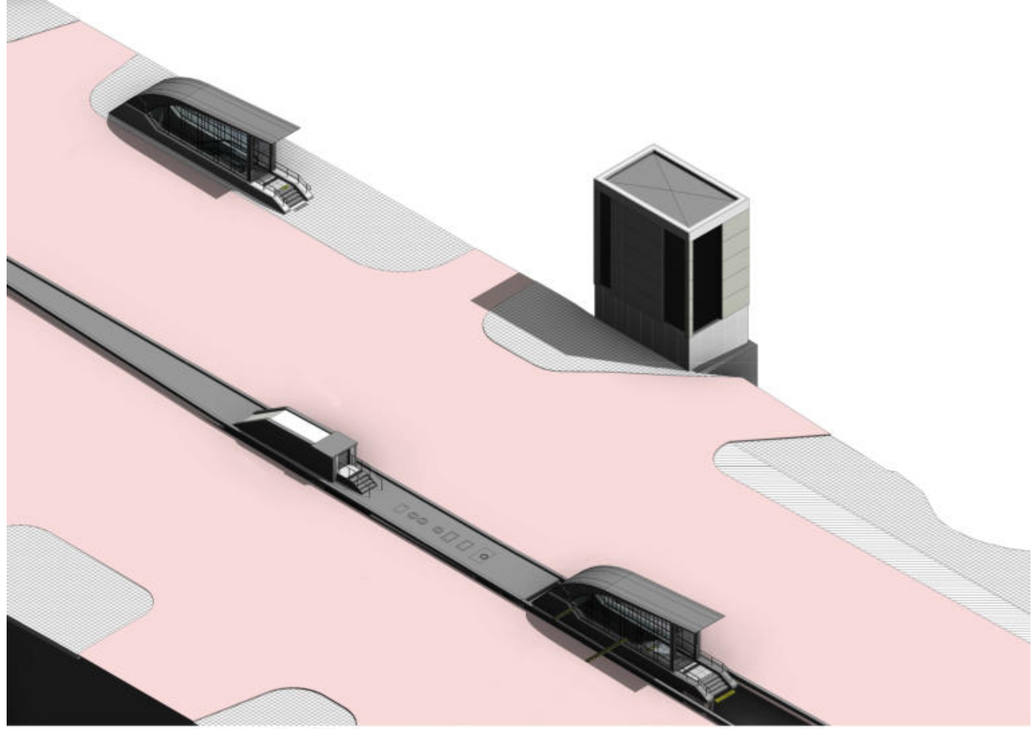
Bundaran HI CTVT Alternatives Design 2

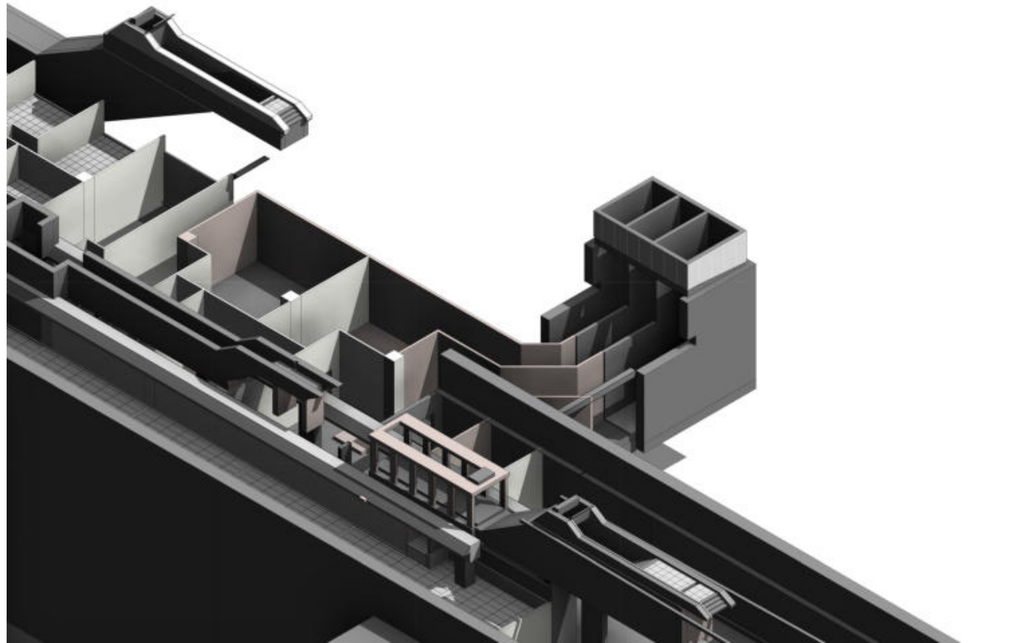
SIDE BLOW CTVT



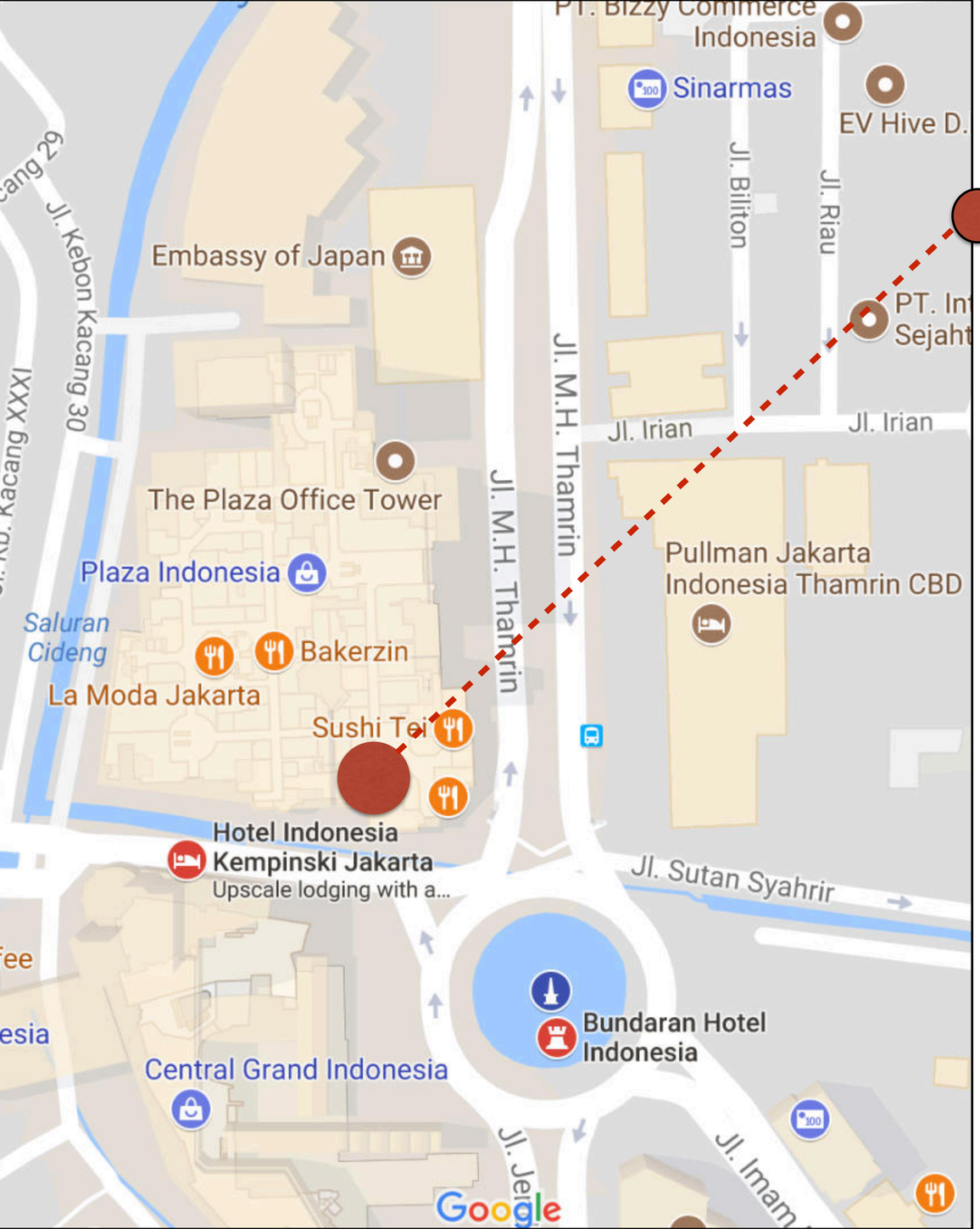
Bundaran HI CTVT Alternatives Design 3

UP BLOW CTVT





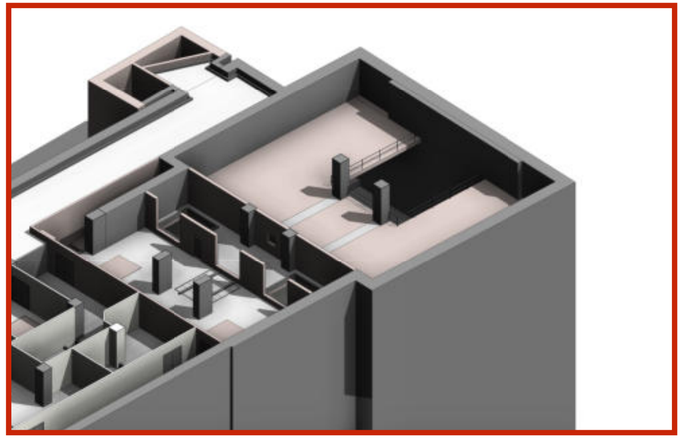
SINARMAS GROUP



BASIC REQUIREMENT

SECURITY
SAFETY
PRIVATE LAND
COMMERCIAL AREA
ECONOMICAL VALUE

DOUBLE CENTRAL MODELS

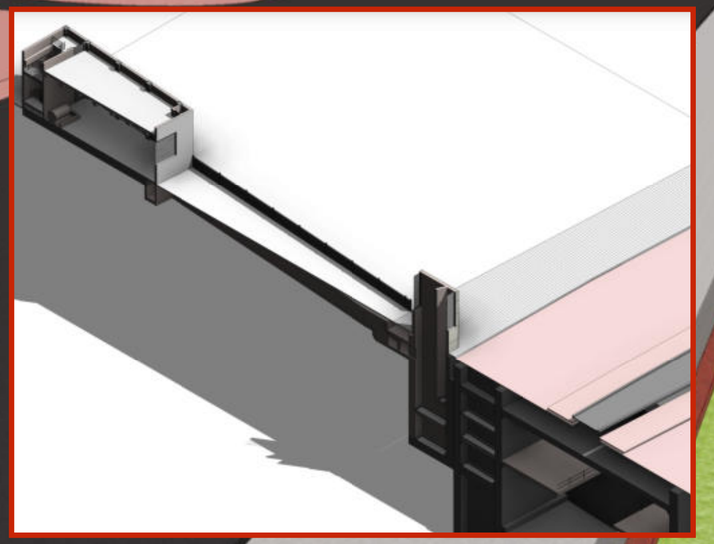


Cooling Tower
Height 12.6 m

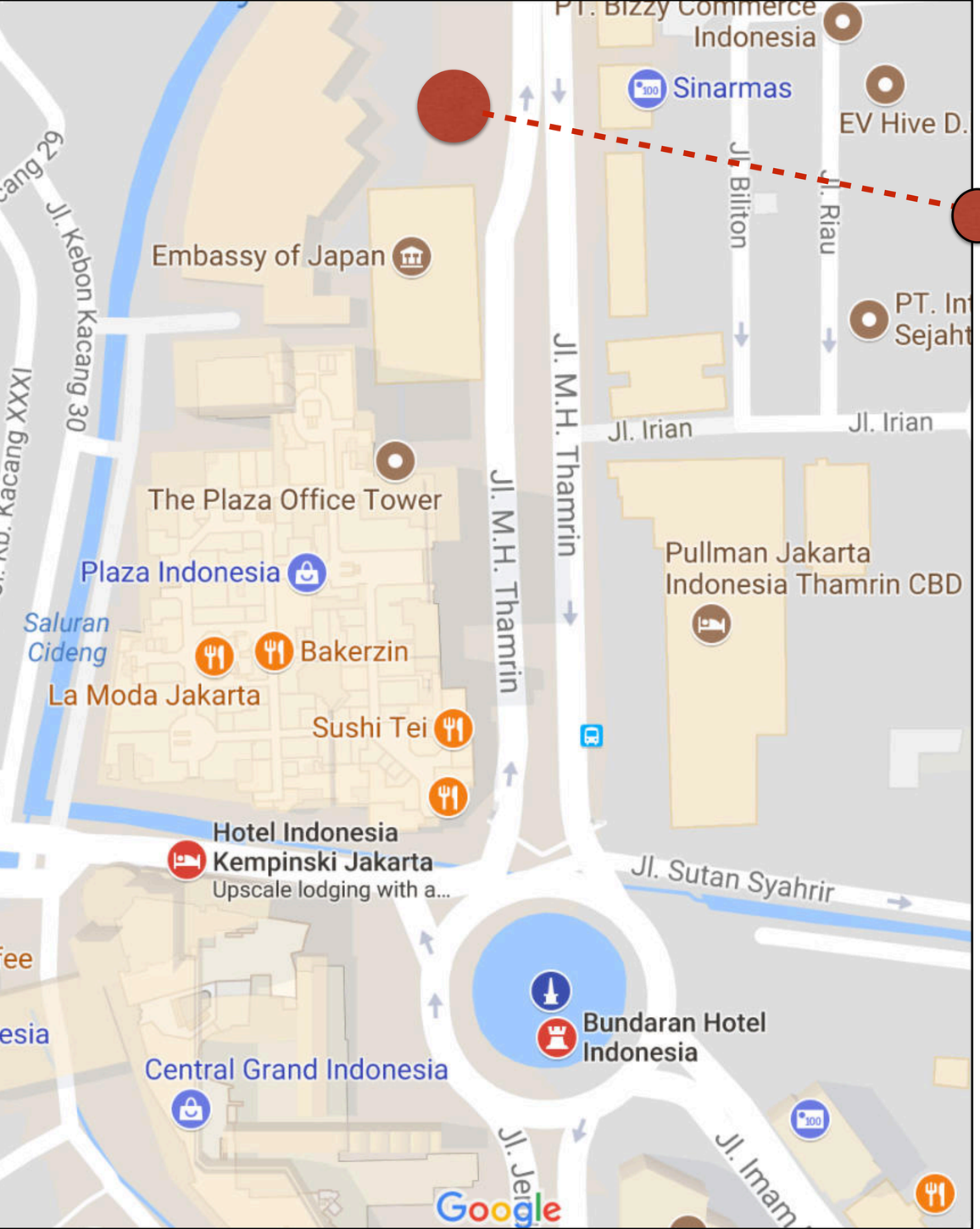
Ventilation Tower
Height 11.6 m

Precast Wall

Sinarmas Land



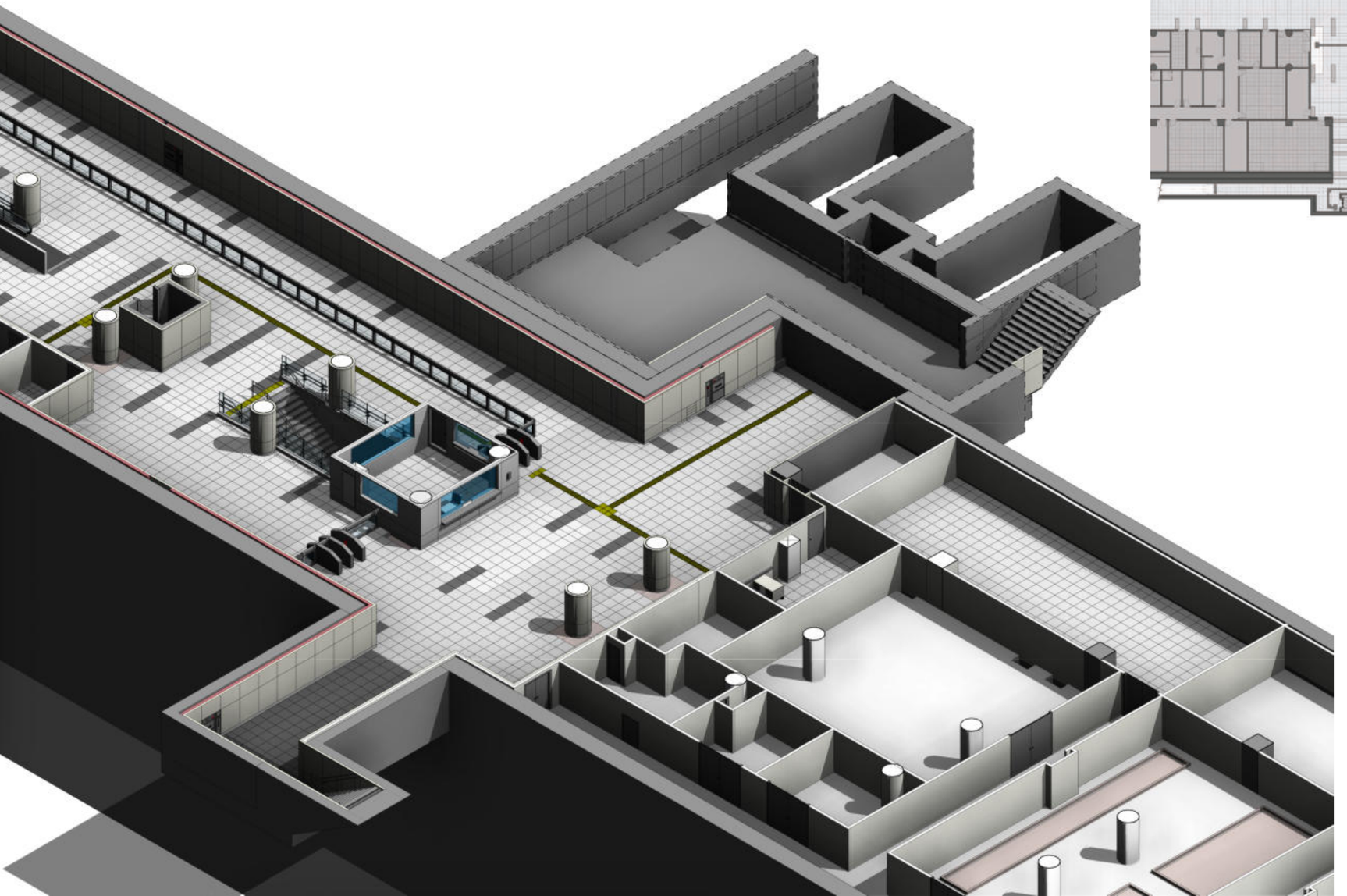
INDONESIA SATU BUILDING

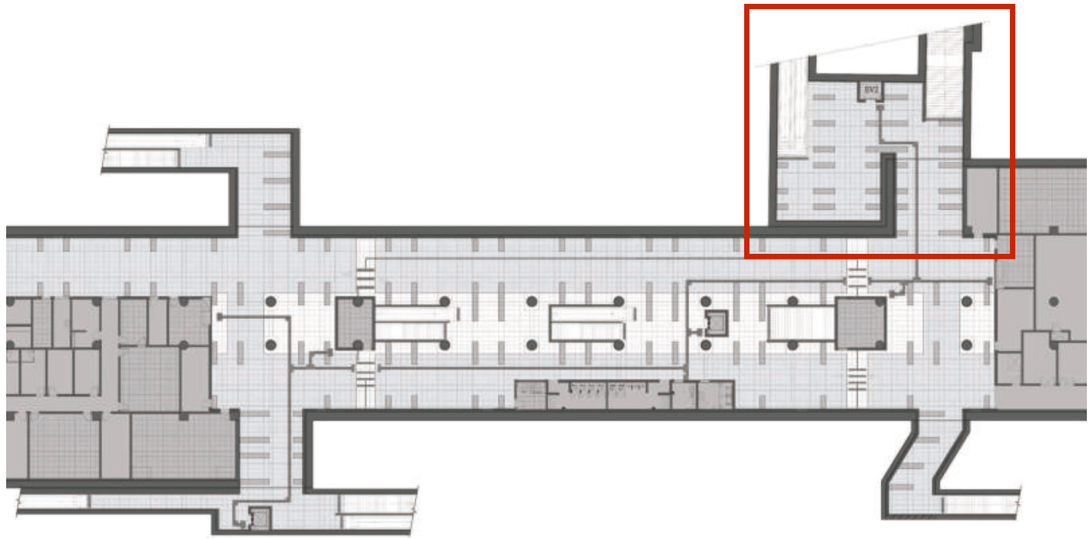


BASIC REQUIREMENT

CONNECTION
SAFETY
SECURITY
PRIVATE LAND
COMMERCIAL AREA
MEP SEPARATION

INDONESIA SATU BUILDING

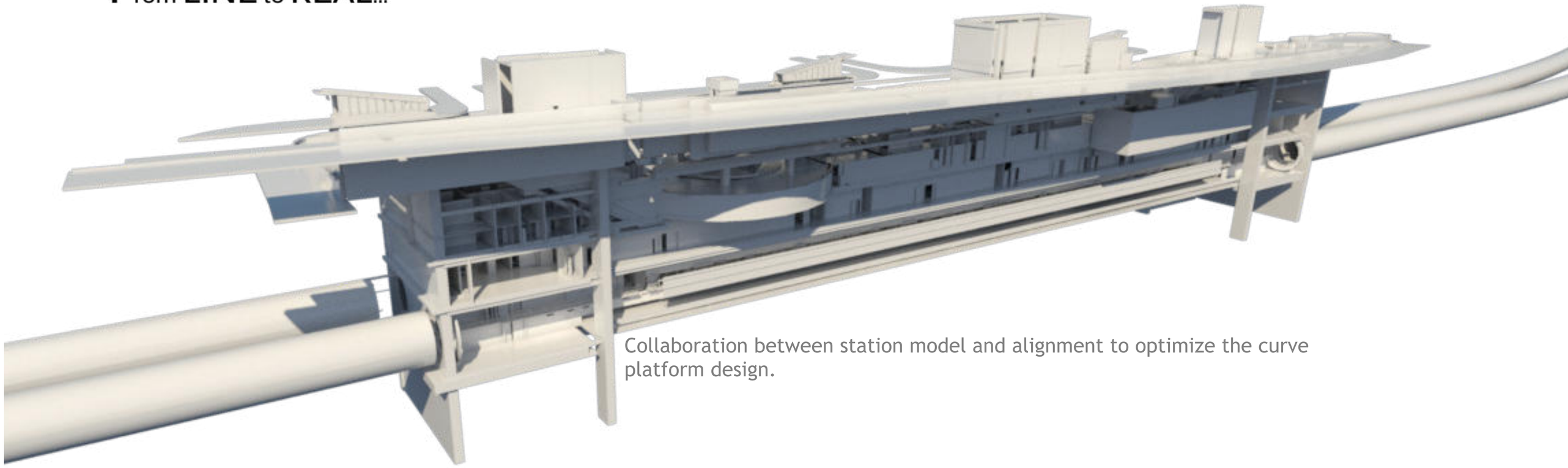




Designed by CS Sonangol
Checked by CECI
Engineering Taiwan

Alignment with STATION

jakarta mass rapid transit
From LINE to REAL...

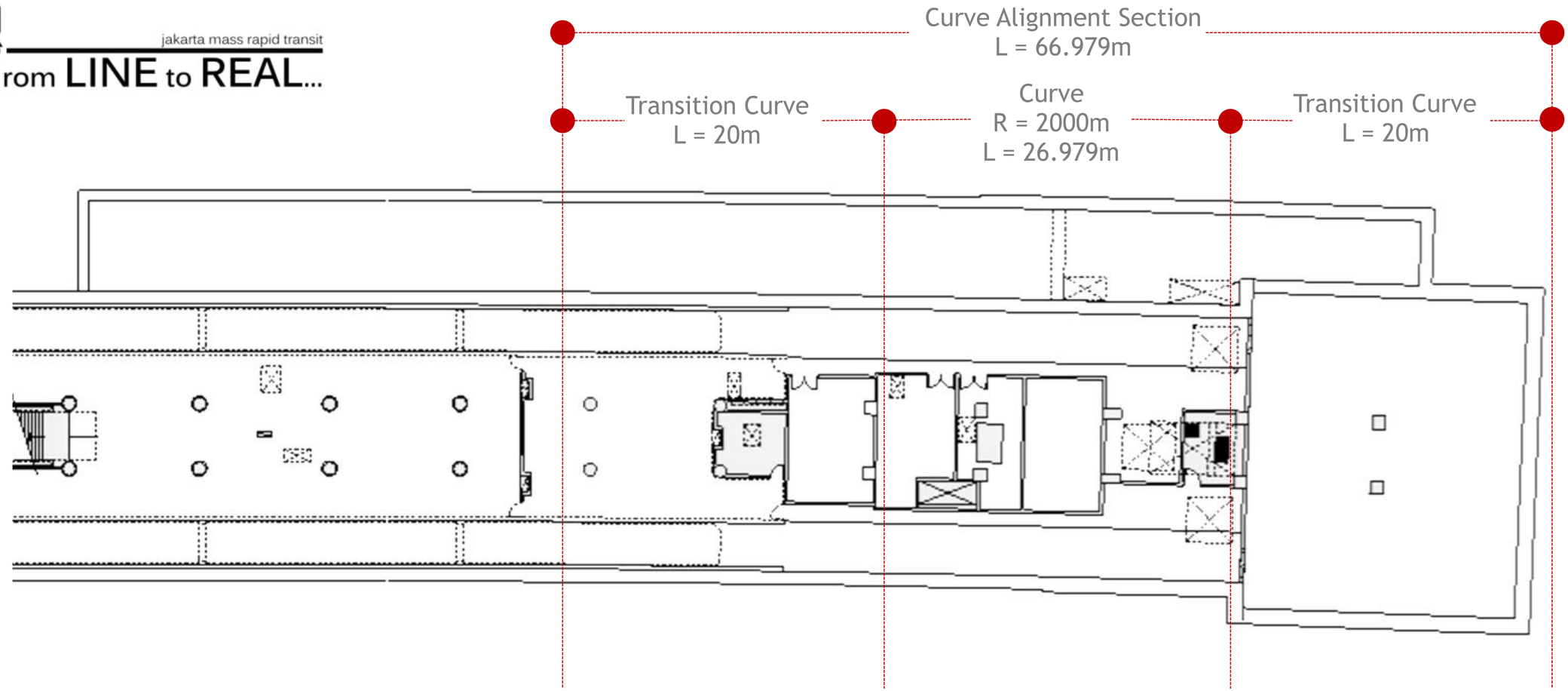


Collaboration between station model and alignment to optimize the curve platform design.

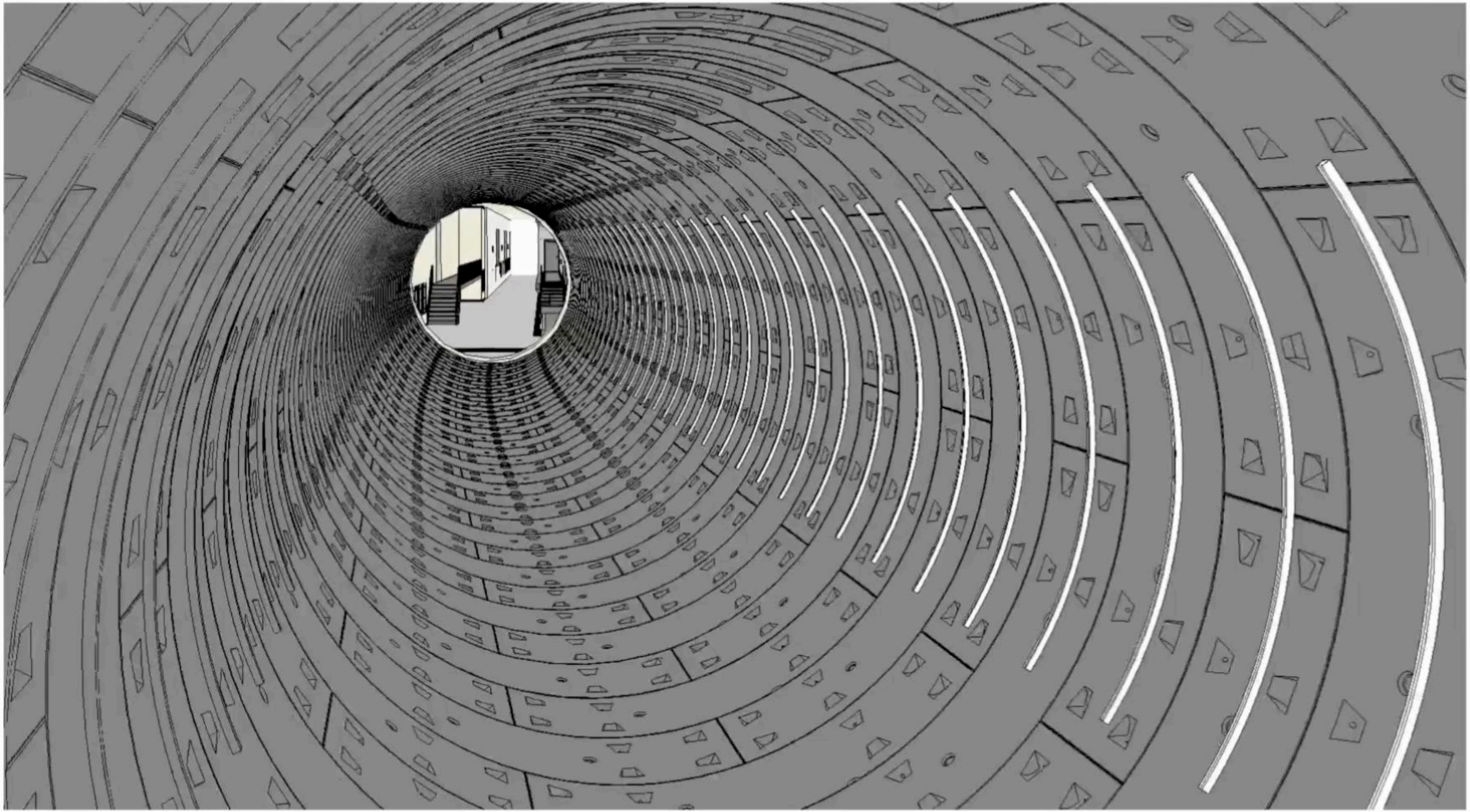
Design Decision

Station at curved alignment

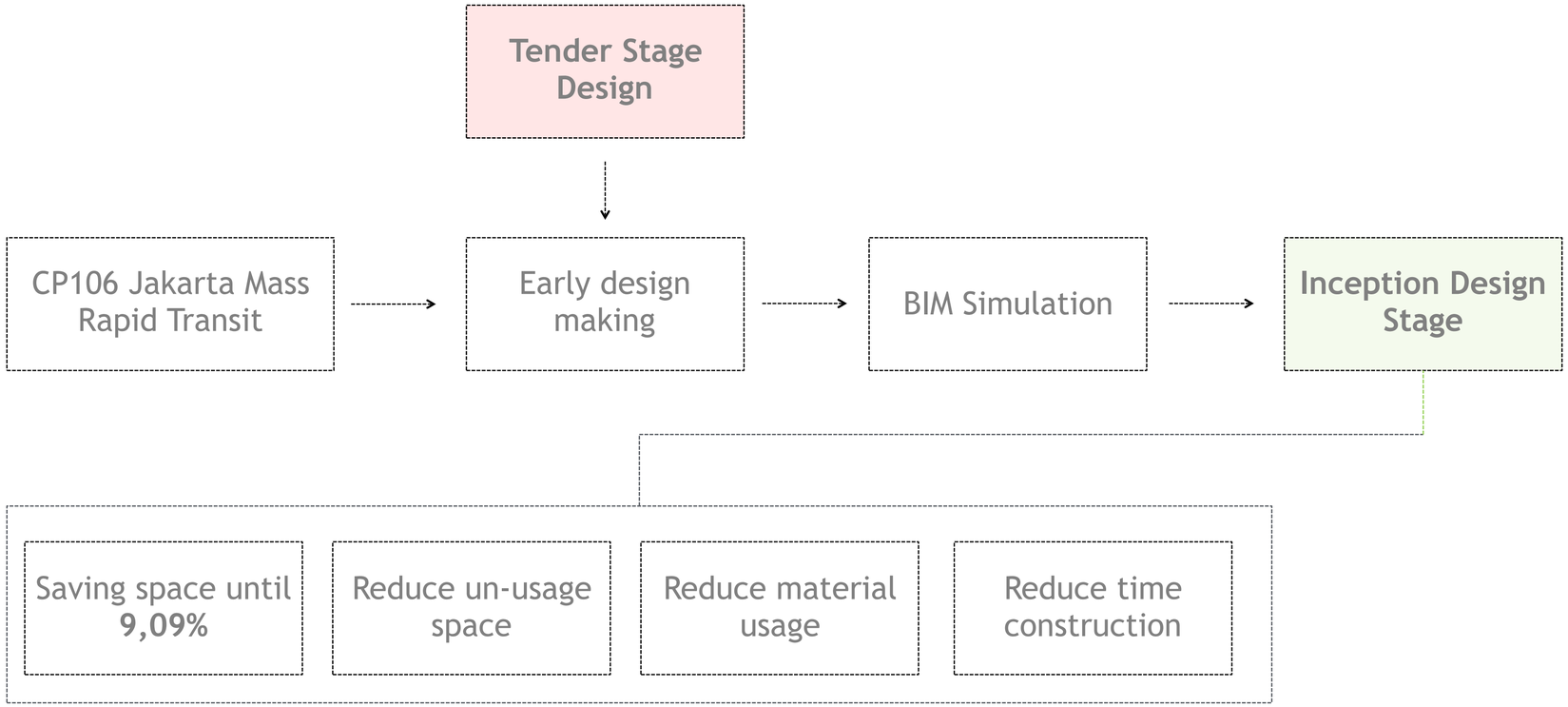
jakarta mass rapid transit
From LINE to REAL...

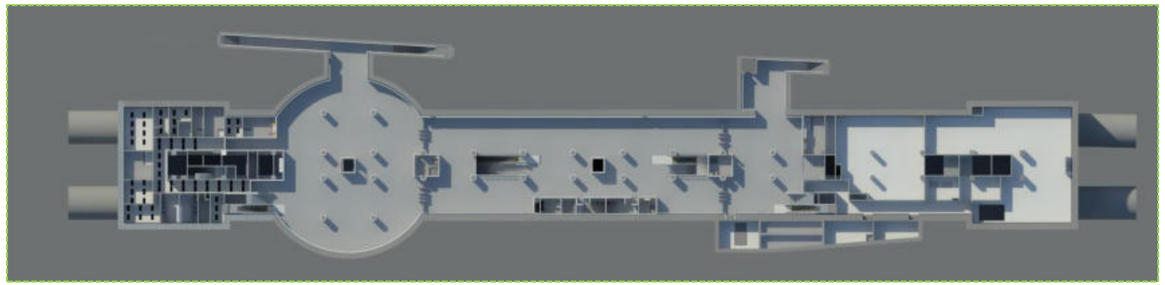


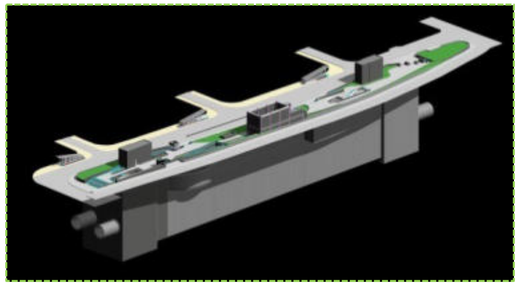
This MRT Station is based on alignment (13 stations), so the location and shapes of the other station need to be considered. BIM provide ability to measure the curve possibility in the station design



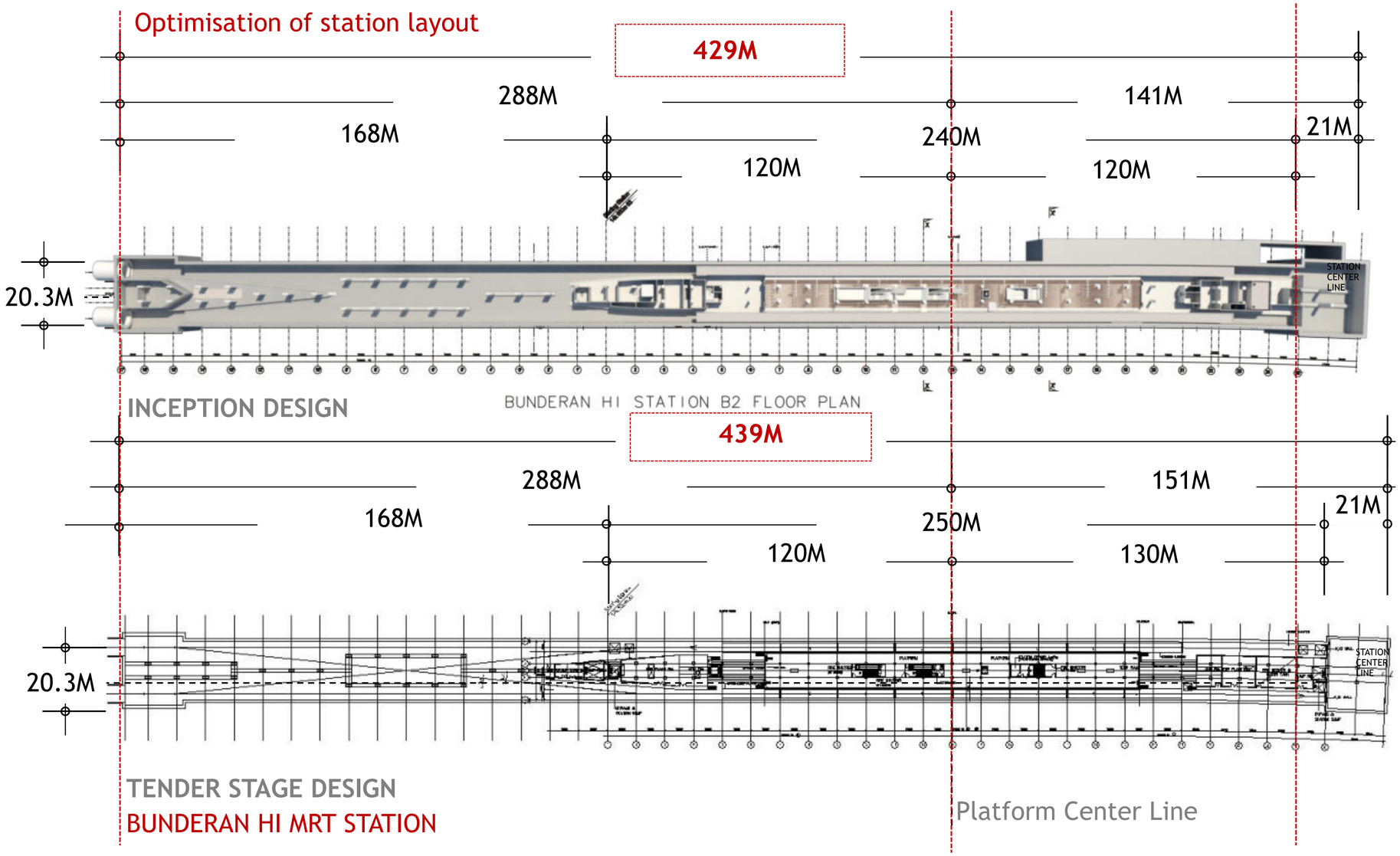
VALUE ENGINEERING



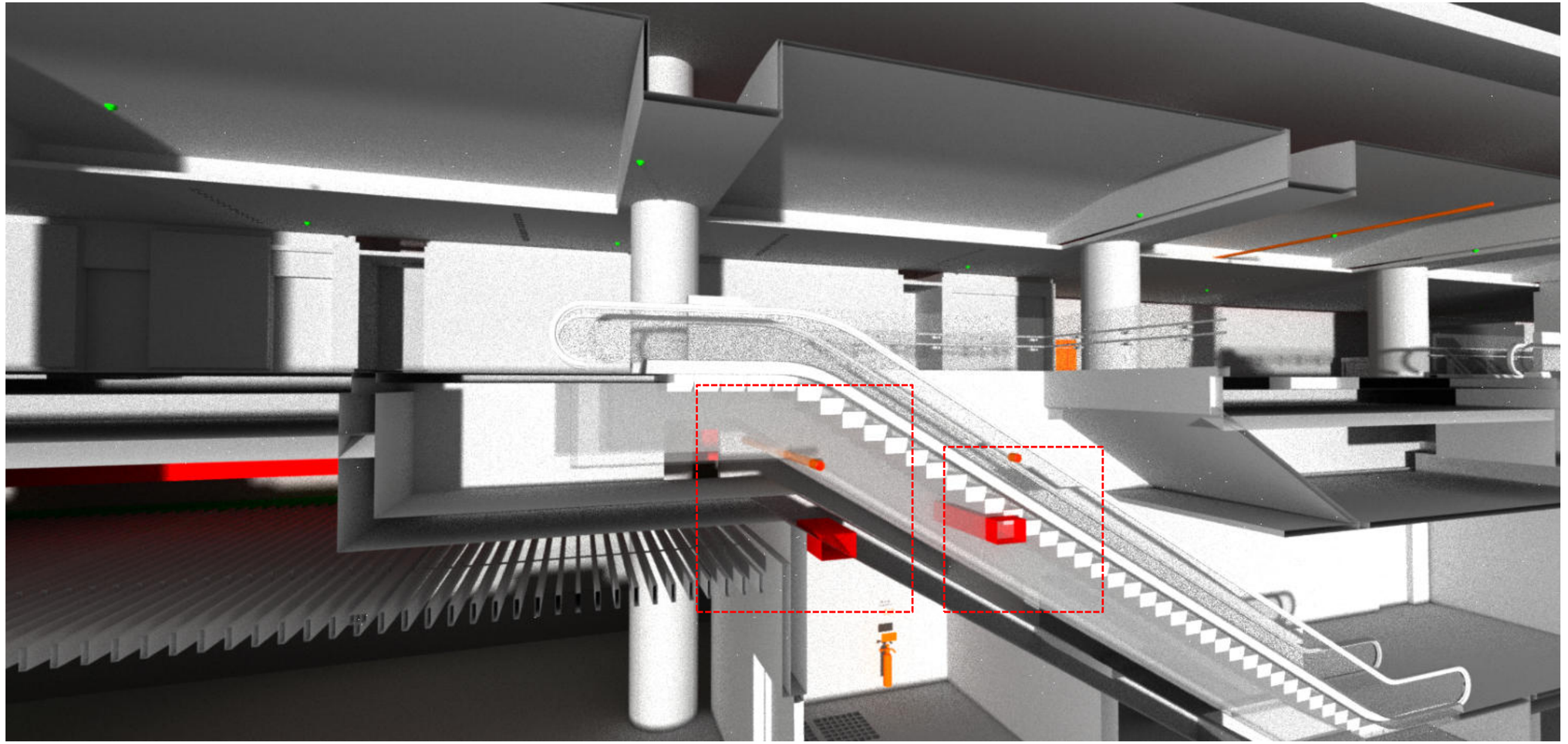




VALUE ENGINEERING I SUSTAINABLE DESIGN

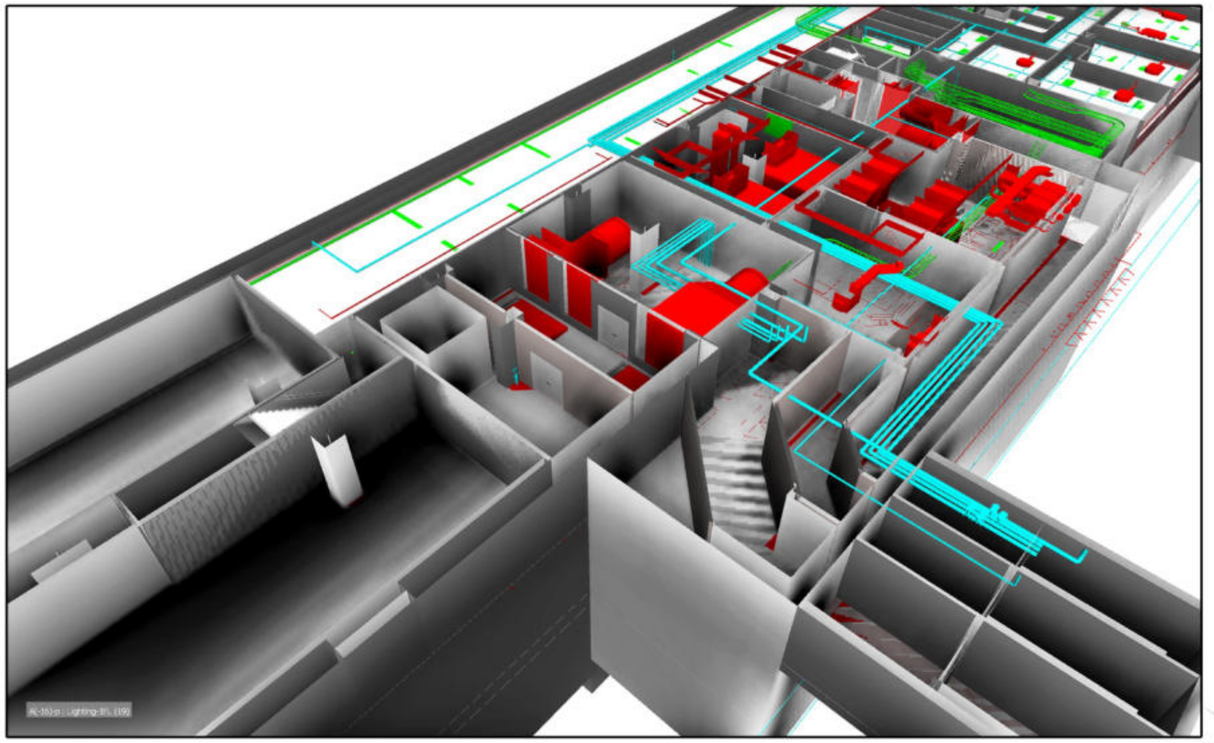


Clash Checking

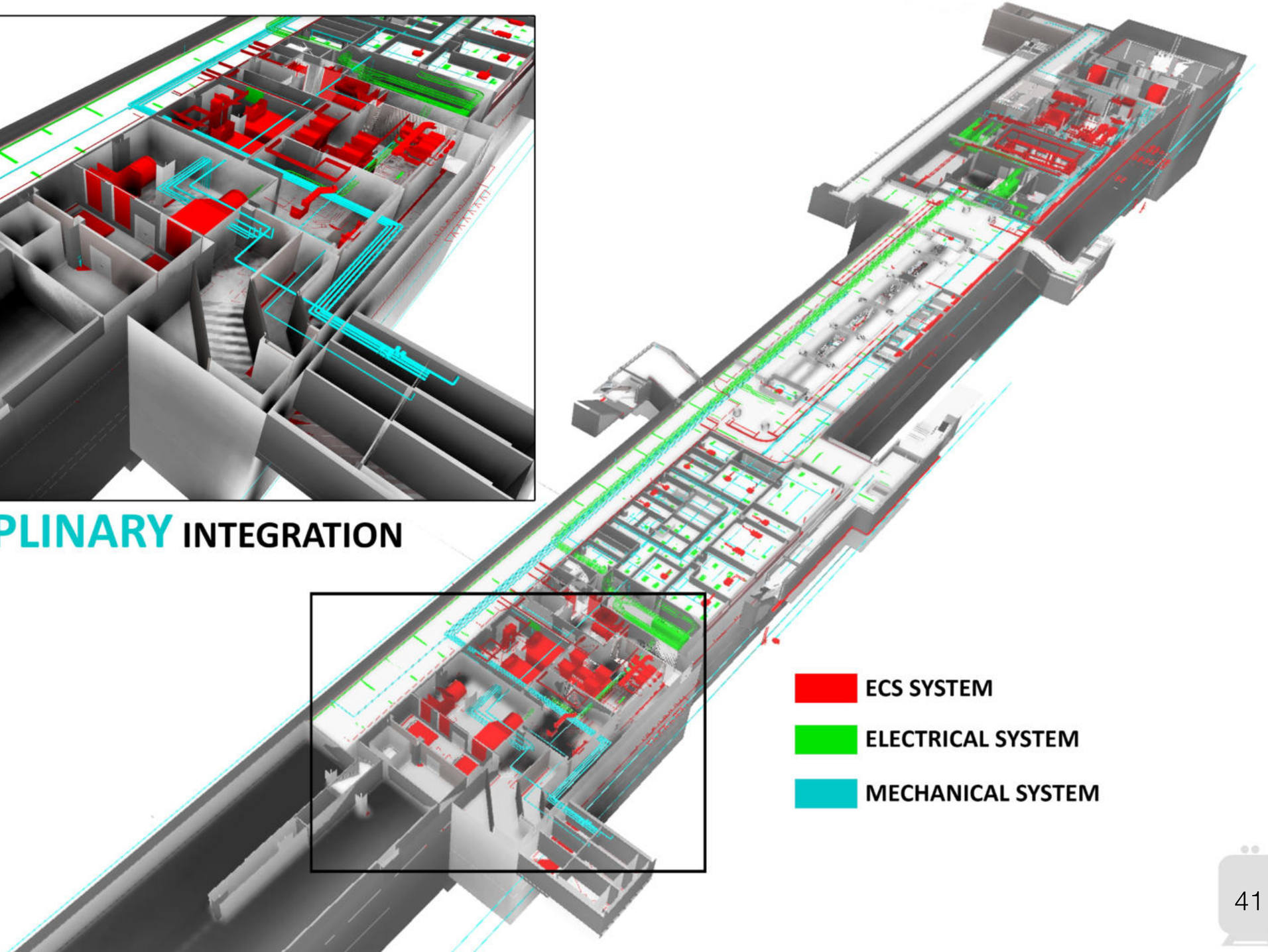


*Minimize the construction error by early checking in design stage

Muti-Disciplinary Collaboration

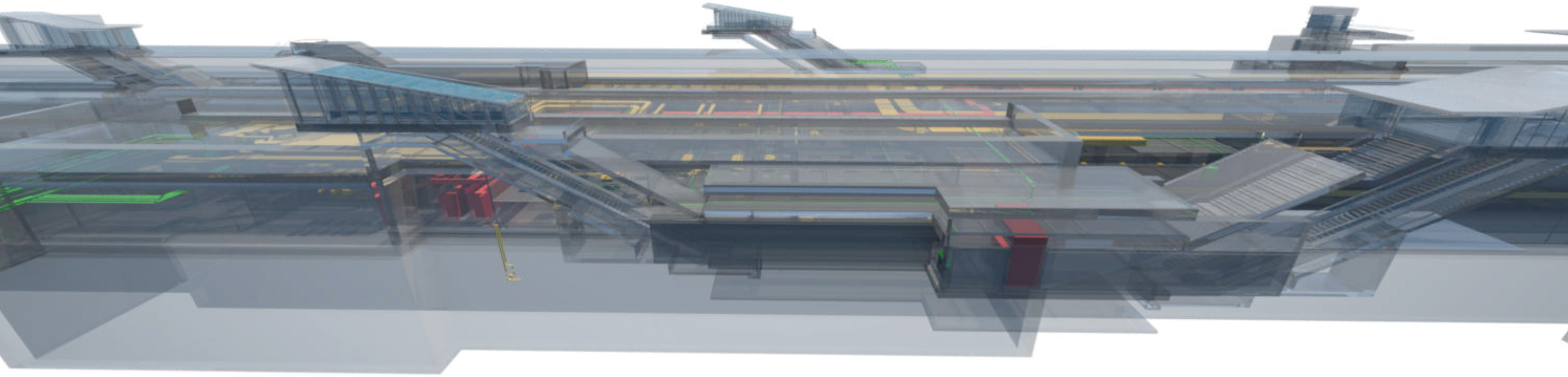


MULTIDISCIPLINARY INTEGRATION



3D Model for Construction Communication

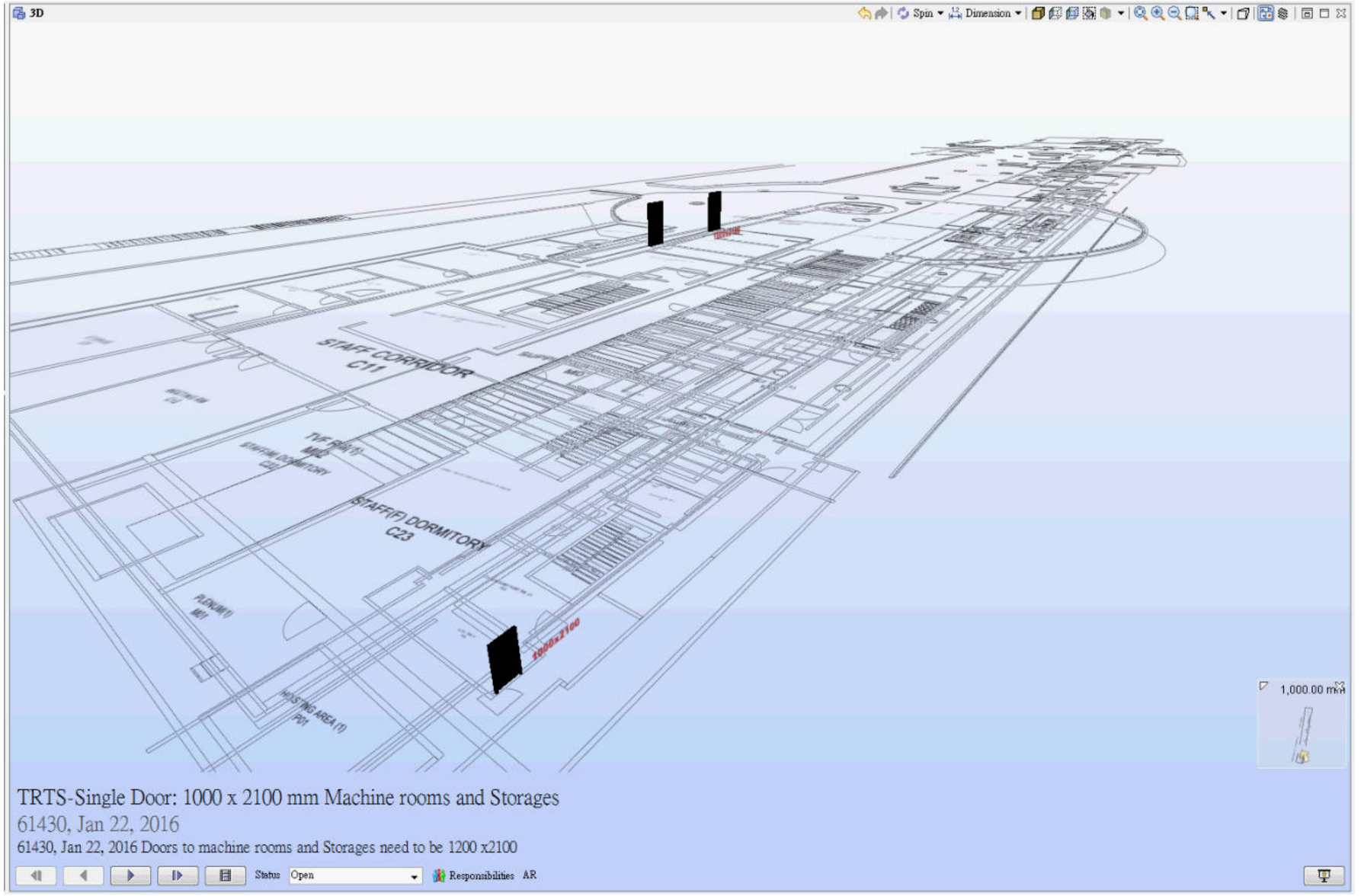
OPENING ARRANGEMENT



*By using BIM software to check all of the opening arrangement, this system can minimise the potential error in real field (double work, material excess, time scheduling, and many others)


B3F Platform Level

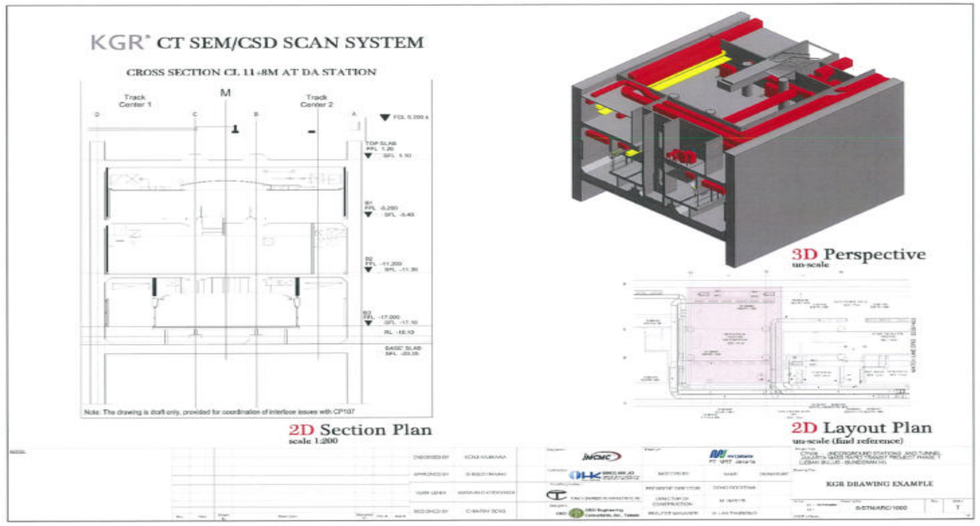
CODE CHECKING



IFC Model Code checking development

COORDINATION WITH SYSTEM-WIDE CONTRACTORS

KGR System (System that provide **easy coordination** between architect on Consultant Head Office (Taipei) and also Site coordinator at Jakarta. Contractor will be more understand about the drawings and minimize the conflict on site



ARCHITECT

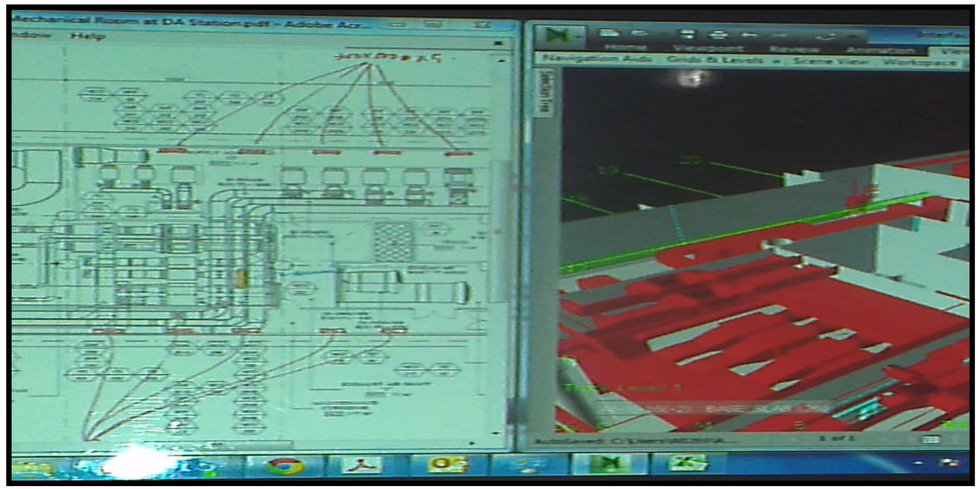
Head Office Taipei

Explanation

Feedback/ RFI

Site Coordinator
Site Office Jakarta

Contractor
Jakarta



*Discussion (on site) based on Detail Drawing and 3D Model

KGR CT SEM/ CSD SCAN SYSTEM

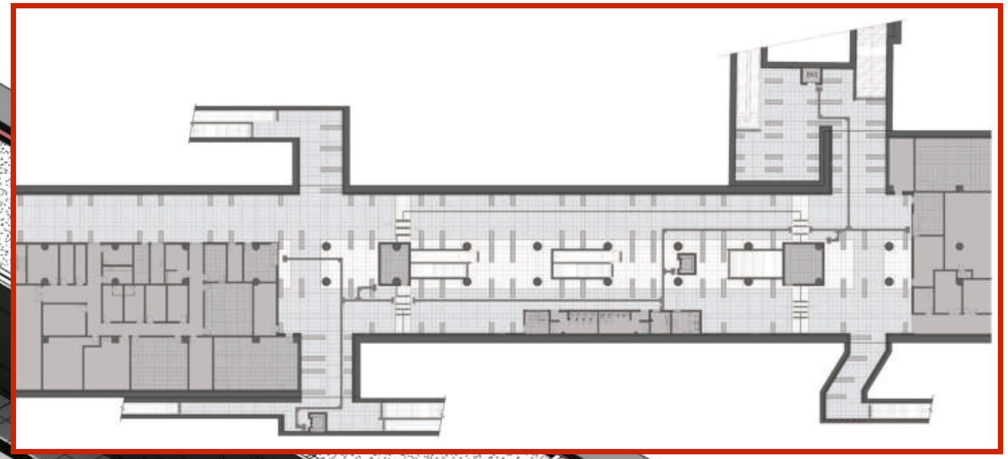
structural, electrical, and mechanical

FRUITFUL RESULTS

豐盛的收獲

BENEFIT - DESIGN QUALITY

ZERO Error between Plans/Sections/Elevations



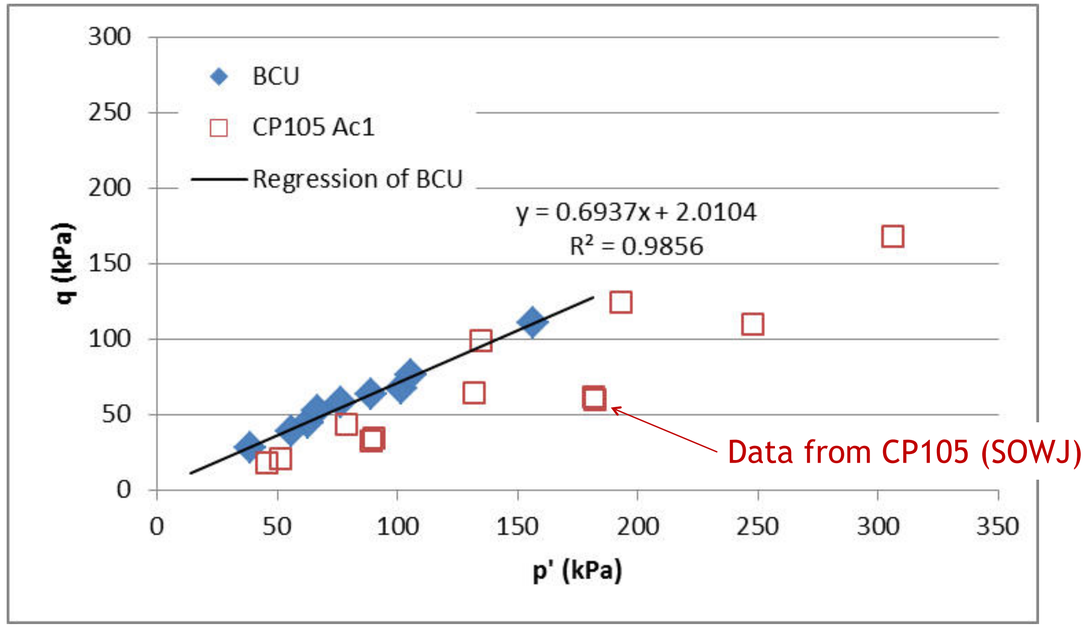
BENEFIT - ECONOMICAL

High Quality Soil Investigation

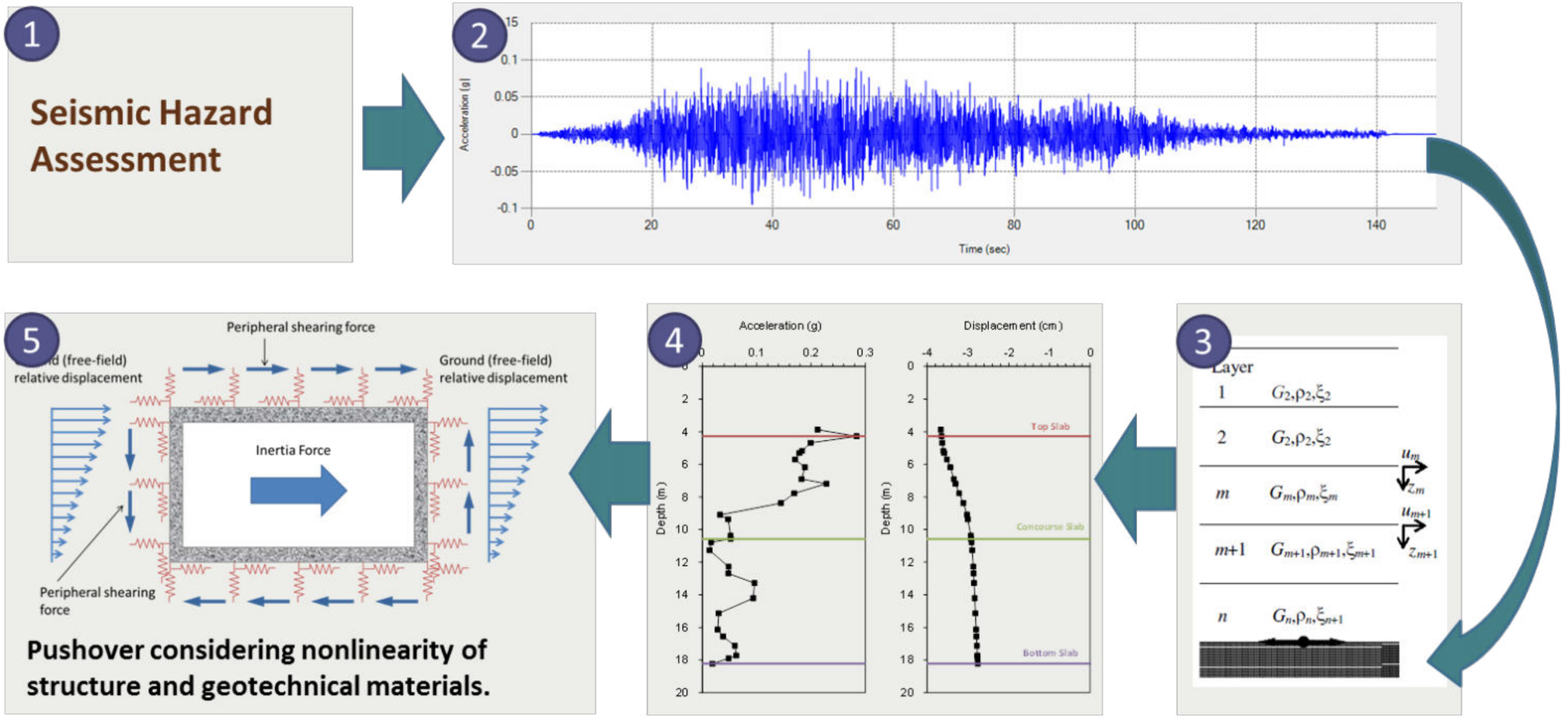
- With qualified supervision
- Good soil sample quality (stationary piston and Mazier sampler)
- Good soil testing quality (carried out by Singapore lab)

Good sample
Good testing

→ Sound Parameters



Nonlinear Seismic Analysis



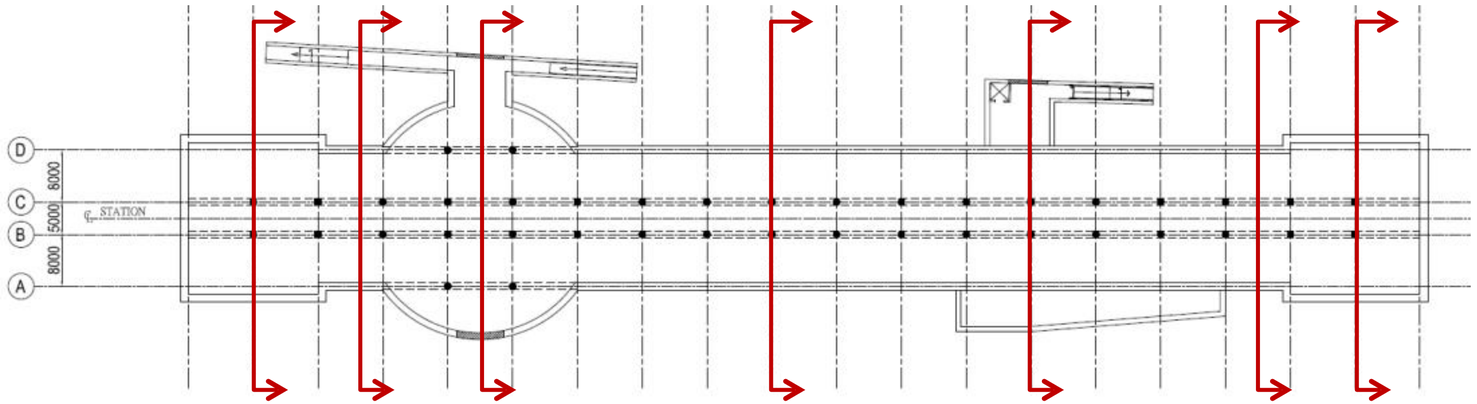
Optimum Design:

Sophisticated FEM Soil/Structure Analysis

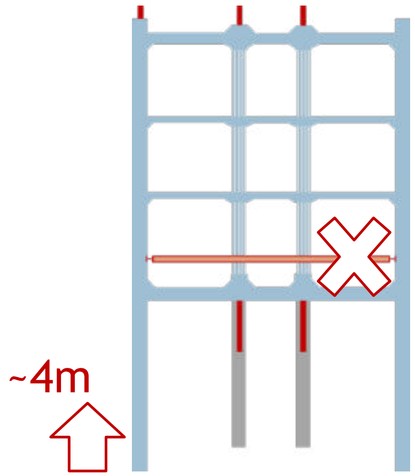
>10% Saving

- Tender Design
  - D-wall t=1.2m **L=38~40m**
  - **One layer of steel strut.**

➢ Technical Design
- D-wall t=1.2m L=33.7~36.5m
- No strut.



Dukuh Atas Station



7 Analytical sections of geotech. / structure analysis.

STATUS OF BUILDING PERMIT PROCESS

as of 24 June 2015

No.	STATION NAME	DPK	P2B							
				TPKB		TPIB				
		Block Plan	TPAK	TPKB-1 Low er Structure	TPKB-2 Upper Structure	LAK (Electrical)	LAL (Electronica)	SDP (Sanitation Drainage & Plumbing)	TUG (HVAC Building)	TDG (Transport Inside Buildings)
0	DEPOT BUILDINGS	Not Completed	Not Submitted	Not Submitted	Not Submitted	Not Submitted				
1	LEBAK BULUS	Not Completed	Passed	2nd Hearing	1st Hearing	Presentation of E&M general concept for all stations CP-101 and CP-102				
			25-Feb-15	25-Mar-15	24-Jun-15					
2	FATMAWATI	Not Completed	Passed	2nd Hearing	1st Hearing					
			25-Feb-15	1-Mar-15	24-Jun-15					
3	CIPETE RAYA	Completed	Passed	2nd Hearing	1st Hearing					
		12-Jun-15	25-Feb-15	25-Mar-15	24-Jun-15					1-Apr-15
4	HAJI NAWI	Completed	Not Submitted	Not Submitted	Not Submitted	Not Submitted				
		7-Jun-15								
5	BLOK A	Completed	1st Presentation	Not Submitted	Not Submitted	Not Submitted				
		7-Jun-15	13-May-14							
6	BLOK M	Completed	Passed	Passed	5th Hearing	Passed	Passed	Passed	Passed	Passed
		7-Jun-15	8-Oct-14	29-Oct-14	14-Jan-15	17-Dec-14	17-Dec-14	17-Dec-14	17-Dec-14	17-Dec-14
7	SISINGAMANGARAJA	Completed	Passed		Submiited	Submitted	Submitted	Submitted	Submitted	Submitted
		7-Jun-15	25-Mar-15		5-Jun-15	11-May-15	11-May-15	11-May-15	11-May-15	11-May-15
8	SENAYAN	Completed	Passed	3rd Hearing	3rd Hearing	Not Submitted				
		27-May-15	1-Apr-15	21-Jan-15	10-Sep-15					
9	ISTORA	Completed	Passed	Not Submitted	Not Submitted	Not Submitted				
		27-May-15	1-Apr-15							
10	BENDUNGAN HILIR	Completed	Passed	Not Submitted	Not Submitted	Not Submitted				
		27-May-15	1-Apr-15							
11	SETIABUDI	Completed	Passed	3rd Hearing	3rd Hearing	Not Submitted				
		27-May-15	1-Apr-15	21-Jan-15	10-Sep-14					
12	DUKUH ATAS	Not Completed	6th Consultation	Passed	Passed	Not Submitted				
			10-Jun-15	10-Jun-15	13-May-15					
13	BUNDERAN H.I	Not Completed	7th Cosultation	Passed	Passed	Not Submitted				
			27-May-15	27-May-15	13-May-15					

BENEFIT - DESIGN REQUIREMENT

Standard that can apply in different scale and major, such as Structural and Architectural

Can make the design more efficient and effective

Most Optimize and Economical Design

The first to pass TPKB review

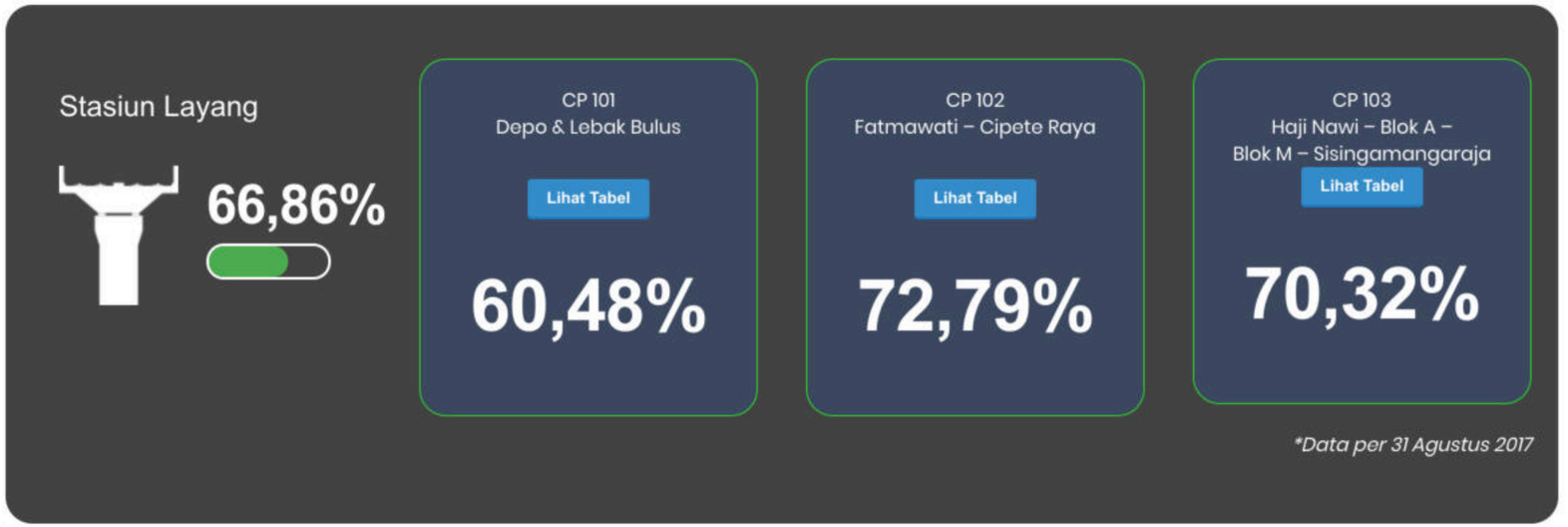
BEST CONSTRUCTION PROGRESS

November 2013 **December 2014**

SOURCE: ANNUAL REPORT MRT JAKARTA

BEST CONSTRUCTION PROGRESS

BEST CONSTRUCTION PROGRESS



SOURCE: ANNUAL REPORT MRT JAKARTA

*Design and Construction

BENEFIT - WINNING PRIZES

AUTODESK BIM AWARDS 2015 - HONG KONG, TAIWAN, AND MACAU

BENEFIT - WINNING PRIZES

AUTODESK BIM AWARDS 2015 - HONG KONG, TAIWAN, AND MACAU

Gave 2015 BIM Award Trophy to our client - MRT Jakarta

TICKETS FOR OTHER OVERSEAS PROJECTS

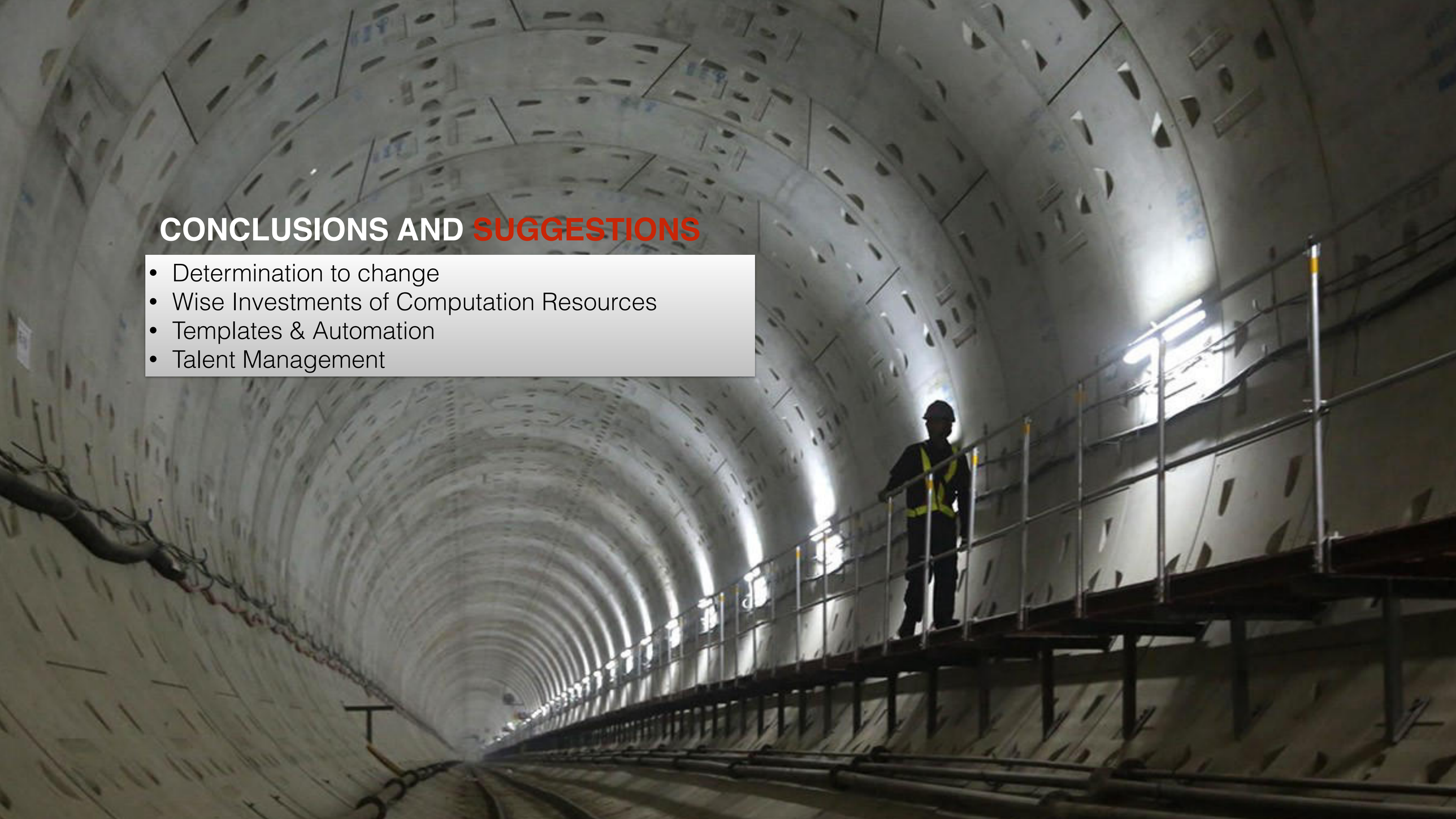
- For Europe, Japan and South Korea and other foreign aid programs
- ENR 100 multinational consultants come to the front
- The only non-english multinational consultants

MRT JAKARTA/JMCMC/GAMUDA VISITS

Delegates from KVMRT Project OBSERVE real BIM Coordination work on SAAS Server

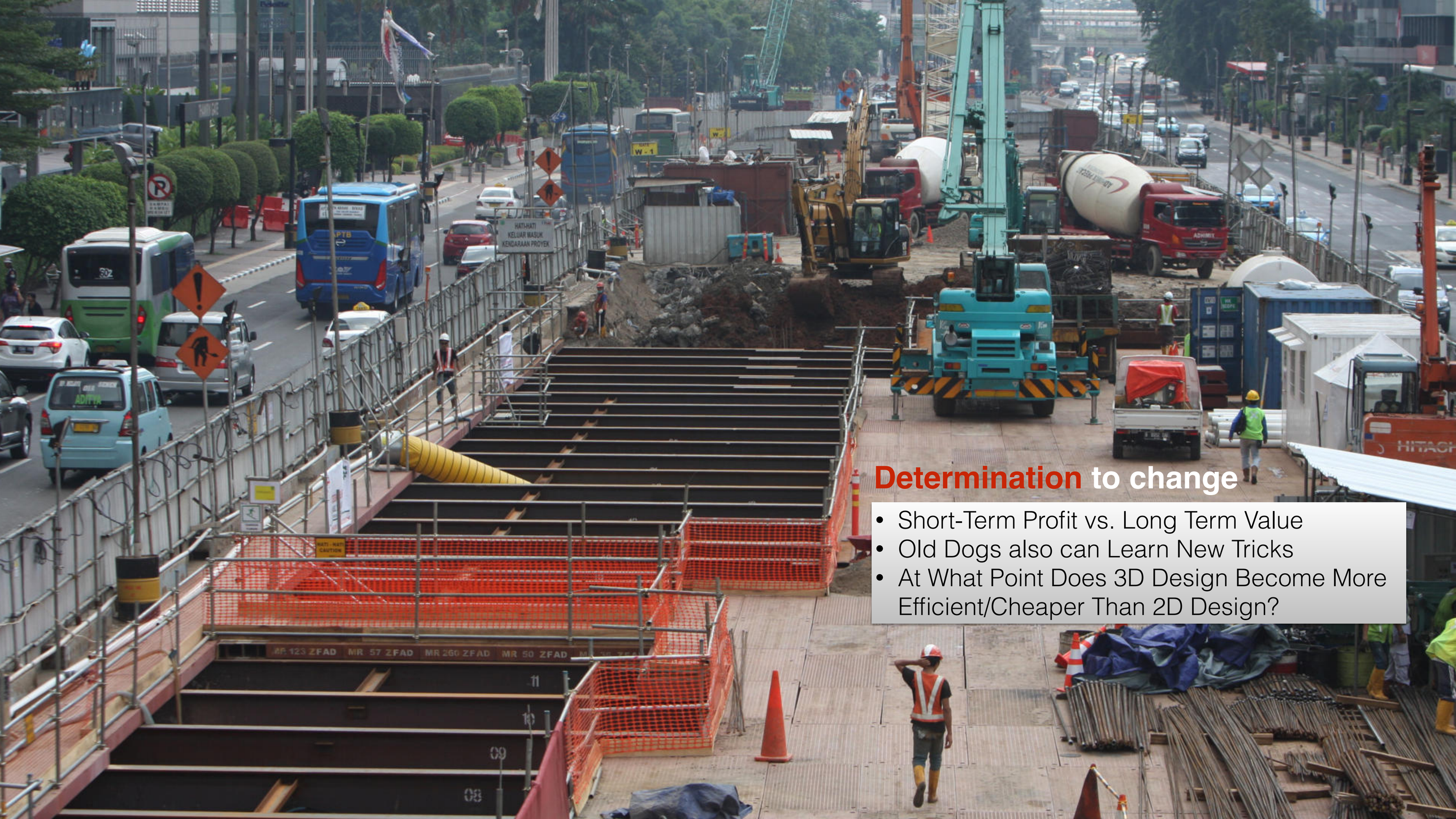
CONCLUSIONS AND SUGGESTIONS

結論與建議



CONCLUSIONS AND SUGGESTIONS

- Determination to change
- Wise Investments of Computation Resources
- Templates & Automation
- Talent Management



Determination to change

- Short-Term Profit vs. Long Term Value
- Old Dogs also can Learn New Tricks
- At What Point Does 3D Design Become More Efficient/Cheaper Than 2D Design?

Short-Term Profit vs. Long Term Value

當你真心想要某樣東西時 : 全世界都會聯合起來幫助你完成 - 保羅·科爾賀

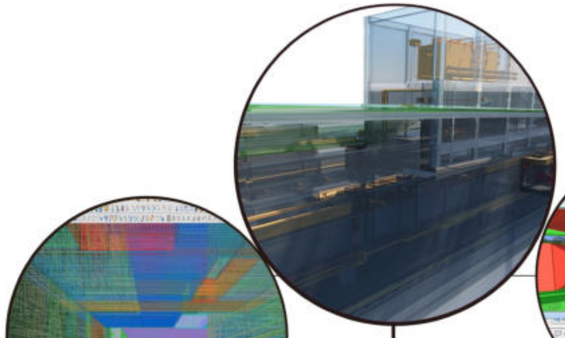
"When you want something, all the universe conspires in helping you to achieve it." Paulo Coelho, The alchemist

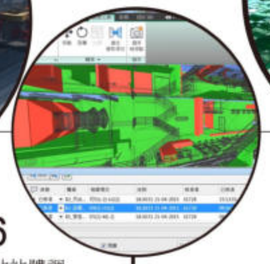
Autodesk HK Sanying Line | Autodesk HK CP106 | AU2015 Shanghai Honored Speaker | Chinese Civil Society | Chinese Civil Society

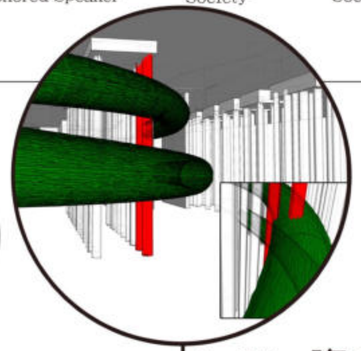
LEVEL III
建物資訊數據交換與儲存的協同作業

LEVEL II
以建物 3D/4D/5D 為主軸的協同作業

LEVEL I
以 3D 建物為主軸的協同作業







DQ123
- 建築與結構 BIM 模型
- 結構分析 / 配筋設計
- AR/ MEP 車站介面

CP106
- 隧道配合車站站體調整
- 站體 SEM/CSD 斷層掃描
- 人流分析

環狀線一期施工服務

台中捷運
- 聯合開發大樓

桃園機場捷運
- DU02 機場聯絡道

三鶯線
- BIM 和 GIS 結合
- BIM 模型整合高架橋與車站
- 綠建築環境模擬
- 施工模擬
- 建物日光模擬

桃園機場 WC 滑行道遷建

CoBie 資產管理
- 台灣大學 BIM 中心研發案
- 制定初始資產管理標準化

桃園機場 T3 航廈

環狀線南北環

機場捷運 A14 站

RT Department

2010 2012 2014 2016

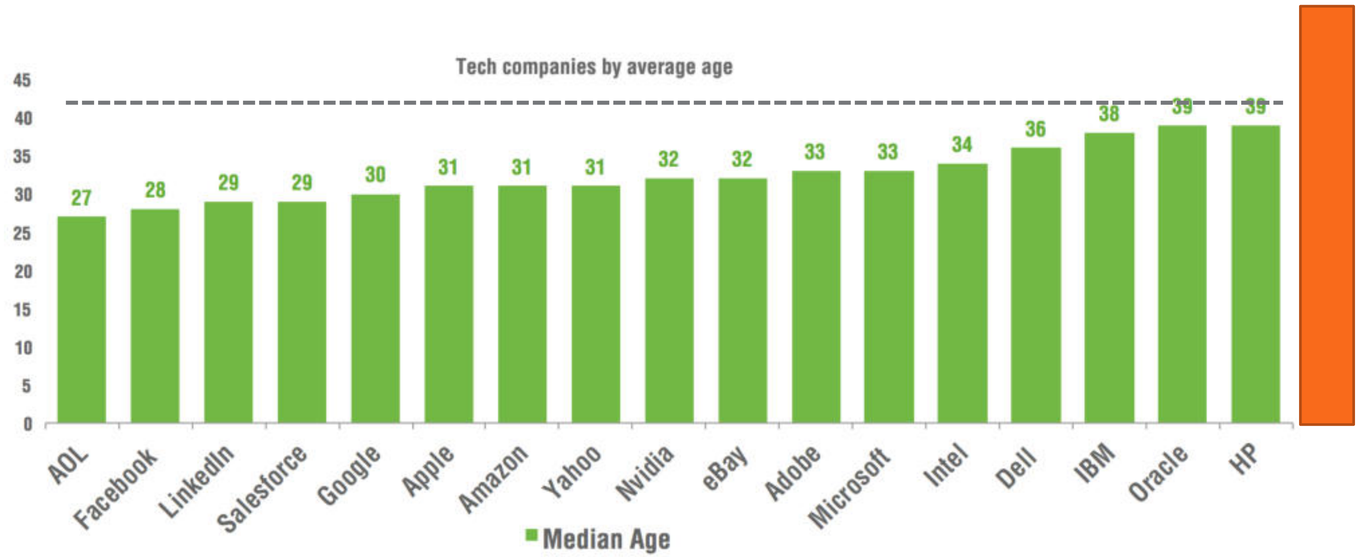
Old Dogs also can Learn New Tricks
銀髮也能創新

Senior, Well-Experienced and Innovated Team

AVERAGE

MRT Team

48 yrs

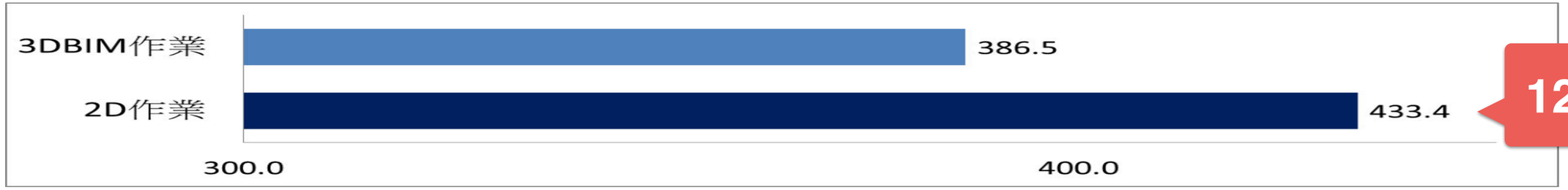


At What Point Does 3D Design become More Efficient/Cheaper Than 2D Design?

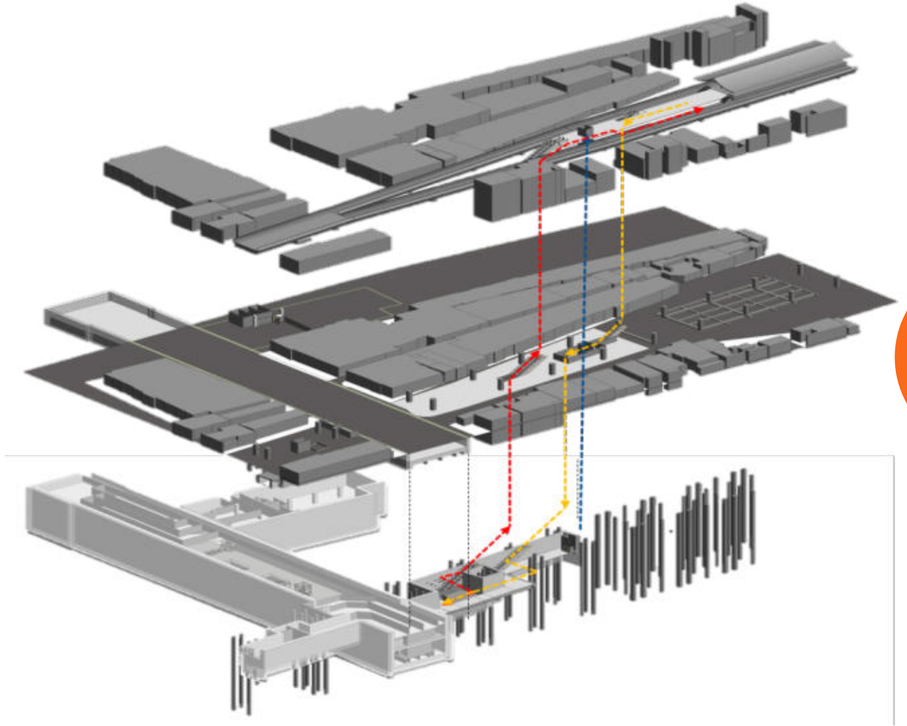
3C

- Complicated Interfaces
- Conflicting Requirements
- Continued Iterations

REAL CASE COMPARISON OF DESIGN RESOURCE

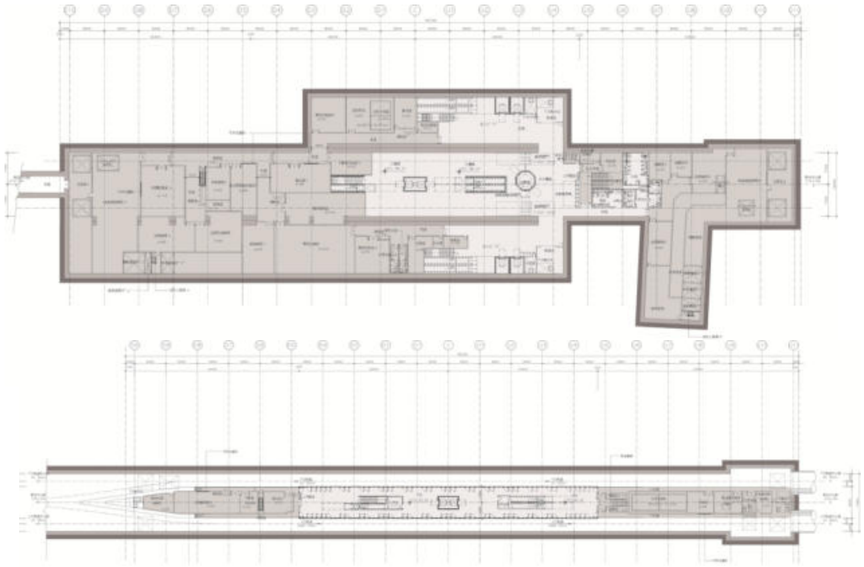


3D BIM:地下與高架連通交會站



VS

2D設計: 標準地下兩層車站



Paperless - ACONEX Platform

98.3%~99.1% SAVING

計畫名稱	工程規模	服務期間	無紙化設計送審	影印費用
「臺灣桃園國際機場聯外捷運系統建設計畫」三重站至臺北車站特定專用區路段DA115設計標	130億	94年迄今	否	425萬
桃園國際機場聯外捷運系統延伸至中壢火車站工程細部設計DU02標	40億	99年迄今	否	298萬
臺北都會區大眾捷運系統萬大-中和-樹林線(第一期) DQ123設計標	90億	100年迄今	否	225萬
印尼雅加達捷運CP106標細部設計服務工作	60億	101年迄今	是 - Aconex	4萬

Templates & Automation

The development of templates and automation programs

空間

101
010
參數
屬性

</>
邏輯
規則

- 避免人為錯誤
- 提昇效率
- 強化設計整合

SENIOR ENGINEERS

KNOWLEDGE | WISDOM | EXPERIENCE

Wise Investments of Computation Resources

- Optimize Computation Resource Deployment
- Cloud-Base Services
  - SaaS: Project wise, A360
  - IaaS: VDI

TALENT MANAGEMENT

Talent Acquisition and Retention

- Overseas Talent Resources
- Nurturing of Talent
- Talent Development

Overseas Talent Resources 優秀的國際化團隊

Wega (Indonesia)
Electrical Engineering

Ricky (Indonesia)
Architectural Design
Green Building

Rara (Indonesia)
Power Simulation

Gabby (Indonesia)
Construction Management
Assistant of Design Coordinator

Ayesha (Indonesia)
Construction Management
Assistant of Design Coordinator

Nurturing of Talents

Second and Third Generation Seed Members

Rapid Transit Engineering Department BIM Team

WELCOMING 4th GENERATION BIM TEAM……

Best Indonesia Metro

jakarta mass rapid transit

DUKUH ATAS MRT STATION | BUNDERAN HI MRT STATION

mrt jakarta
increasing mobility, improving life quality

Inovasi Untuk Solusi

CECI
ENGINEERING CONSULTANTS., TAIWAN