SISTEM IBS MASA KINI

(Seminar CKAS- IBS a must!)

PRESENTED BY:

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KPPK, BHG STRUKTUR (UNIT KESELAMATAN)

CAWANGAN KEJURUTERAAN AWAM DAN STRUKTUR

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رَبِّ زِدْنِيْ عِلْمًا وَارْزُقْنِيْ فَهْمًا *

رَبِّ اشْرَحْ لِيْ صَدْرِيْ وَيَسِّرْلِيْ أَمْرِيْ *

Wahai Tuhanku, tambahkan ilmuku dan luaskan kefahamanku.

Wahai Tuhanku, lapangkan dadaku dan mudahkanlah urusanku.

Presentation area

- Introduction
- Common construction systems in Malaysia
- -Precast Concrete (PC) components, HKL car park
- --PC frame, floor/wall panels and acotec
- ---hybrid
- ----system formwork
- Quality assurance stages
- Automation dan mekanisasi
- Kilang IBS - automasi dan konvensional
- -singapore experience
- --kilang terbesar dunia
- ---30 storey hotel in 15 days?
- ----Modular building
- Seismic resistance buildings

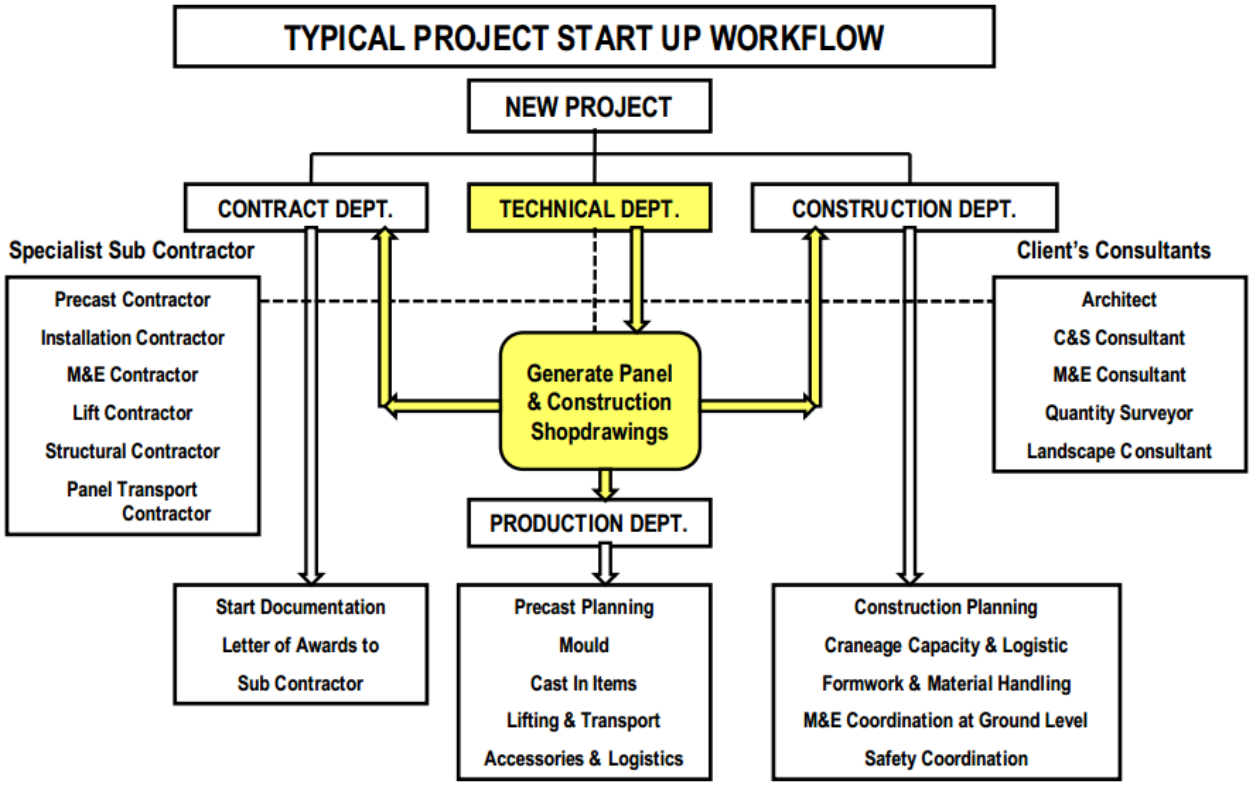
introduction

IBS RECIPE : WORKING IN TANDEM, COORDINATED SYSTEMS

INITIATION/ PLANNING

DOCUMENTATIONS AND DRAWINGS

PRODUCTION/ CONSTRUCTION

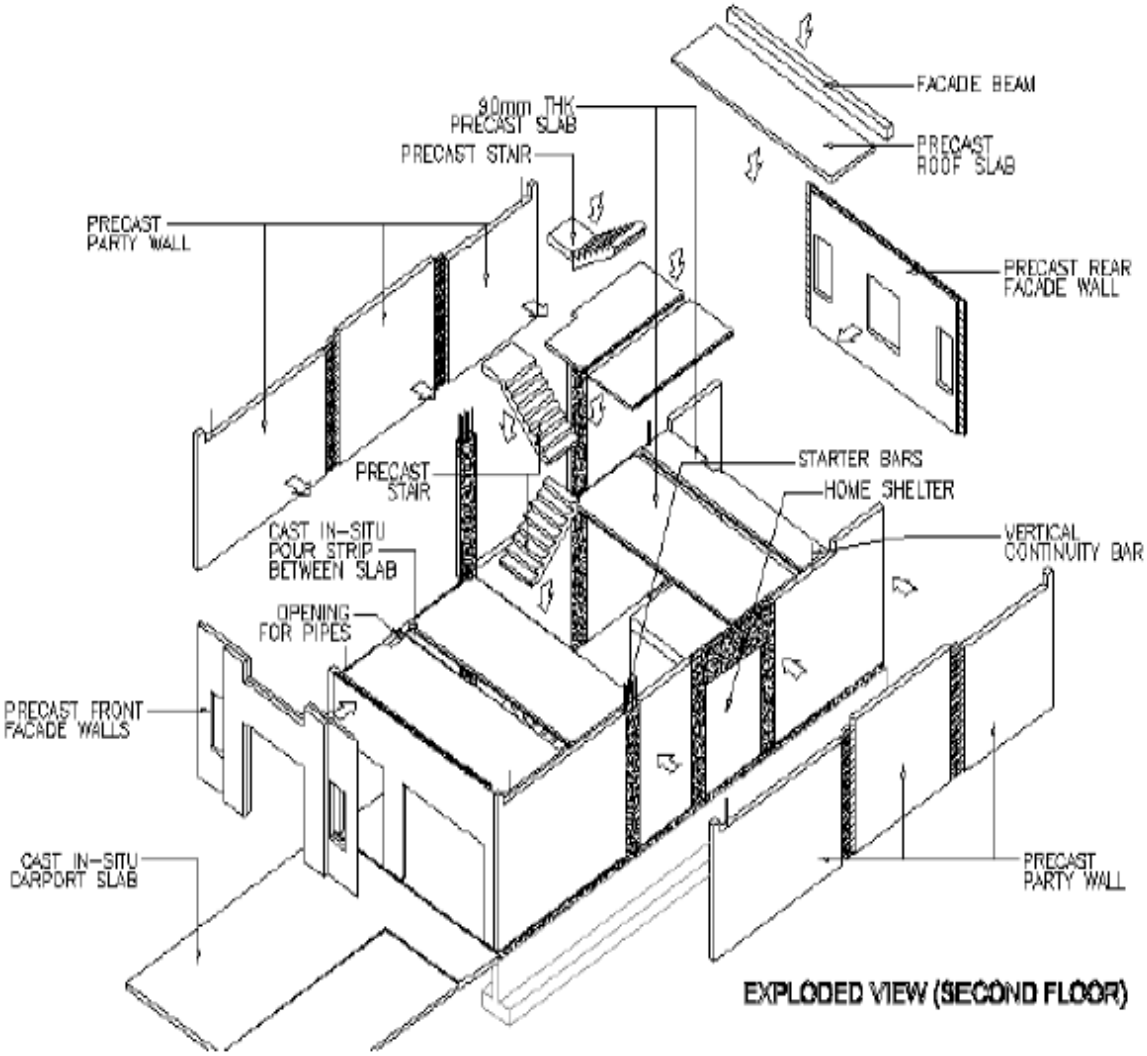


General principles of IBS

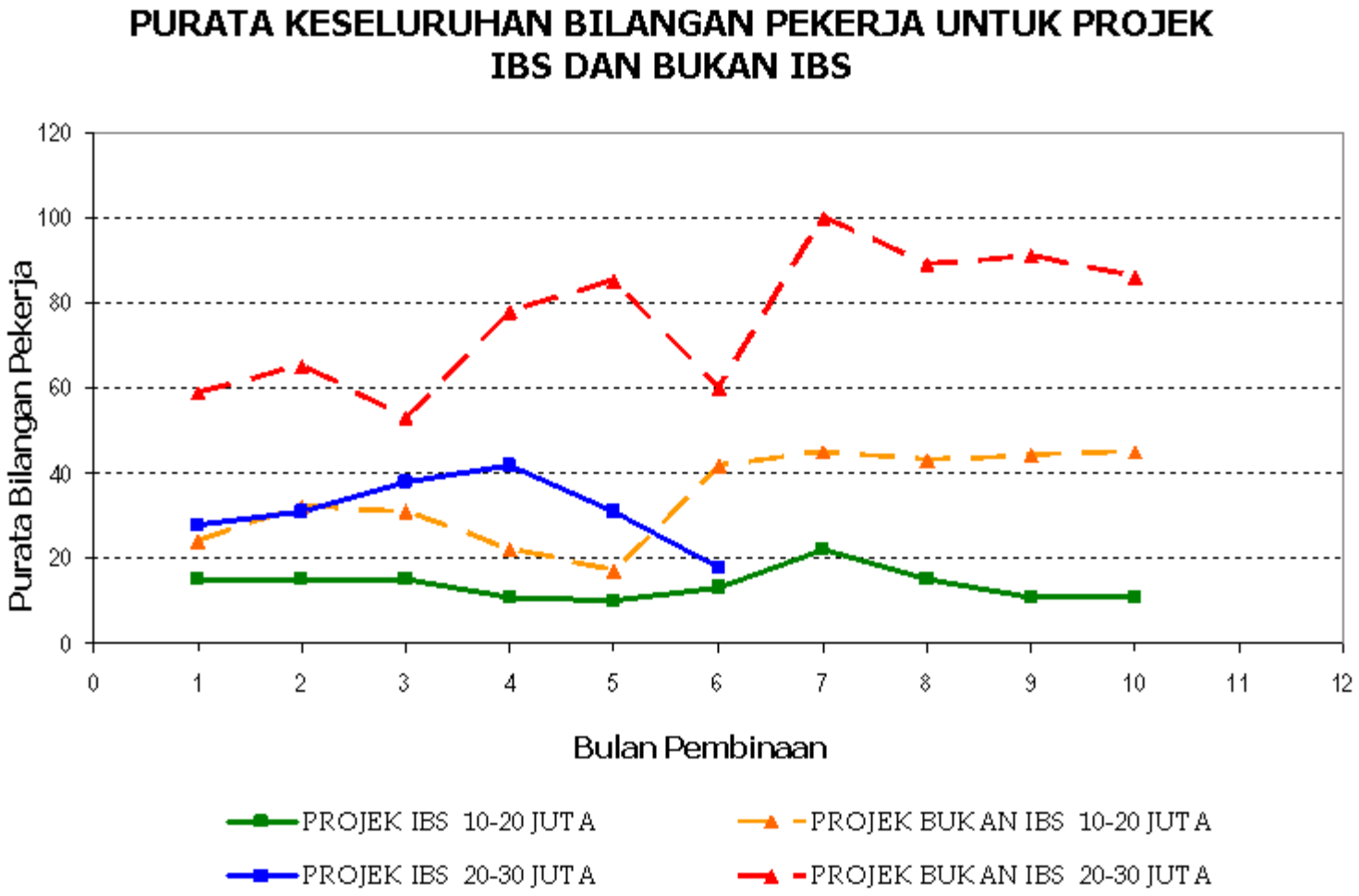
1. Industrial production of components; prefabrication; precast (under controlled environment, can be in factory/site)
2. Labour reduction
3. Open building system – standard components; Moduler Coordination: MS1064

DESIGN CONCEPTS FOR PRECAST CONCRETE BUILDINGS

The design concept of the precast buildings is based on the buildability, economy and standardization of precast components.



PERBANDINGAN PENGGUNAAN BURUH



Half slab and hollowcore

Half Slab disusun sedia untuk dipasarkan.

Kerja pemasangan *Half Slab* ditapak bina.

Hollow Core Slab yang siap dipasang.

Hollow Core Slab disusun mengikut saiz.

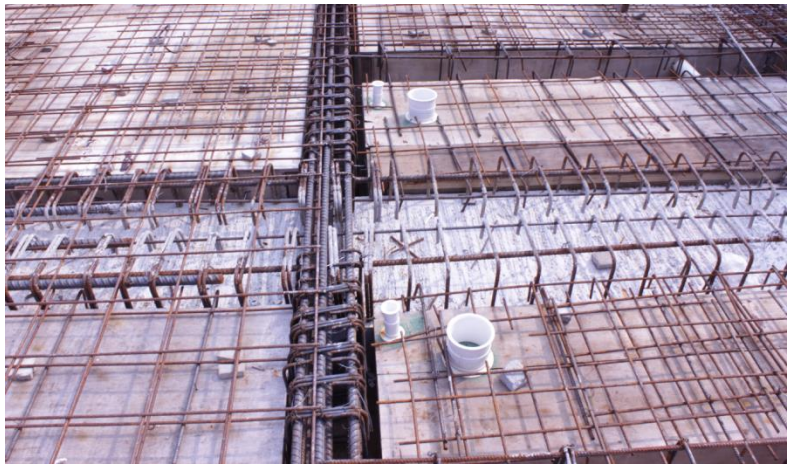
Advantage hollowcore-longer span lesser components

Kerja pemasangan *Hollow Core Slab* ditapak bina.

2000 BAYS CARPARK - HKL

HKL VIDEO

Hybrid system
eg: PC components + CIS concrete



System formwork

This system were used since 1984. It was the most economical and efficient system for the construction of high rise buildings.

Common systems

The companies that being implementing the similar to this type of formworks are:-

1.PASCAL FORMWORK - German
2.SGB - Brittain
3.EFCO FORMWORK - Australia

PKNS Engineering & Construction Bhd (PECB)

PLASFORM FORMWORK SYSTEM – 64 UNITS SECTION 7

Common systems

PKNS Engineering & Construction Bhd (PECB)

FORMWORK SYSTEM (Slab)


6/5/2009


msu
edu.my
msu


doka
doka
doka
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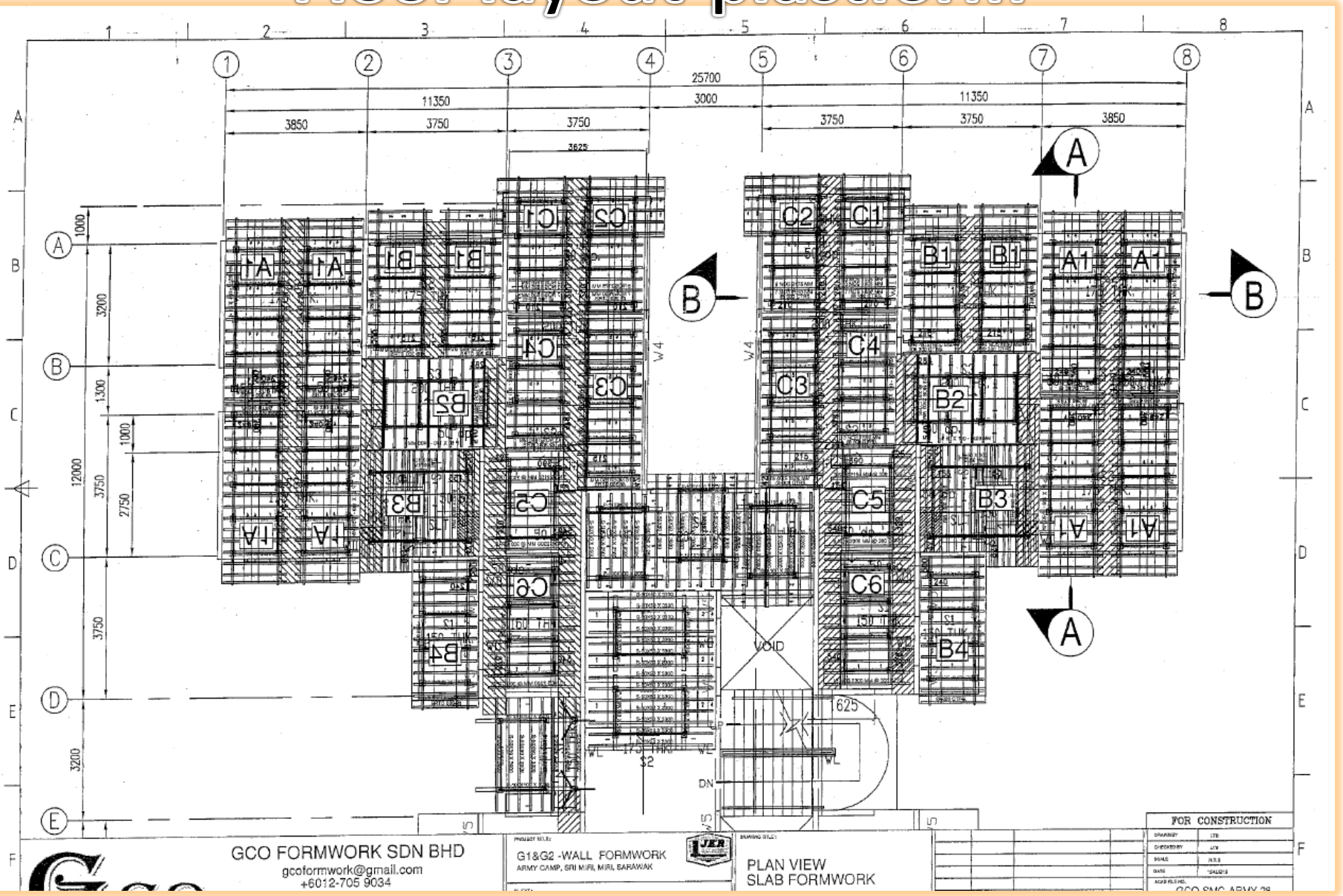
doka

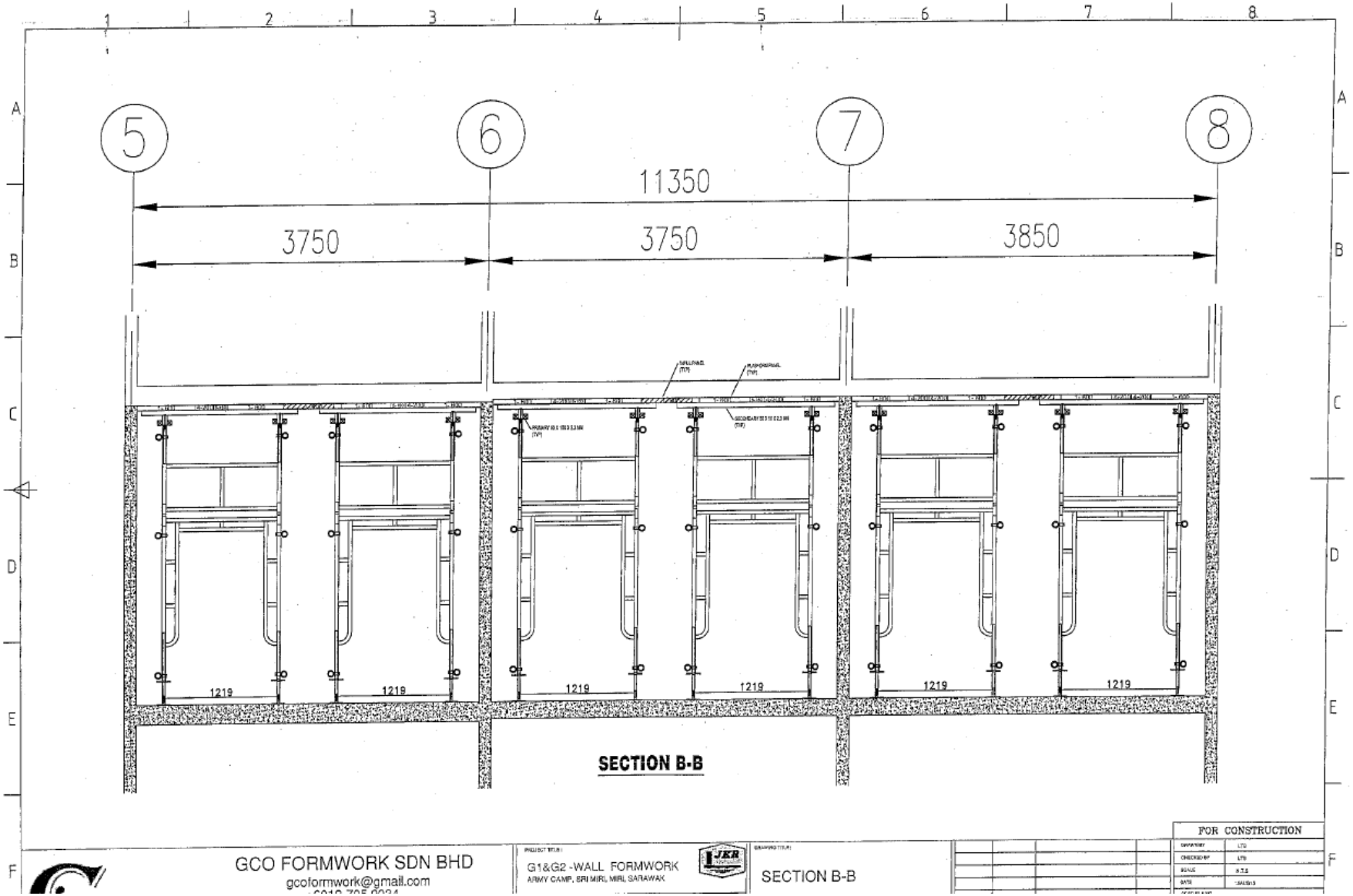
50 storey NAZA TOWER
doka system (timber panels)

CADANGAN PEMBANGUNAN 2 BLOK MENARA IBU PEJABAT 50 DAN 38 TINGKAT MENGANDUNGI 1 TINGKAT KEMUDAHAN DI ARAS 10, 8 TINGKAT PODIUM TEMPAT LETAK KERETA DI ARAS 2 HINGGA 9 BERSERTA 3 TINGKAT TEMPAT LETAK KERETA DI ARAS BESMEN, DI ATAS LOT 267, 270, SEBAHAGIAN LOT 268, SEBAHAGIAN LOT 324, SEKSYEN 63, JALAN STONOR, BANDAR KUALA LUMPUR UNTUK TETUAN NAZA TTDI SDN. BHD.

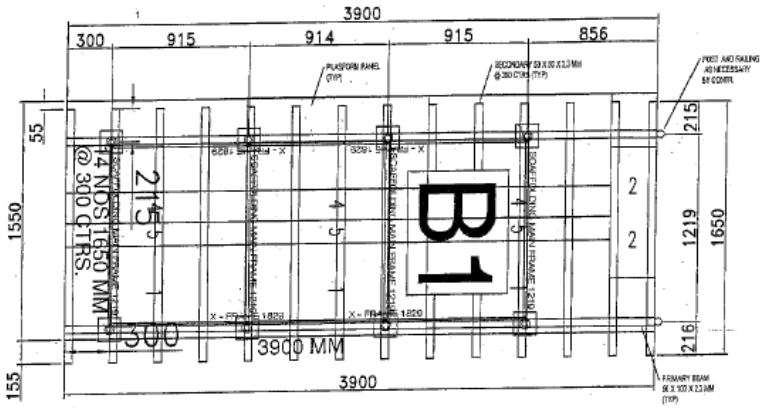
Floor layout-plastform



Formwork support

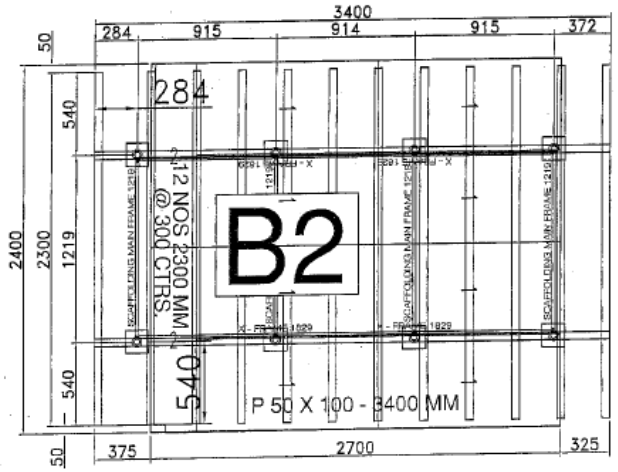


Formwork-individual panels

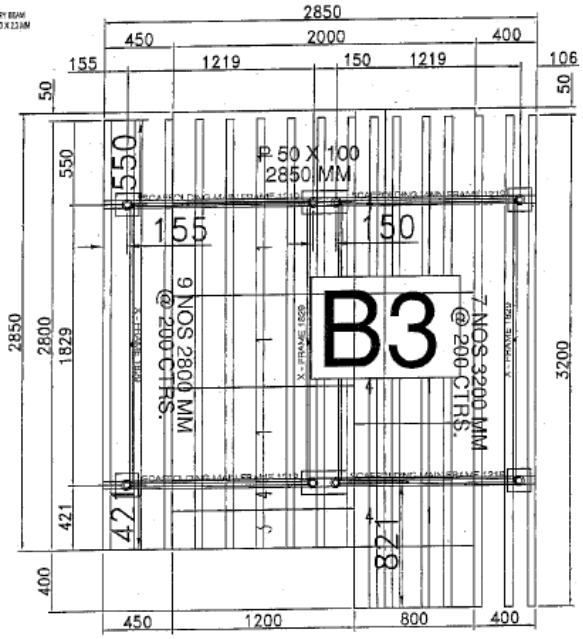


PLASFORM PANEL MARK

MARK	SIZE
1	600 x 1200
2	300 x 1200
3	250 x 1200
4	200 x 1200
5	150 x 1200
6	100 x 1200



PLAN VIEW



GCO FORMWORK SDN BHD
gcoformwork@gmail.com
+6012-705 9034

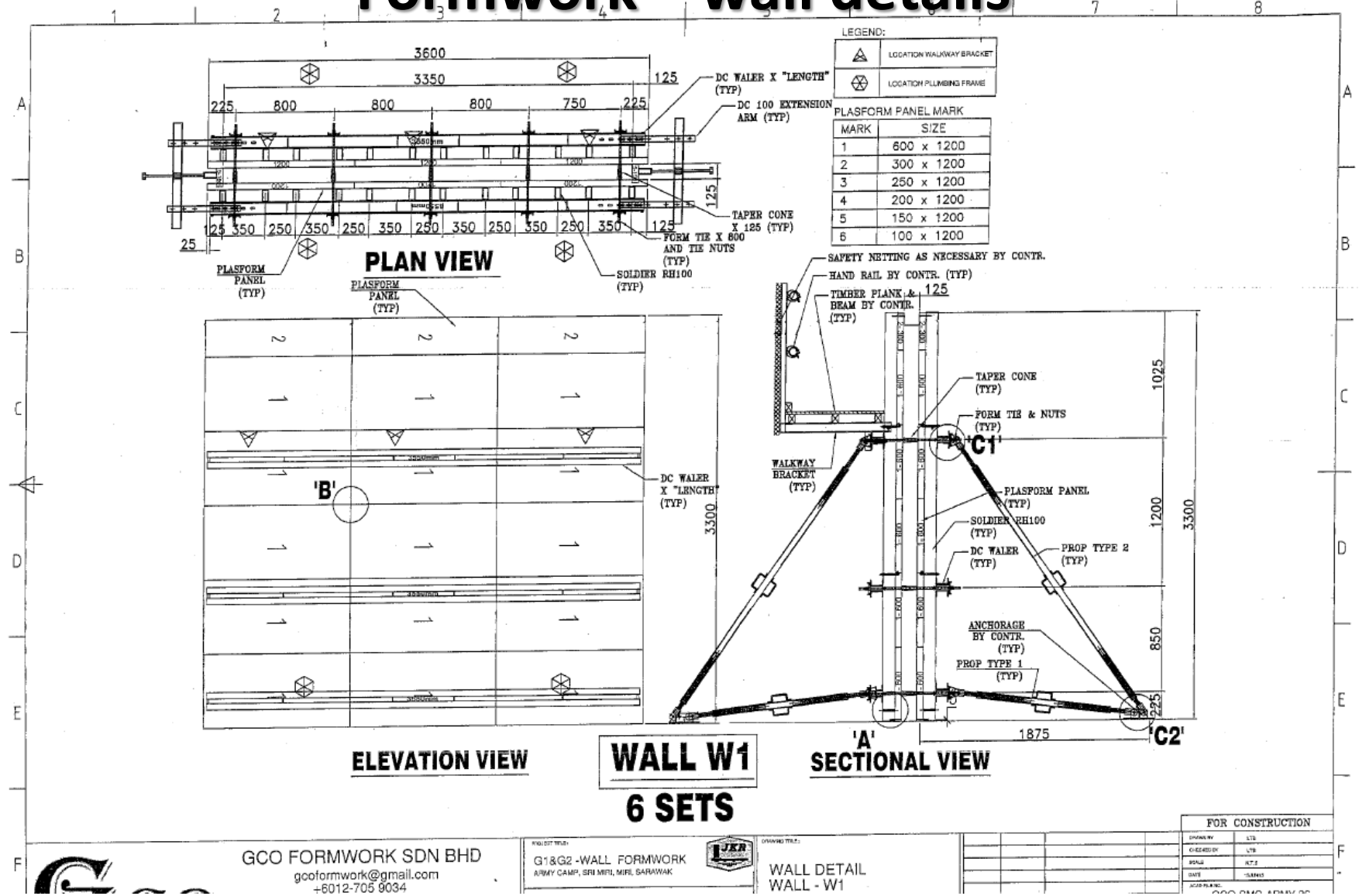
G1&G2 -WALL FORMWORK
ARMY CAMP, SRI MIRI, MIRI, SARAWAK

SLAB FORMWORK
TABLE B1, B2 & B3 DETAIL

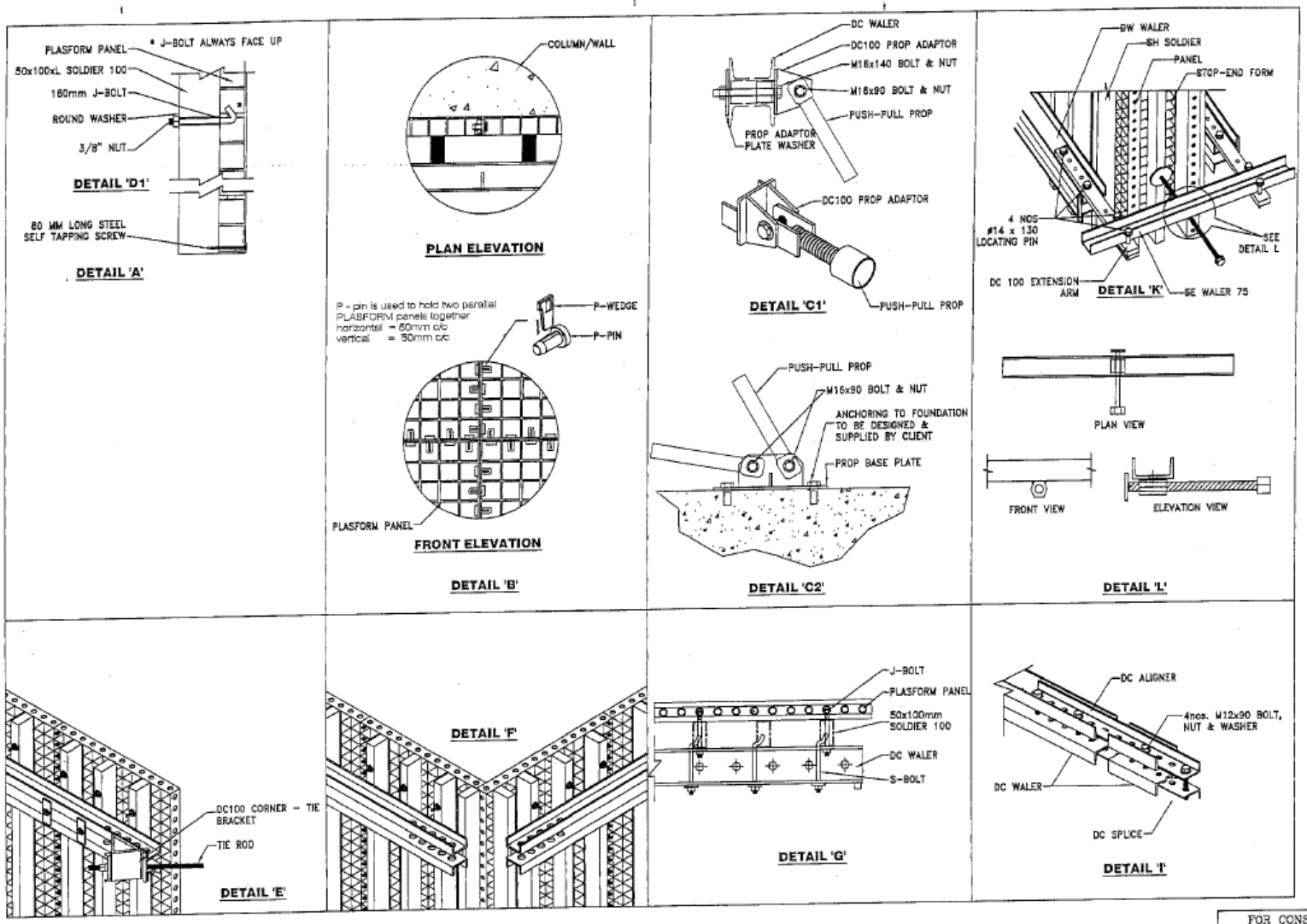
FOR CONSTRUCTION

GCO-SMC-ARMY-26

Formwork – wall details



General data-fasterners



QUALITY ASSURANCE STAGES

- DESIGN (JKR AND OTHERS INCL. INDEPENDENT CHECKER)
- PRODUCTION/CASTING/STORAGE/ TRANSPORTATION (SYSTEM PROVIDERS/CONTRACTORS)
- CONSTN. STAGE –PREFABRICATING /INSTALLATION (CONTRACTORS)
- SUPERVISION – audit/component inspections/General requirements (JKR AND OTHERS)

QA / QC DI KILANG

NO.	ITEM	CHECKLIST			REMARKS
		YES	NO	N/A	
6	Age of precast component lifting	√			* Lifting the precast component from mould to storage yard at 15 Mpa (10 hrs) * Transport the precast component to the construction site after 7 days
7	Concrete testing	√			* Cube test day 1-28, slump test, others
8	Storage of finish product	√			* Stacking and protected
9	Precast concrete component production process	√			* Mould preparation, bar installation, concreting with vibrating, cutting, lifting, curing and transportation is carried out properly
10	Precast concrete component dimensional accuracy	√			* ± 10 mm

INSPECTED BY :

INSPECTED BY :


C-52-01
15-01-2010

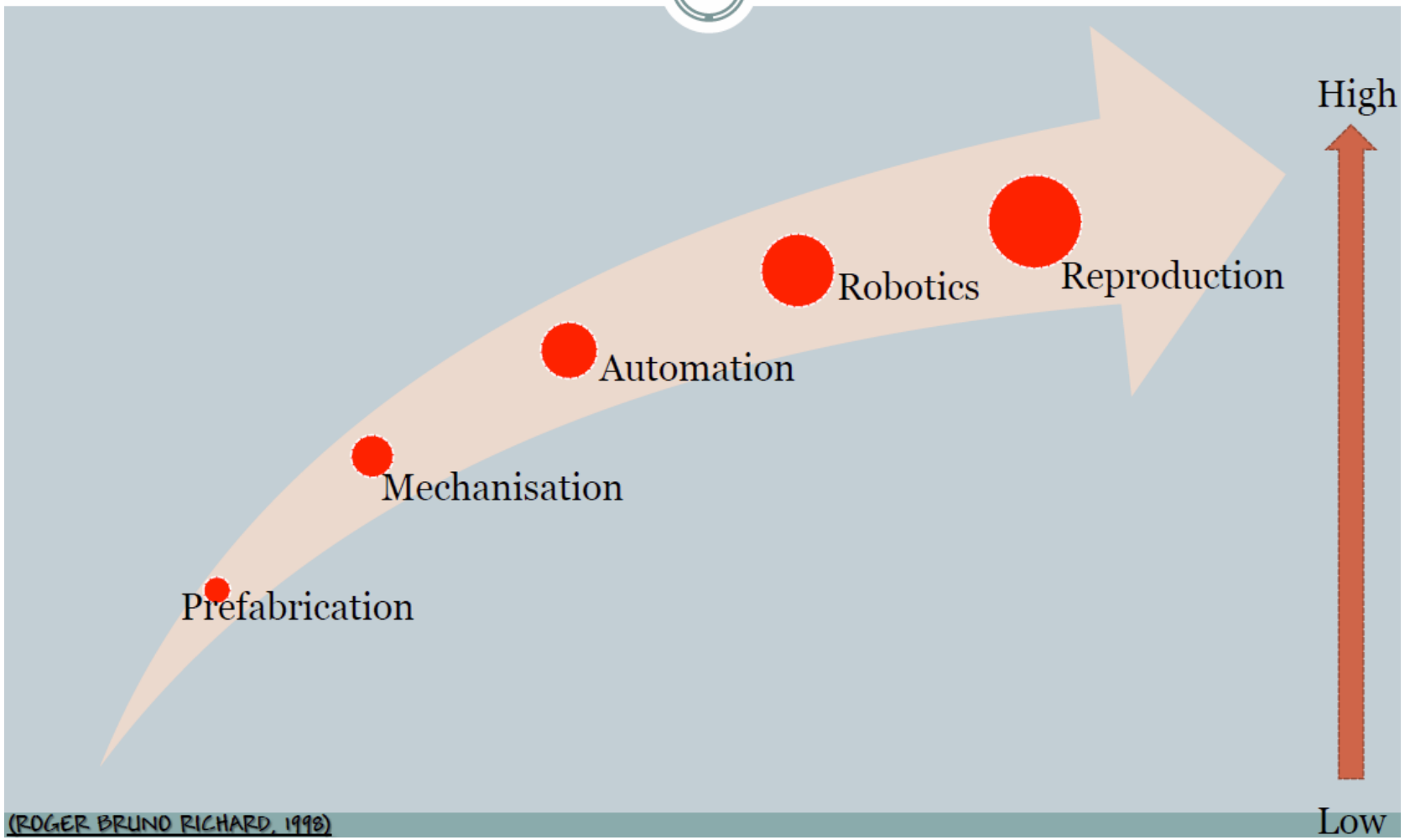

UNIT TEST

BIM and Mechanization – CIDB CONCEPT

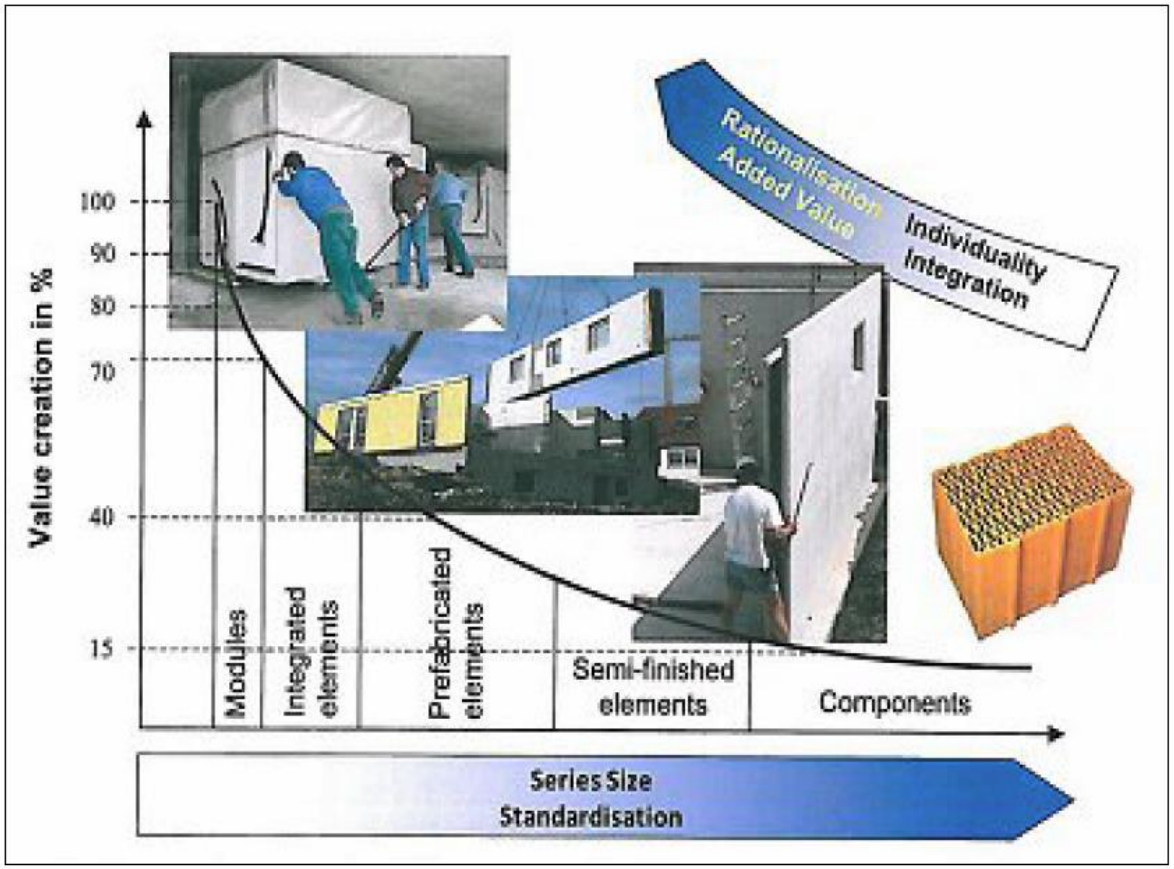
NEED FOR MECHANIZATION IN CONSTRUCTION INDUSTRY

1. The work can be done speedily.
2. The work can be done in time.
3. Large quantity of materials can be handled, so the size of the project can be increased
4. The complex projects involving high grade material.
5. High quality standards can be maintained.
6. Time schedule can be kept.
7. Optimum use of material, man power and finance.
8. Due to shortage of skilled and efficient man power.

DEGREE OF INDUSTRIALISATION

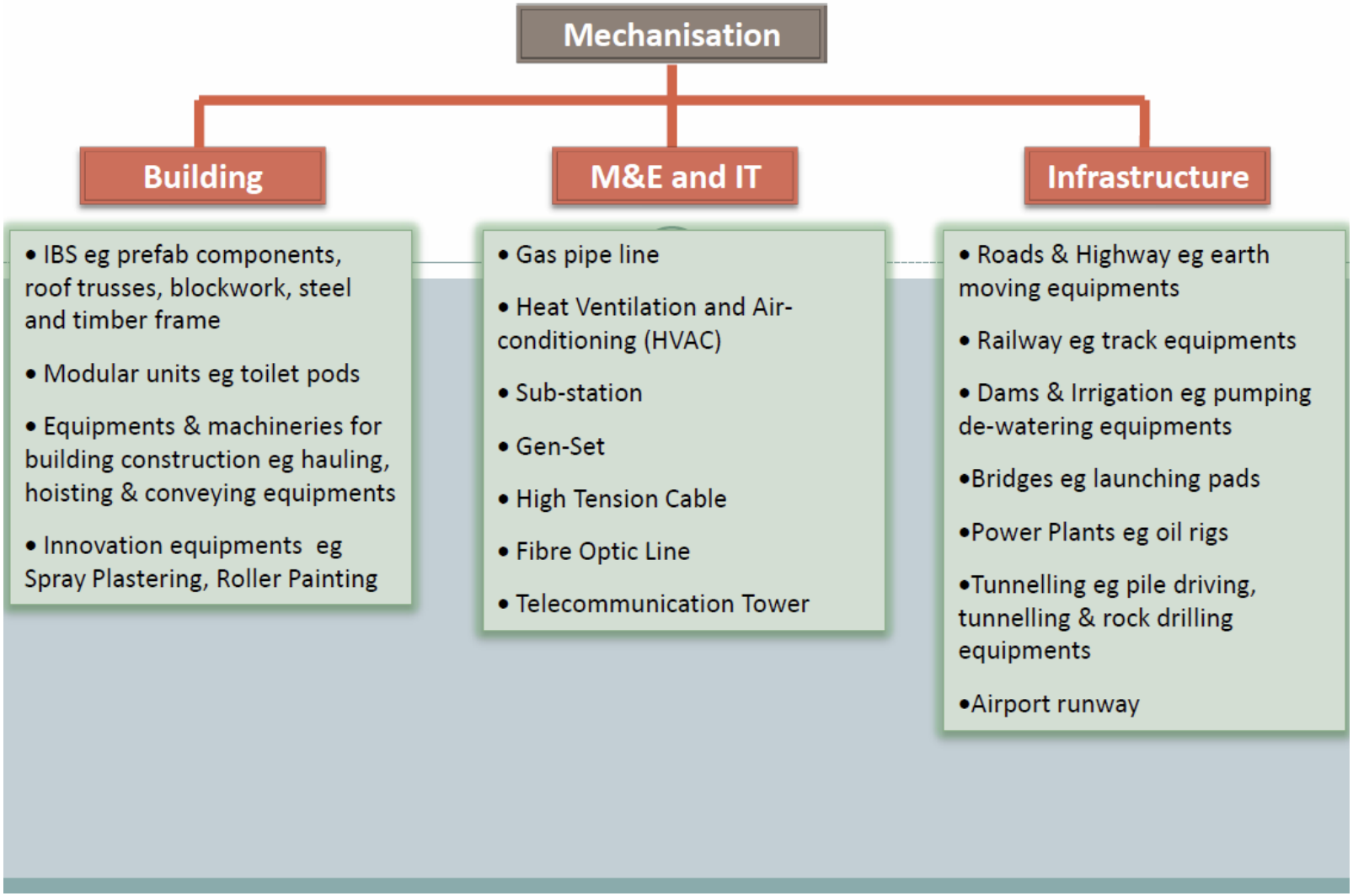


THE VALUE CREATION IN INDUSTRIALISED CONSTRUCTION

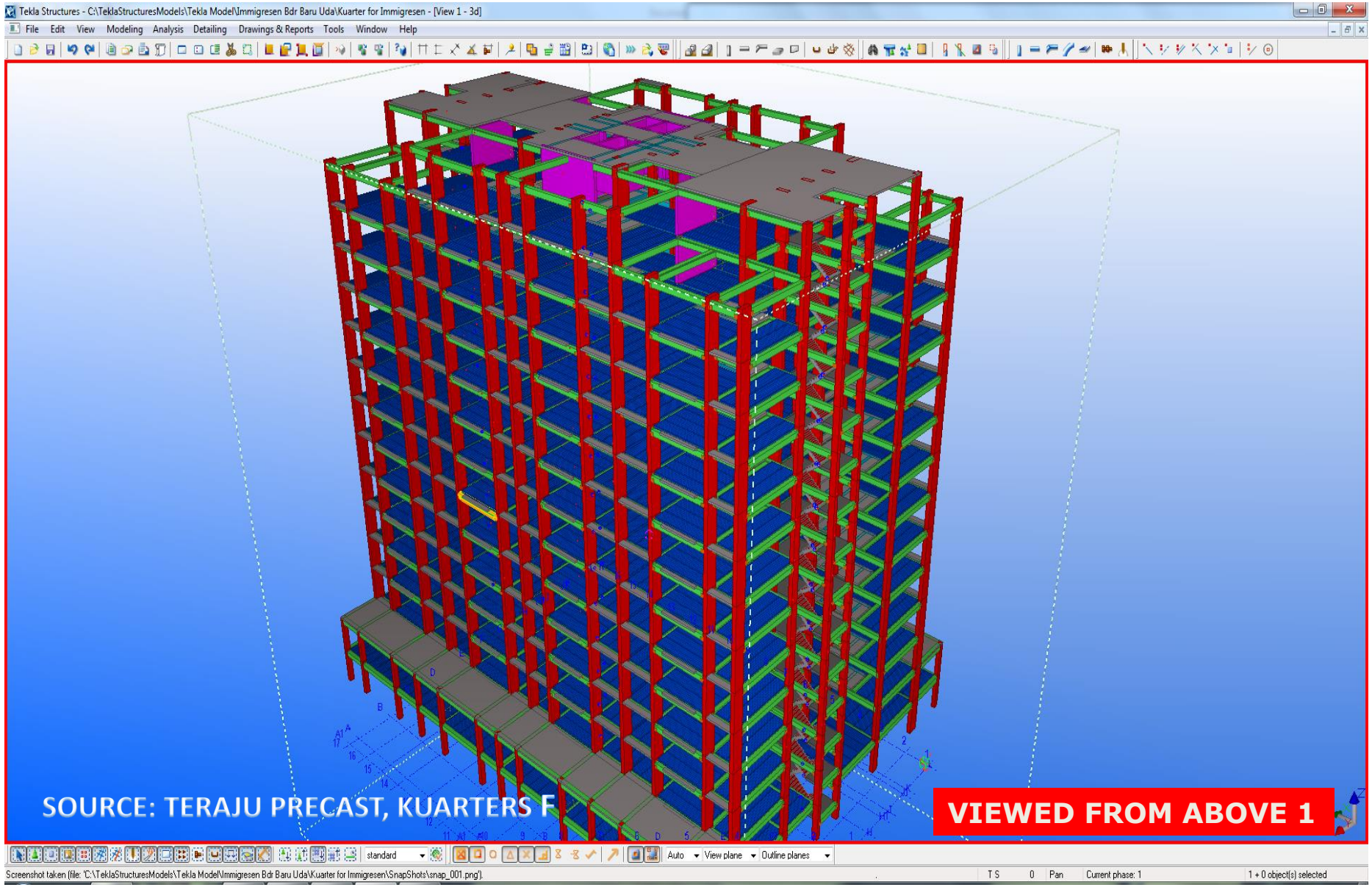


The value creation of industrialisation can only be established using robotised and automated manufacturing process which is different from current conventional practices (CIB, 2010).

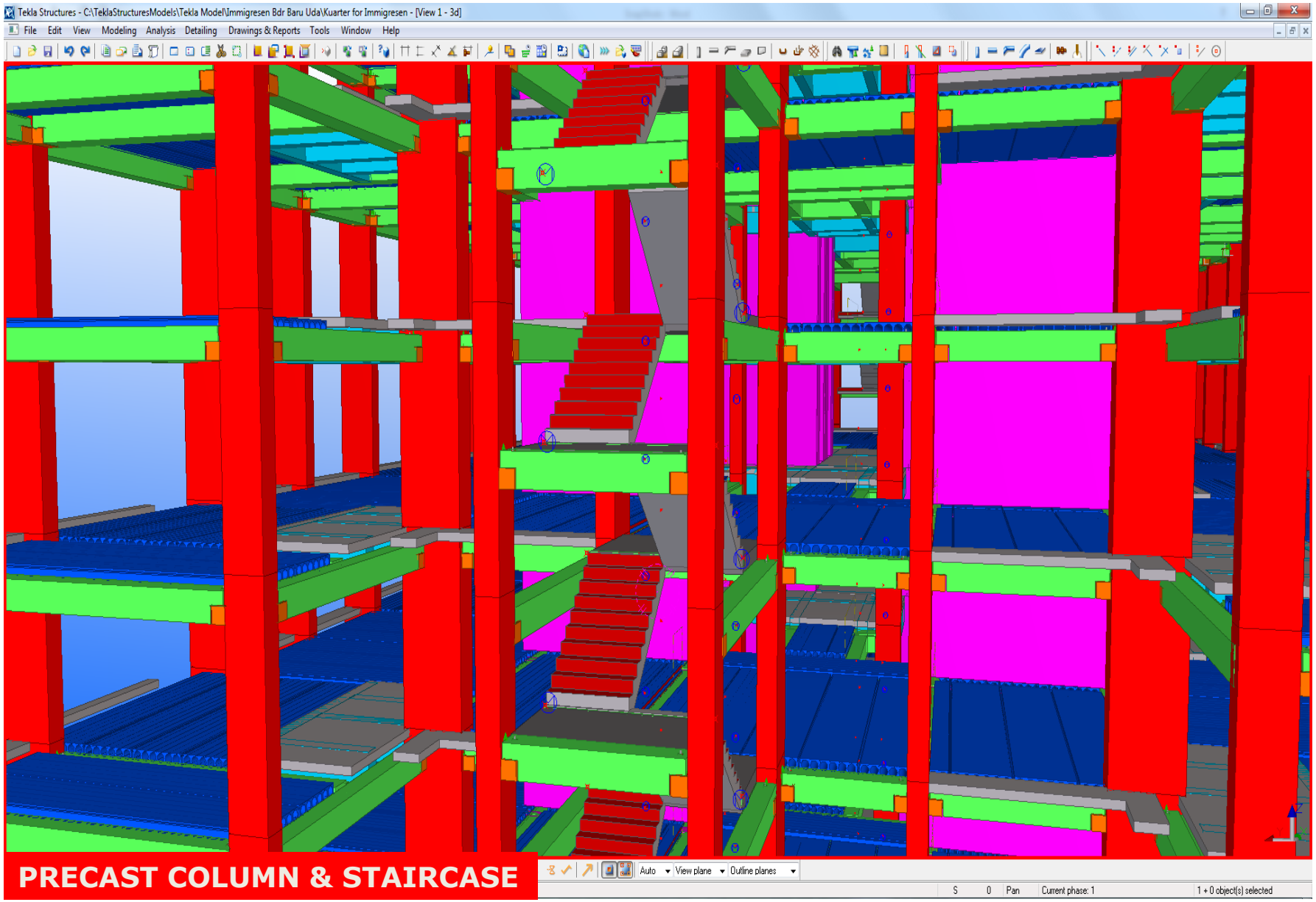
APPLICATION OF MECHANISATION IN CONSTRUCTION



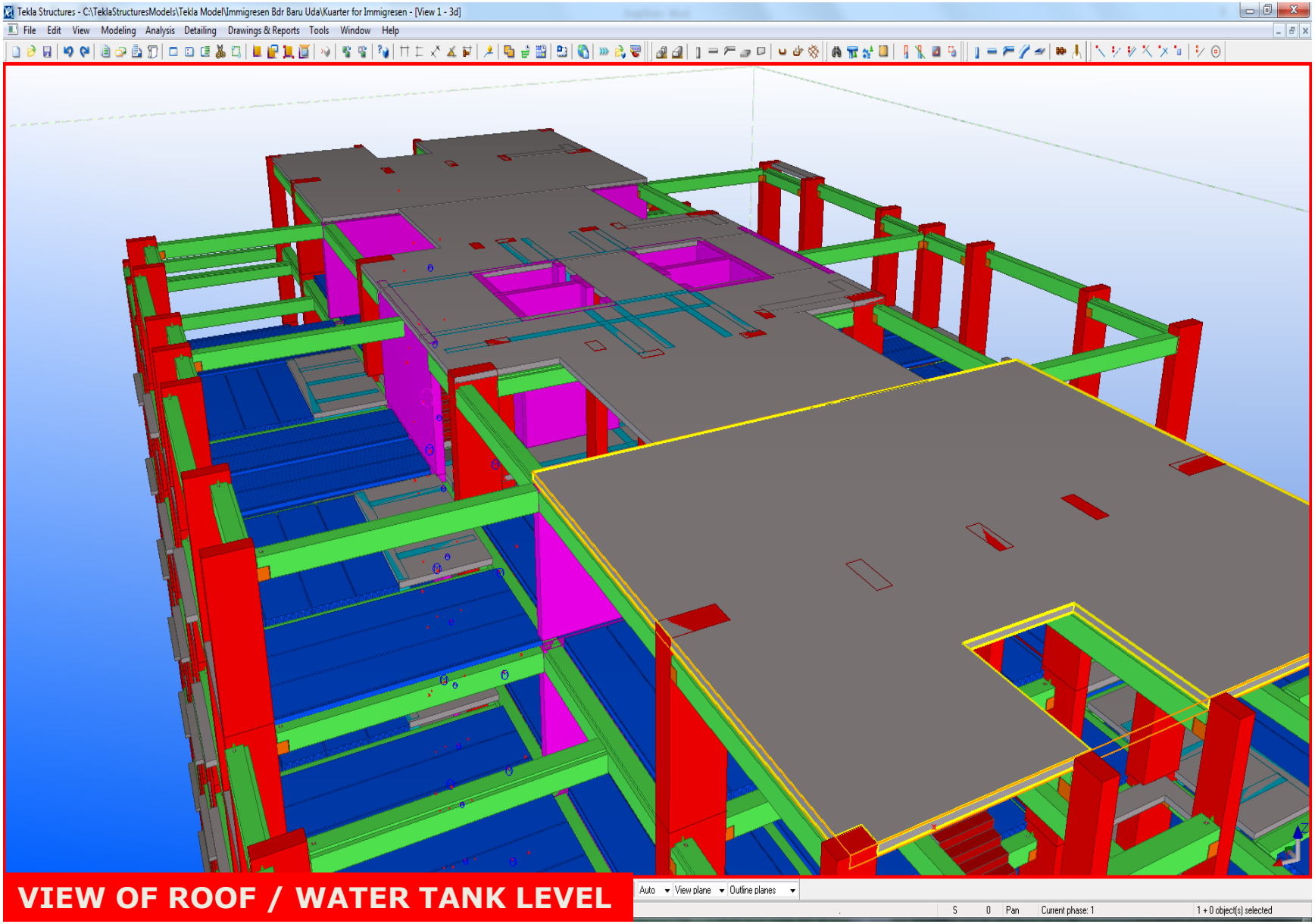
PENGGUNAAN BIM



BUbiLDING VIEW (3-D)



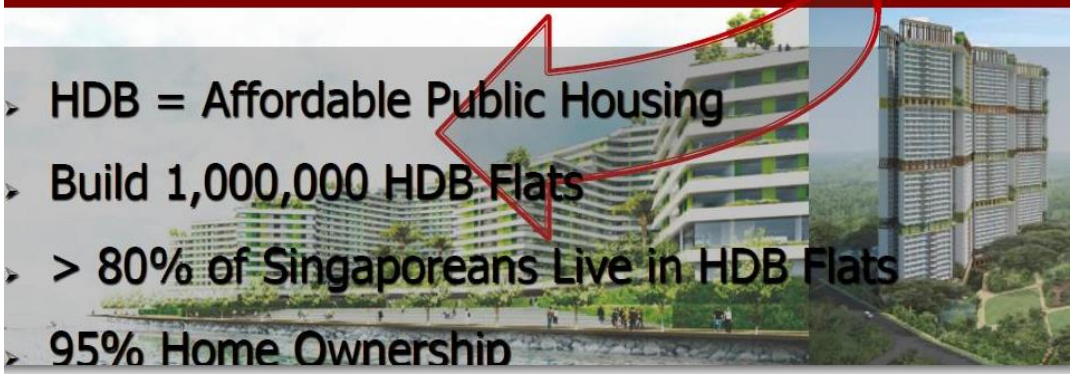
BUILDING VIEW (3-D)



Singapore approach..

- Transformation of public housing (publication 2014)

The Transformation of Public Housing



- HDB = Affordable Public Housing
- Build 1,000,000 HDB Flats
- > 80% of Singaporeans Live in HDB Flats
- 95% Home Ownership

How to Achieve Our Objectives…?

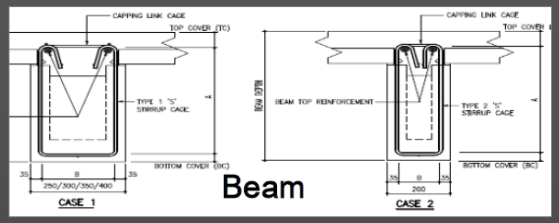
The approaches:

- Facilitate cooperation between stakeholders (designers, suppliers and contractors)
- Develop standardisation
- Optimise usage of standard components
- Simplify site operations
- Emphasis on buildable design

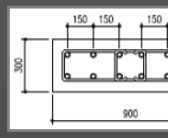
Transformation of public housing

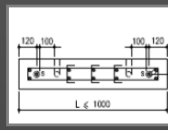
Improvement initiatives

Structural Elements –Modular Dimensio



Beam





Column

S/N	Component Type	Modular Dimension
1	Beam	Width: 200,250,300mm Depth : 500,600mm with incremental of 50mm
2	Column	Width: 200,250,300mm with incremental of 50mm Length : incremental of 100mm
3	Slab thickness	125,150,175,200mm incremental sub-module of 25mm

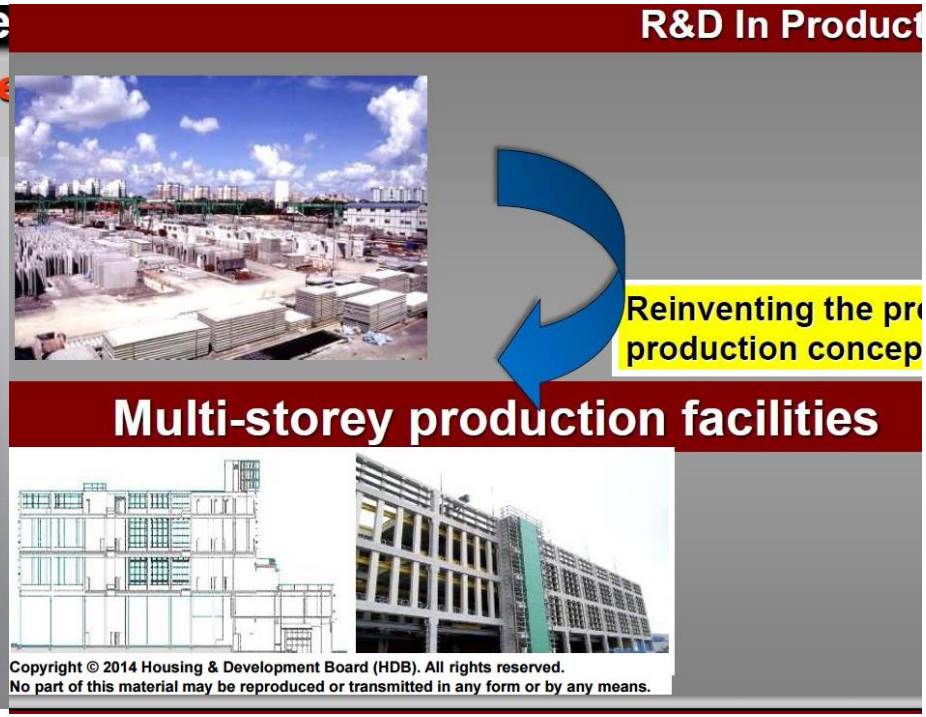
Transformation of Site Machinery

- Provide financial incentives for contractors to procure machinery
- Improved cash flow of contractors
- Improved productivity
- Implemented Construction Quality Control Management System

MODULAR DIMENSIONING

INCREASE SITE MACHINES

Develop solution and improve production facility



use battery mould

Mechanised Production Processe

Production of Flat Panels & Solid Walls

Conventional horizontal production using flat moulds

Optimisation of factory production space

Vertical Production Using Battery Mo

Productivity Improvement Thru' Wor Process Transformation....

- Encourage more adoption of market available machinery and hand tools
- Develop/customise machinery to re-engineer work processes

Develop a Customised Mechanized Materials Handling System

Further improvement to prototype:

- Stability and manoeuvrability
- Diesel powered– noise and smoke
  - Customised battery/fuel cells of suitable size & capacity
- Increase load carrying capacity

Improve Productivity of Precast Production

- **Mould cleaning and oiling**
- **Mould assembly & fixing of reinforcement**
- **Concreting and Compaction**
- **Leveling & Trowelling**

Promote Higher Level of Mechanisation & Automate The Precast Production System

Automated Precast Production System

- Very efficient for production of standardised products
- Flat and with minimum protrusion and profile
- Minimum dowels or projection bars

<u>Complementing the precast automation process</u>:

- A need to customise the production system to suit local practice

CURRENTLY

•Widths of PC Planks are highly standardised (1.0m & 2.4m)

• Planks lengths required are formed by dividers.

– Large Panel Slab (LPS)

NEW PRODUCT

Casting & de-moulding of LPS slab

High quality off form finish requires minimal touch up on site

‘Conventional’ practice

Construction Technology

Conventional Method:

- Manually tracking and coordination of delivery and installation
- Precasters deliver components basing on contractor’s demand schedule
- Tower crane & mobile cranes for handling
- Construction activities subjected to weather condition

Improvement in construction technology

Advanced Construction Technology:

- **Construction mechanisation & automation**
  - **Tools & equipment**
  - **Automation of concrete batching plants**
- **Automated building system (ABS)**
- **Computerised & Integrated Construction Management System**

Automation of building system

Explore Ways to Improve PC Installation & Hoisting Operations

- Computerised crane system that integrated with assembly and precast plants.
- High capacity pc components lifting hoist

Computerised crane and hoisting

PRECAST PLANT-WORLD LARGEST

- THE LARGEST PRECAST PLANT OF THE WORLD Morton Group built a greenfield site to build the world largest precast plant with an annual precast output that enables the construction of buildings with a total floor space of 525.000 m2.
- SOUTH AFRICA

CASTING OF PLANKS – INSTALLING STEEL FRAMING

steel framing

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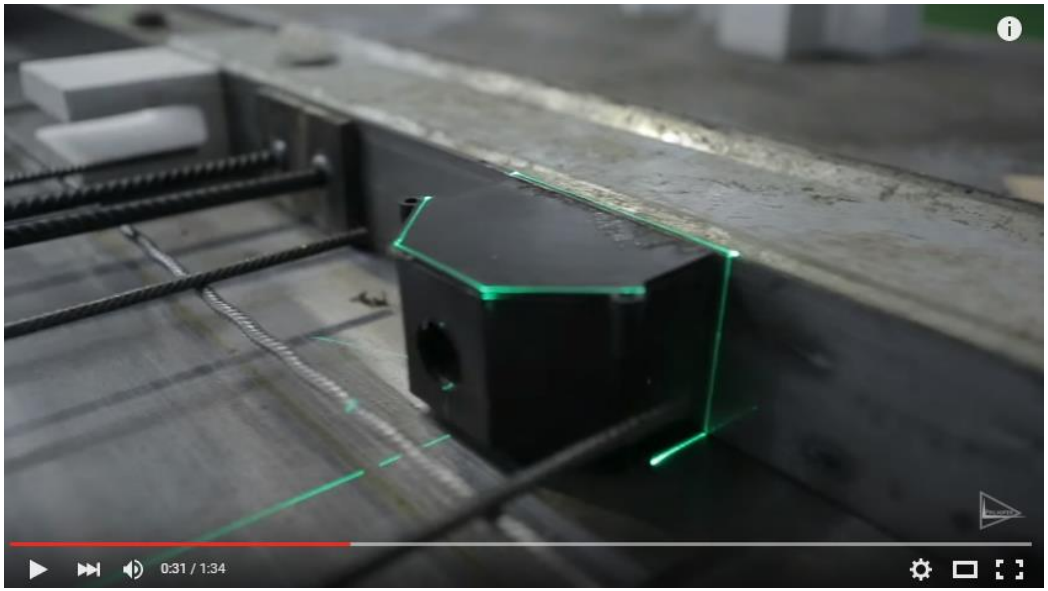
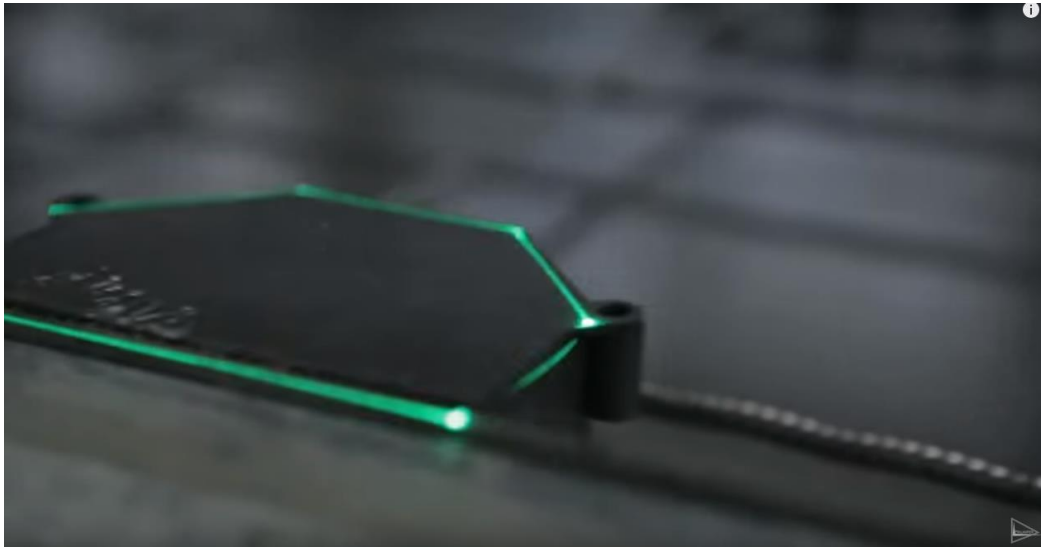
SCANNING OF MOULD





steel framing

scan mould

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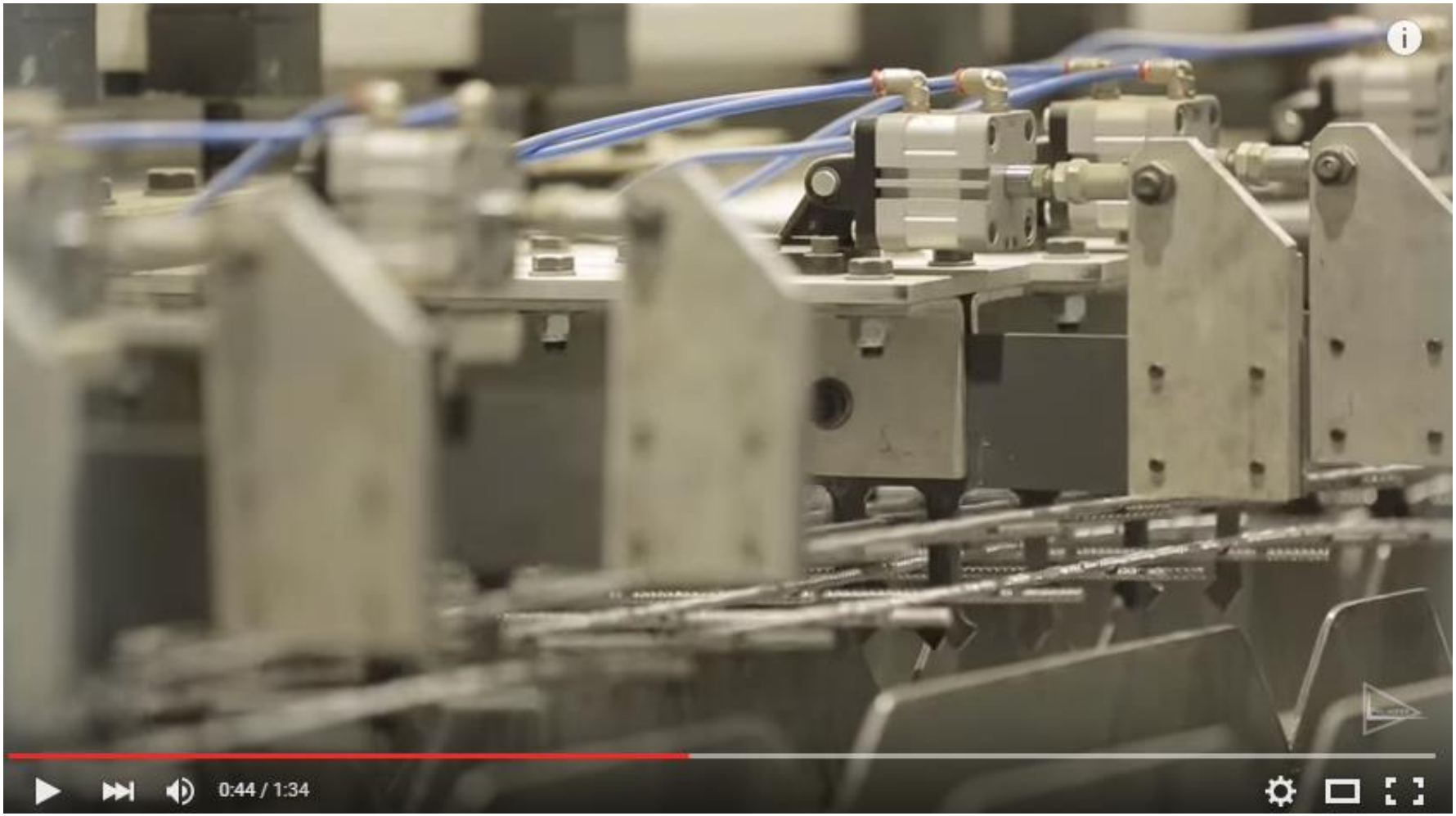
STEEL BARS/BRC

BAR FIXING FRAME


0:41 / 1:34

ROBOTIC BARS SPACERS TO DWG DETAILS



- AND ARRANGING BARS IN TWO LAYERS FOR PLANK

steel framing

scan mould

place rebars

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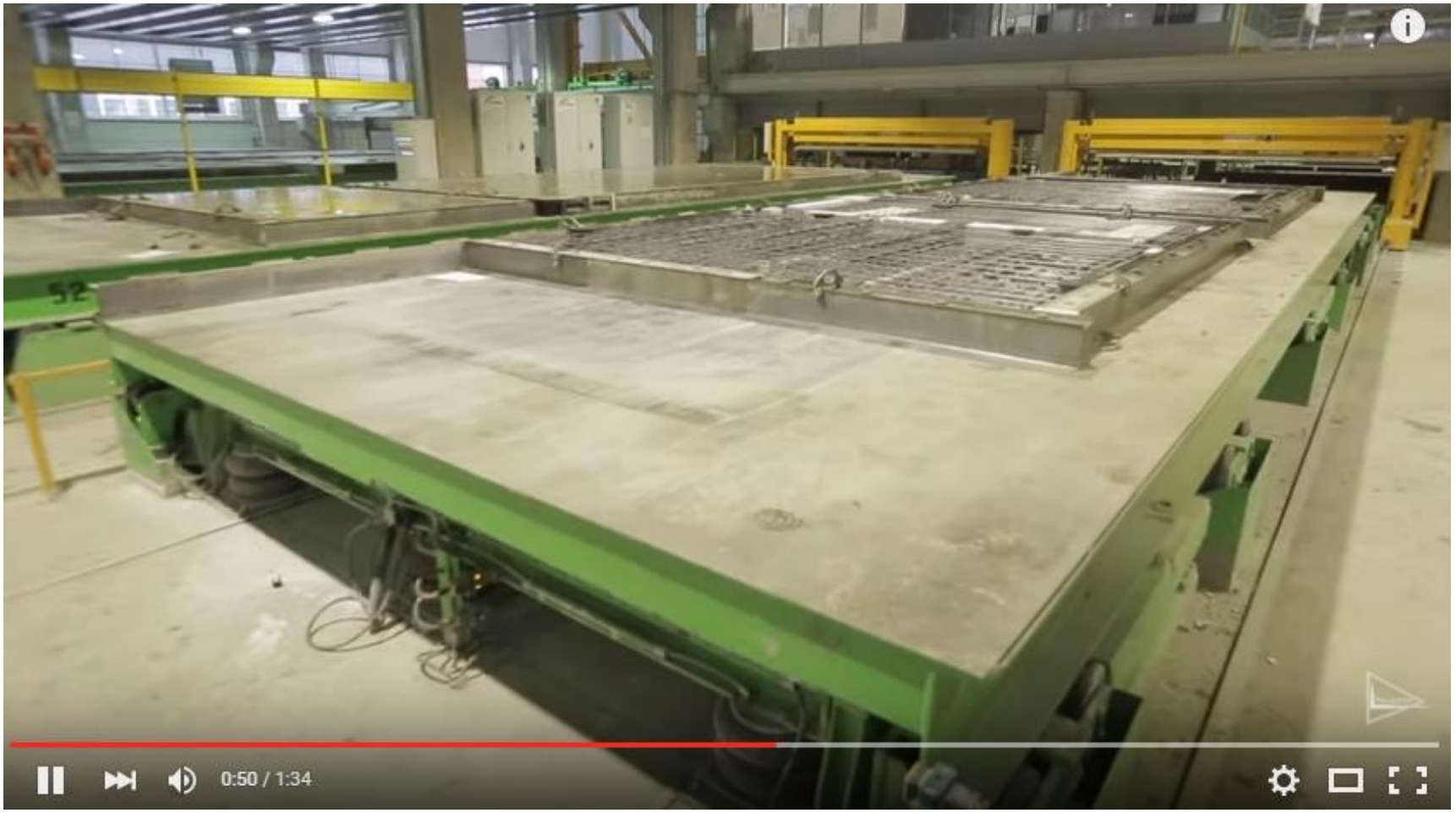
mould ready for casting



auto concrete dispenser

auto concrete dispenser

auto concrete dispenser

steel framing

scan mould

place rebars

pour concrete

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Skimming/finishing

steel framing

scan mould

place rebars

skimming

pour concrete

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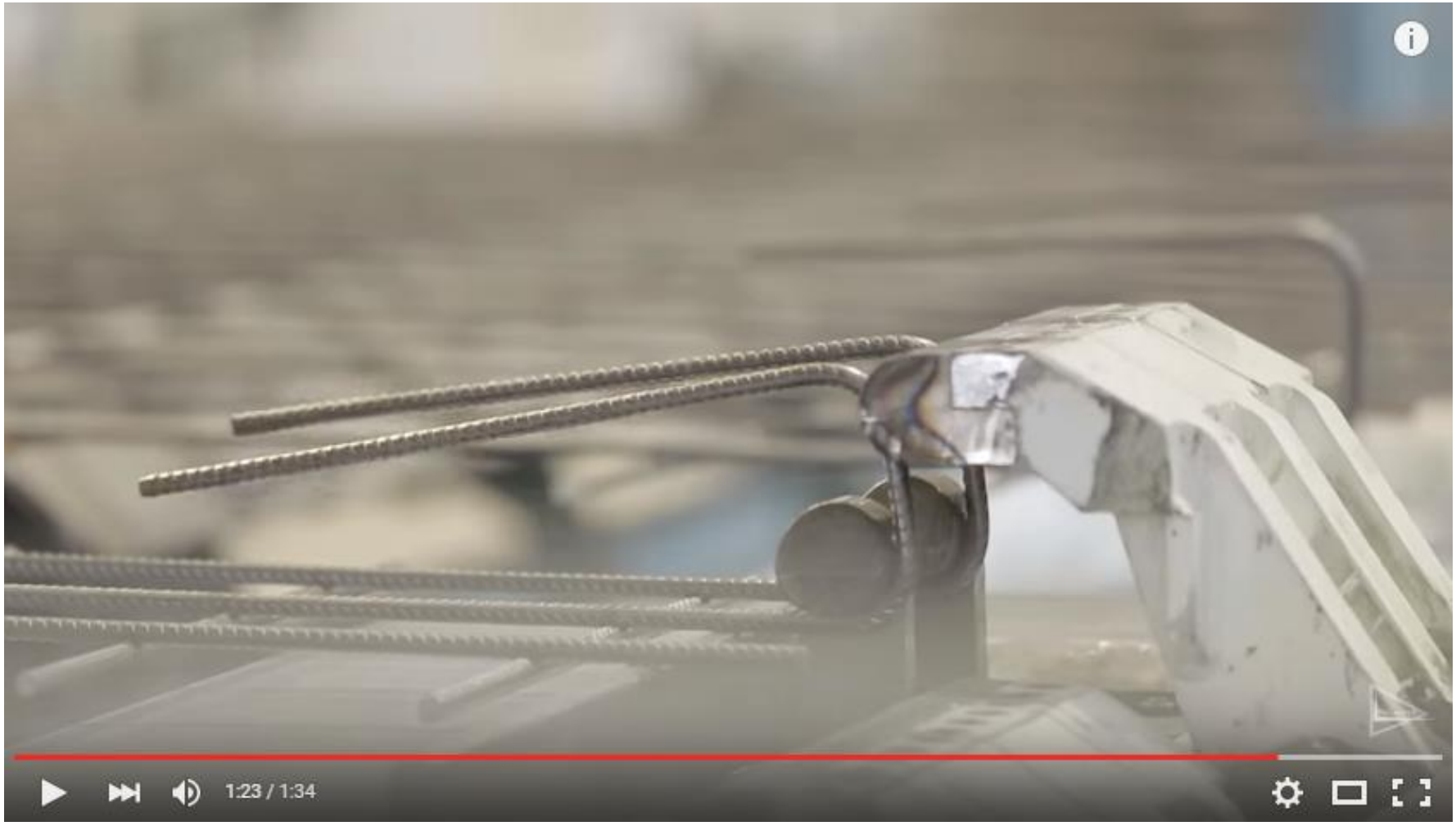
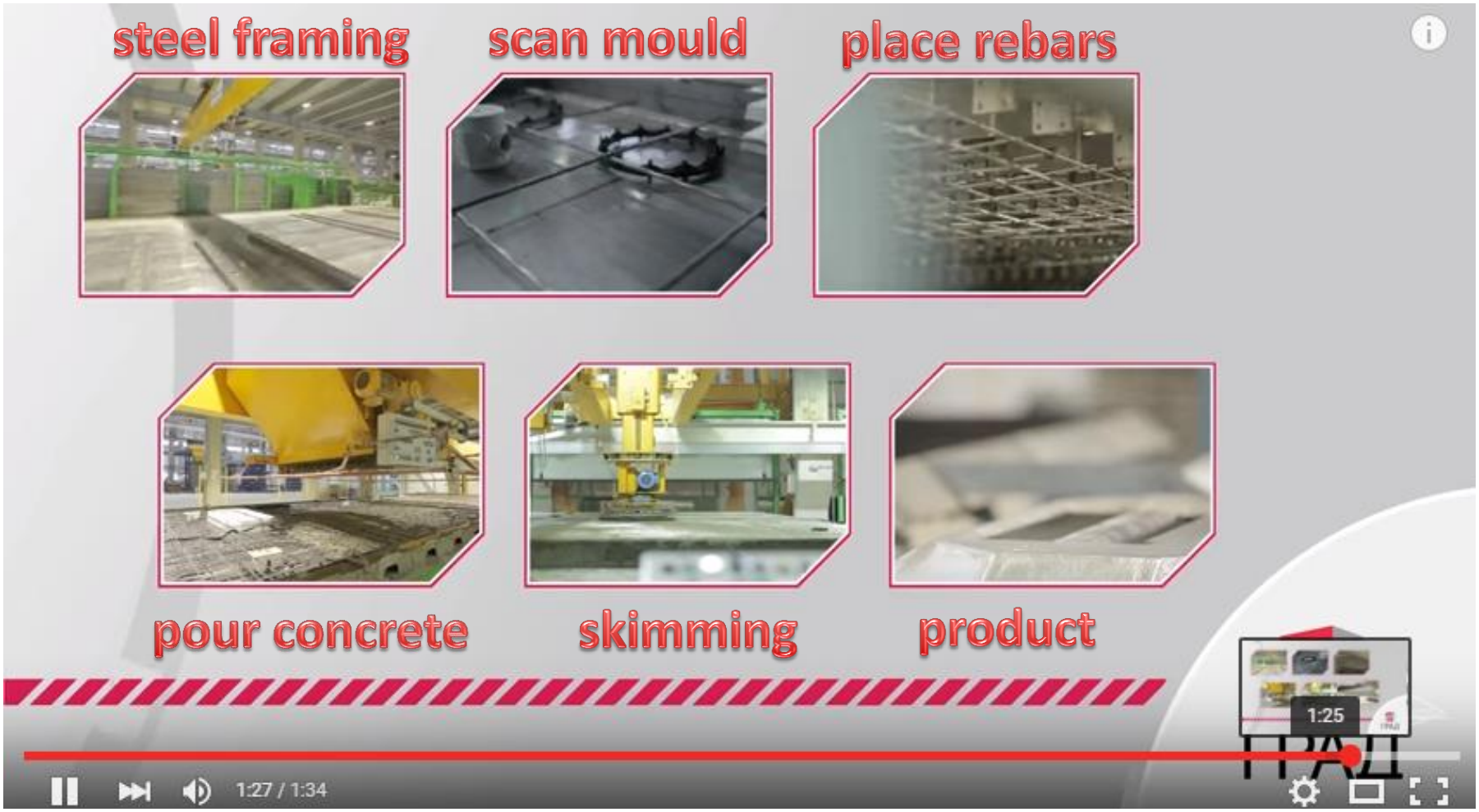
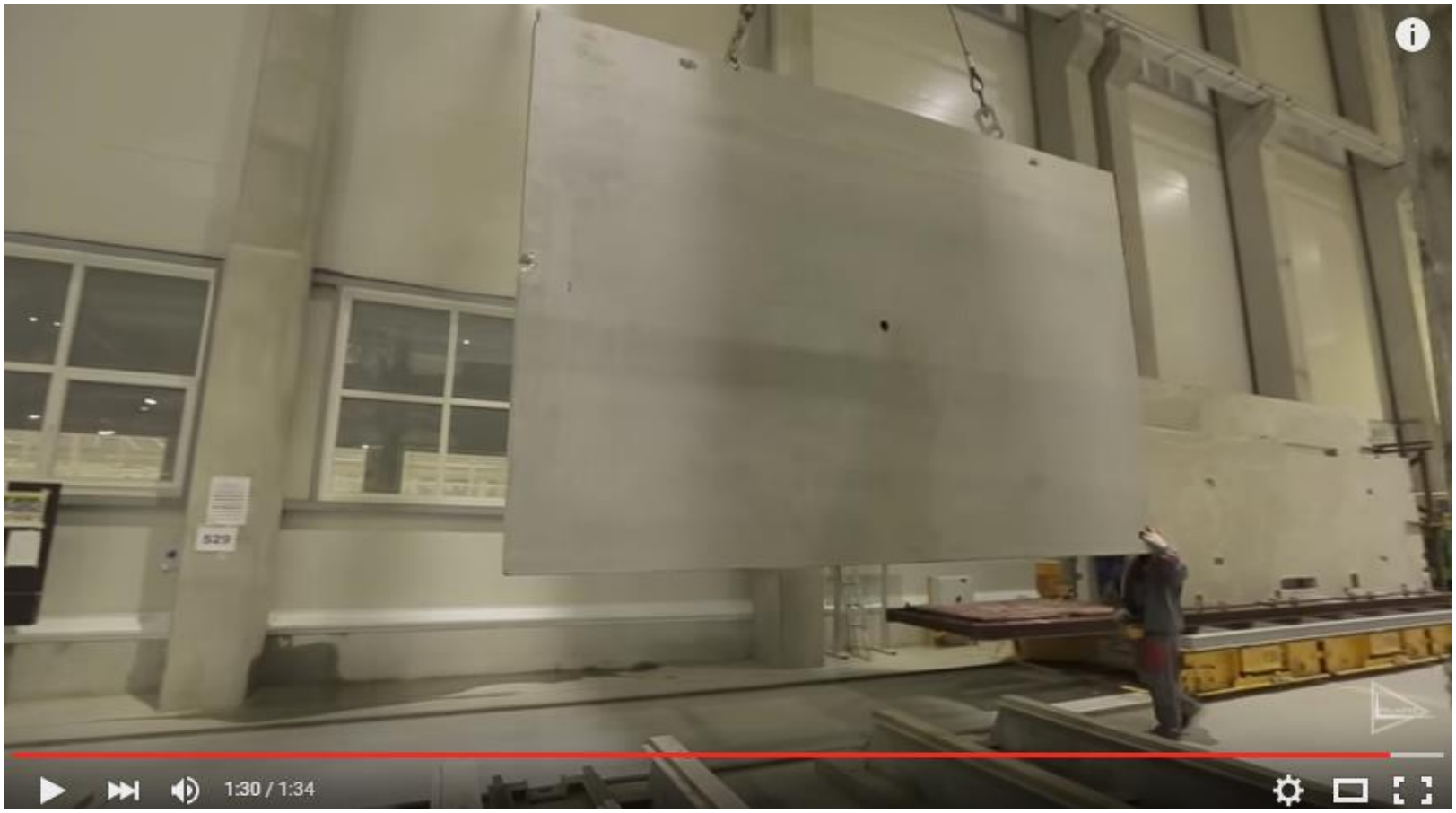
1:15 / 1:34


1:23 / 1:34


steel framing
scan mould
place rebars
pour concrete
skimming
product
1:25
1:27 / 1:34

FINISH PRODUCT



30 STOREY HOTEL IN 15 DAYS

FOUNDATION

FLOORING ELEMENTS

FIXING OF SERVICES

LIGHTING TESTINGS

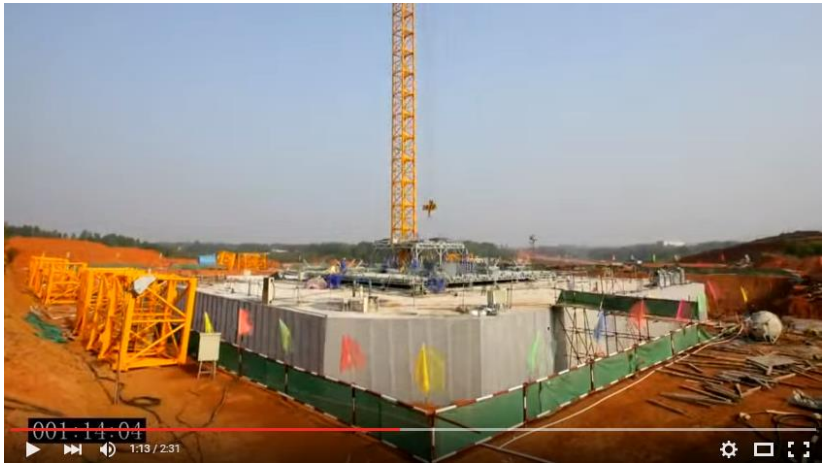
TRANSPORTION AND INSTALLATIONS

CONSTRUCTION IN PROGRESS

FIXING OF STAIRCASE AND CLADDINGS

FURNITURES AND SHADES

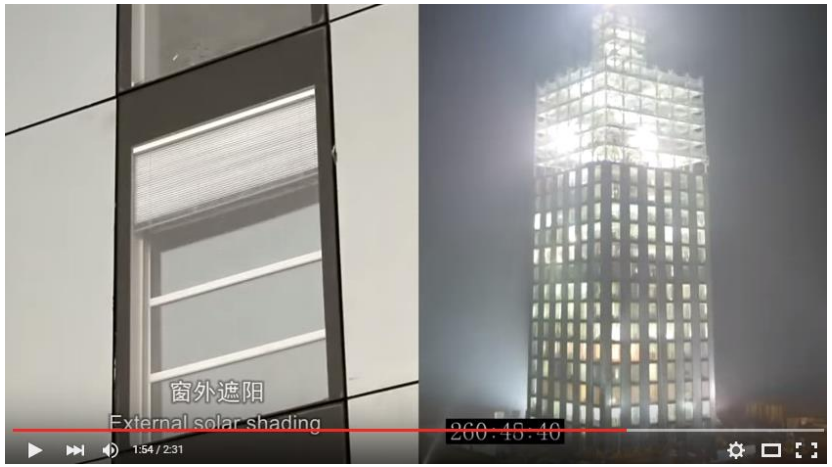
24 HOURS WORKFRAME

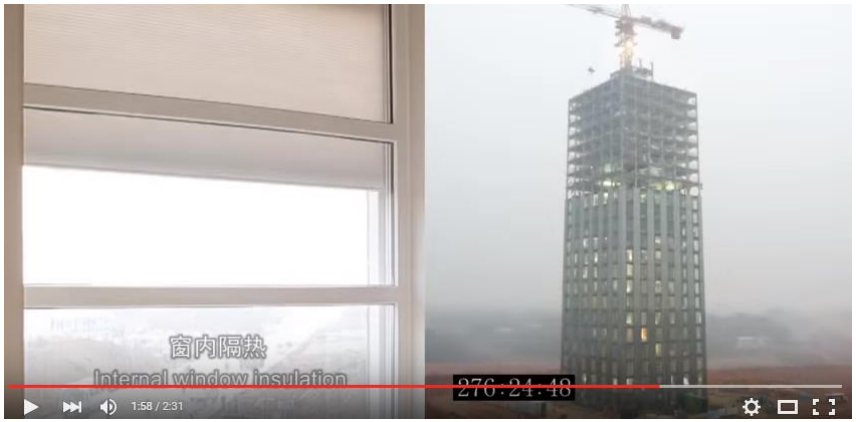


EARTHQUAKE RESISTANCE

- ENERGY EFFICIENT BUILDING

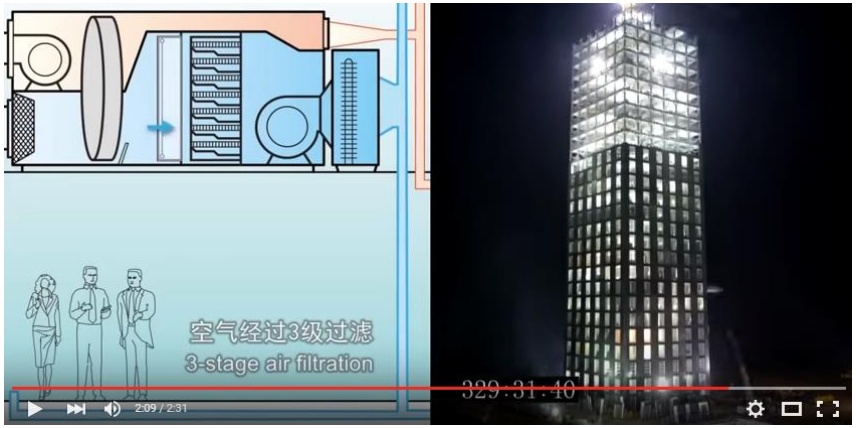
ECO FRIENDLY COMPONENTS




窗内隔热
Internal window insulation
1:58 / 2:31


新风热回收
Heat recovery fresh air
2:01 / 2:31


20倍净化
20 times purer air
2:06 / 2:31


空气经过3级过滤
3-stage air filtration
2:09 / 2:31


种类
室内 Indoor
室外 Outdoor
粉 尘
PM0.3um 1428 96062
PM2.5um 25 1866
PM10 um 1 78
甲醛等VOC
挥发性有机物 0
二氧化碳
CO2 ppm 720 440
室内比室外洁净20倍以上
Indoor air is 20 times cleaner than outdoor air
2:13 / 2:31
344:57:18

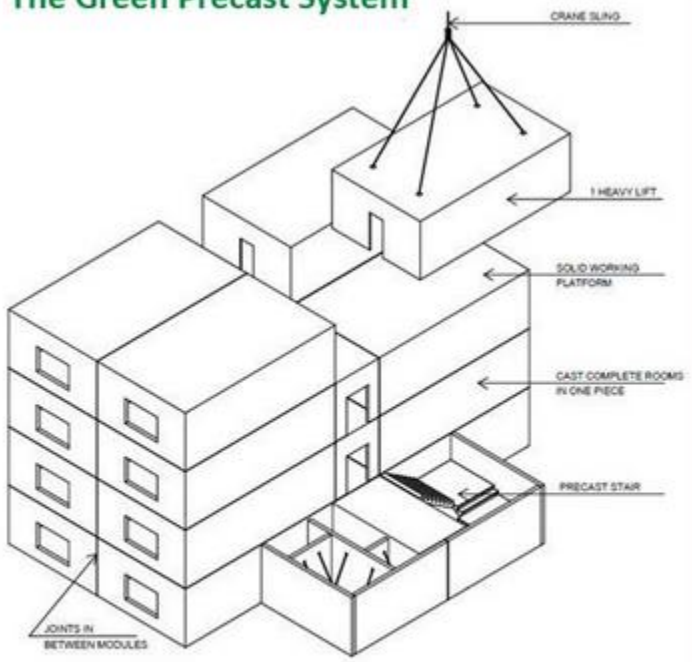

2:20 / 2:31
360:00:00


T30
17000m² hotel
2:28 / 2:31

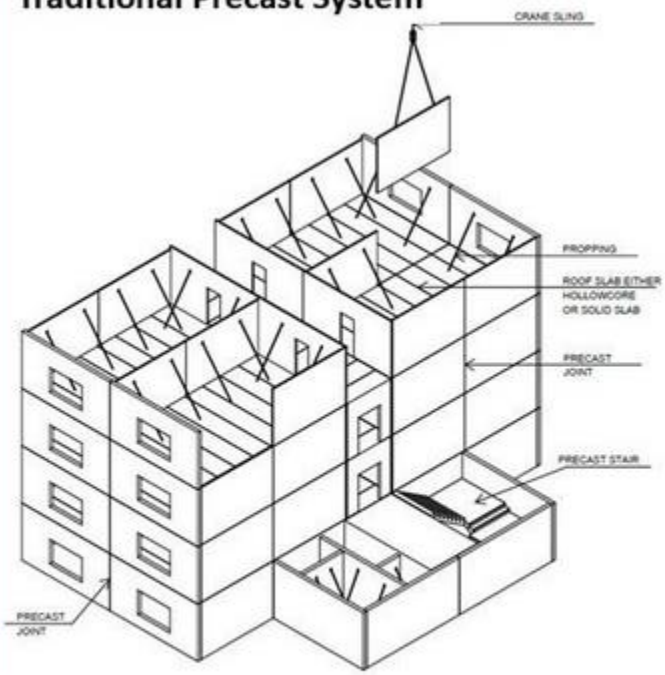

可建 远大 可持续建筑
9度抗震 5倍节能 20倍净化
BSB BROAD SUSTAINABLE BUILDING
9M earthquake resistant 5x energy efficient 20x purer air
www.broad.com
2:30 / 2:31

MODULAR BUILDINGS

The Green Precast System



Traditional Precast System



The Green Precast System provides developers a highly flexible building system that delivers strength, cost and time savings, durability, thermal and acoustic efficiencies and provides structurally superior resistance to natural disasters.

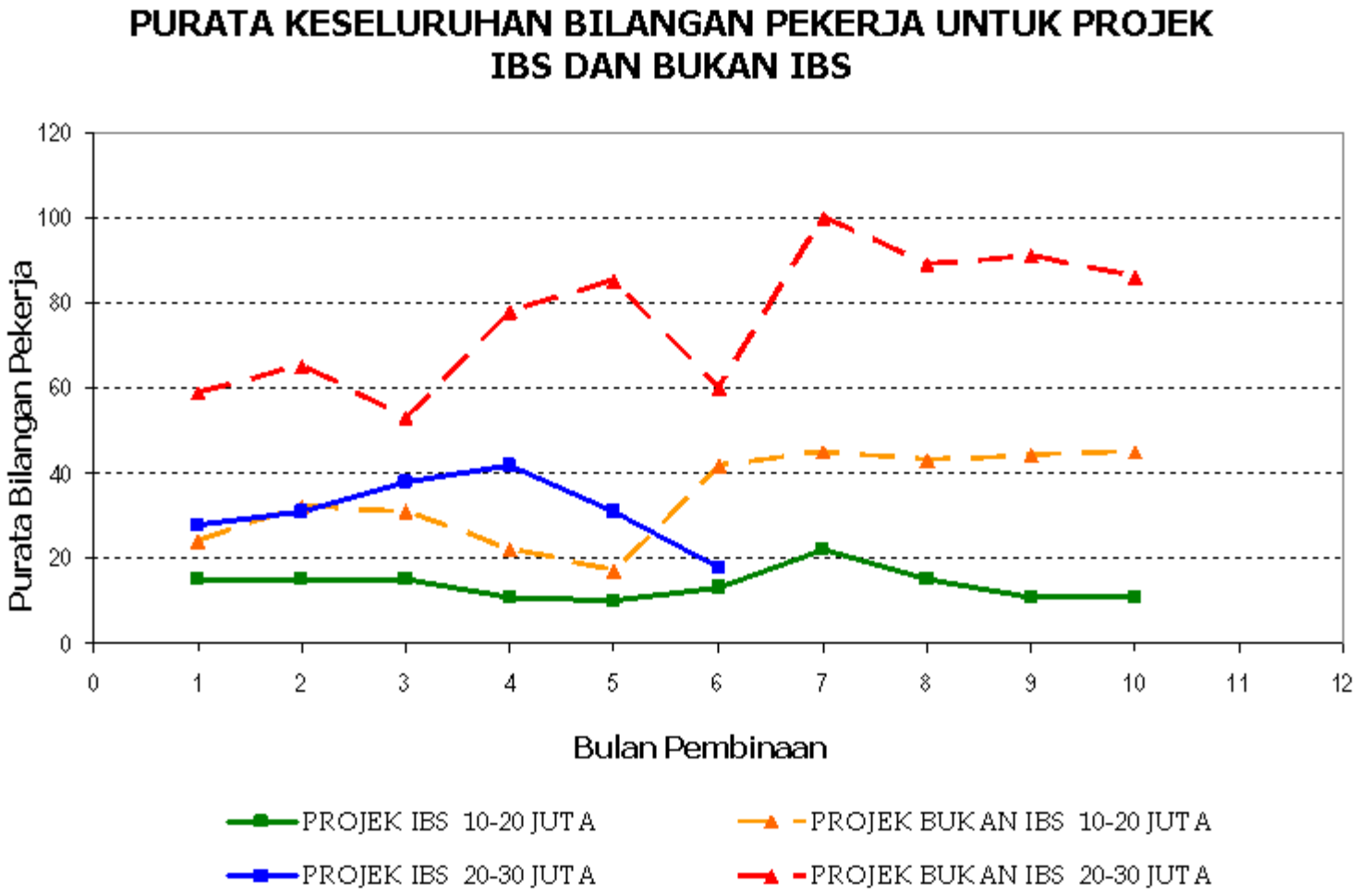

CSU student accommodation

Floating pontoon

General principles of IBS

1. Industrial production of components; prefabrication; pre-cast
   (under controlled environment, can be in factory/site)
2. Labour reduction
3. Open building system – standard components; Moduler Coordination: MS1064

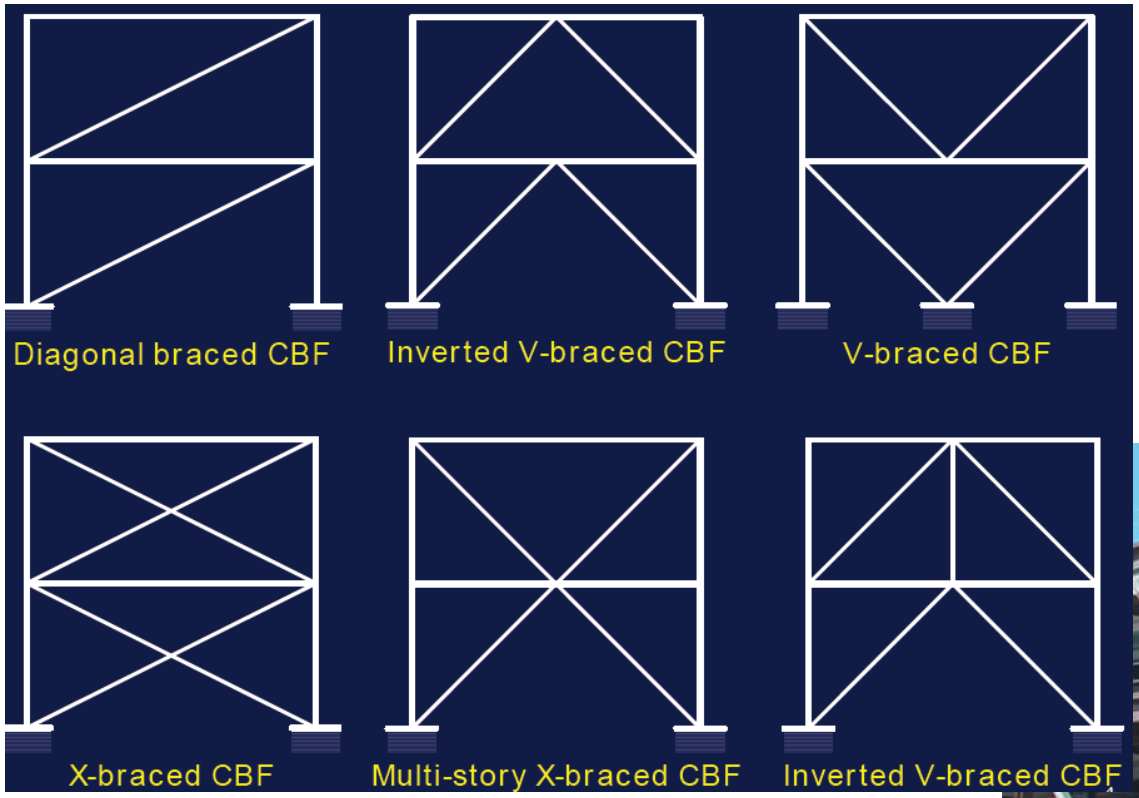
PERBANDINGAN PENGGUNAAN BURUH

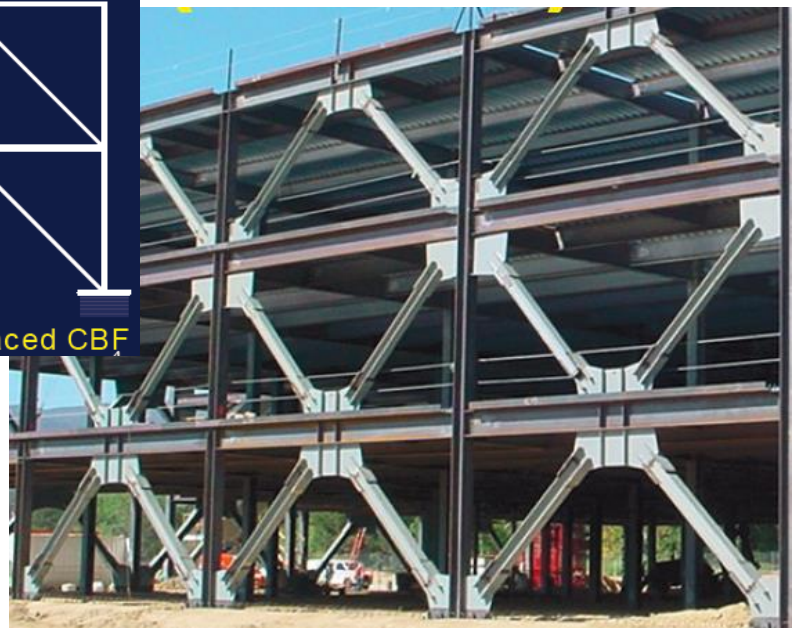


KILANG-KILANG KONVENSIONAL IBS


UNIT TEST

Lateral Force Bracing System in Seismic Active Region

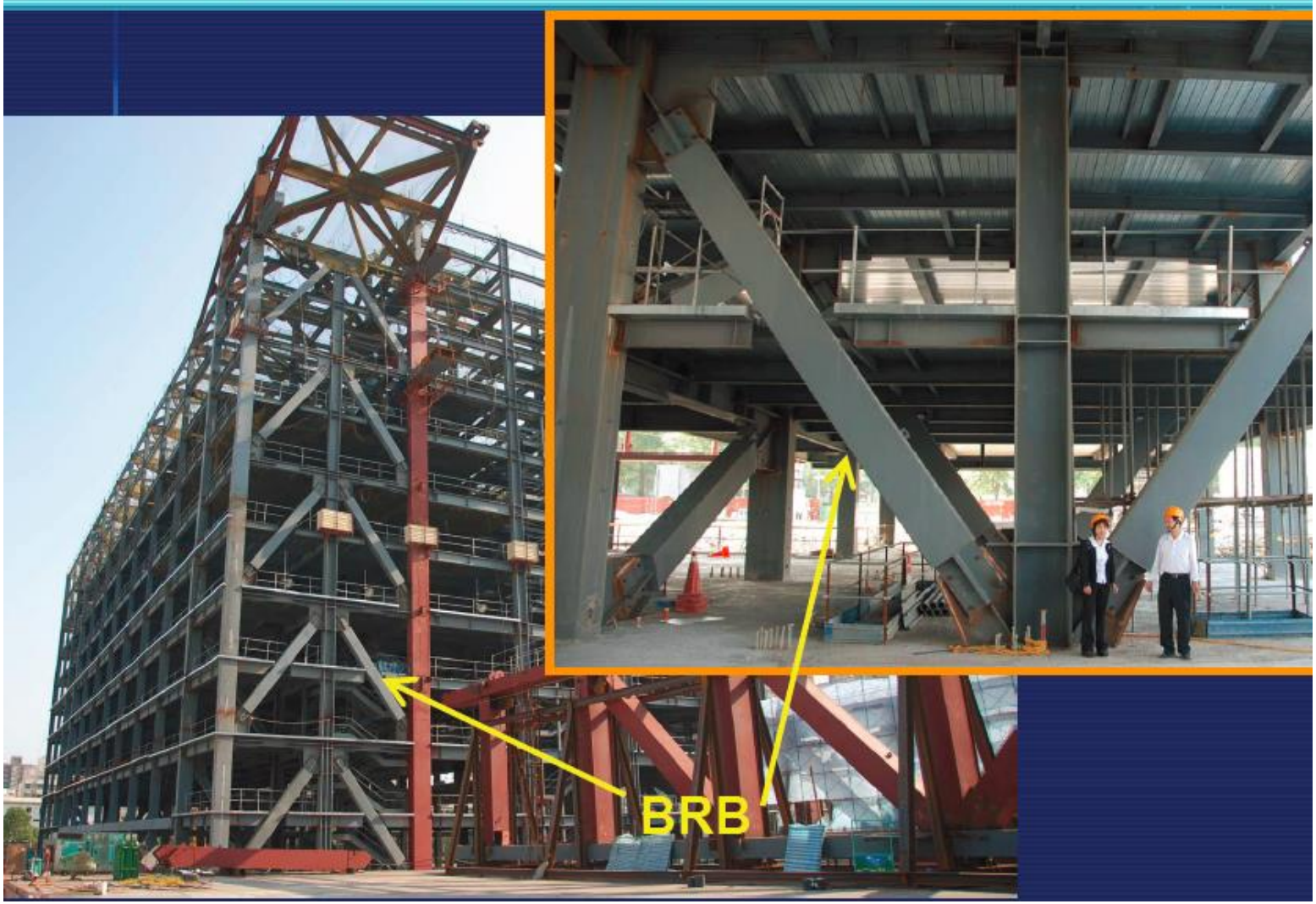




CBF Concentric
Braced Frame

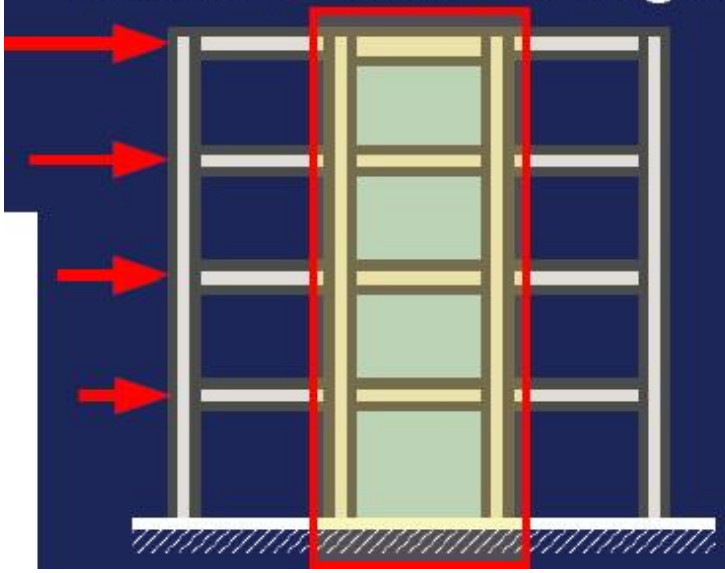
Buckling Restrained Braced Frame

Taichung City Government Building / 台中市政府大樓

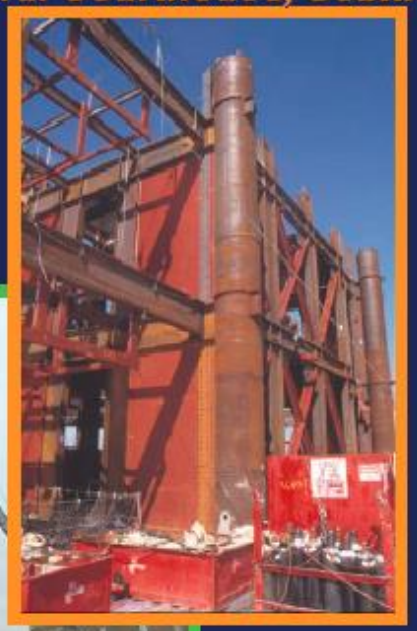


Steel Plate Shear Wall (SPSW)

- *Lateral force resisting system*
- *Thin steel plates are installed into a building's structural frames*
- *Effectively increase the structure stiffness and strength*



USA Federal Courthouse, Seattle



ECONOMY IN DESIGN

(五) 建築物的外觀形狀與耐震性

建築物的造形與耐震能力關係密切。一般而言，造形簡單規則的建築設計，能以較低的建材成本，興建耐震性較佳的建築物；外形花俏多變的建築設計，需要較高的建材成本，以彌補外形上不耐震的缺陷。擁有外形異特多變的建築固然賞心悅目，但若是購買或建造樓房作為居住使用時，應審慎考量耐震安全、經濟性與建築造形三者之間的平衡。

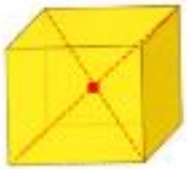
造形簡單規則的建築設計

外形花俏多變的建築設計

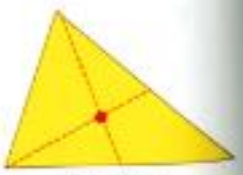
■重心愈高，穩定性愈差

「重心」是指物體的質量分佈中心，例如：實球的重心位於球心，正方體的重心位於兩個斜對角的交叉點，而三角形的重心則是位於兩條「中線」的交會點上。

實球的重心



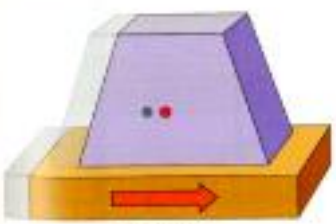
正方體的重心



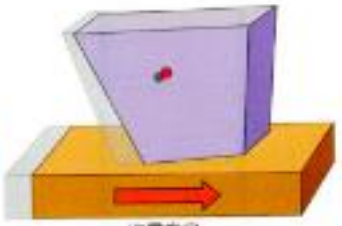
三角形的重心

物體的重心如果偏高，輕輕一推便容易倒下。

外形上寬下窄的物體，重心位置高，地震時，容易翻覆。所以，重心低的建築物相對上較為穩固。

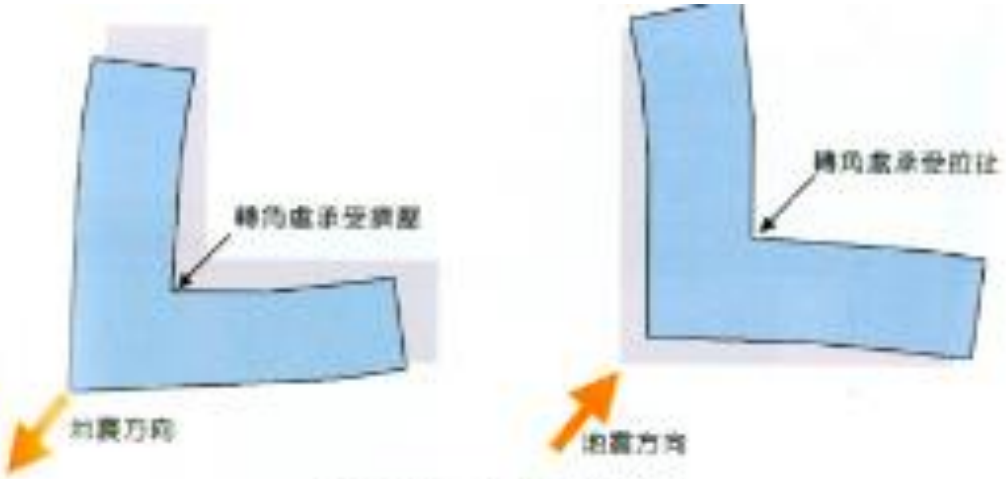


地震方向



地震方向

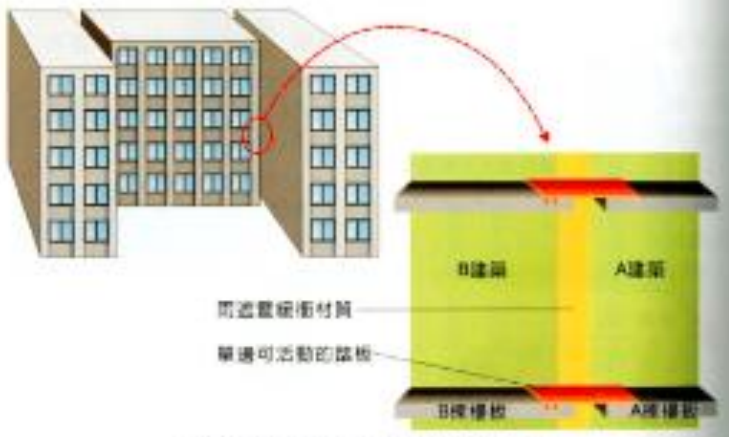
VULNERABLE SYSTEMS



平面形狀為L型的建築物俯視圖

除了L形外，口字型、T字型等平面形狀不對稱的建築，轉角處情況相似，也都容易於地震時發生破壞。

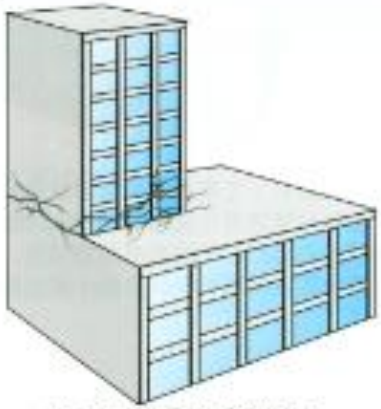
類似上述的建築設計，工程師通常建議採獨棟建造，以及保留適當的各棟間距，防範地震時發生碰撞。如果有功能上的需求，必須讓人們可以在各棟間往來行走，可將各棟空間走道，設計成類似捷運的車廂連結走道。通道間以緩衝材作為外牆，並以單邊可活動的踏板連接樓地板。



凸形建築採震縫設計，即棟間以適當間隔

● 退縮建築容易局部受損

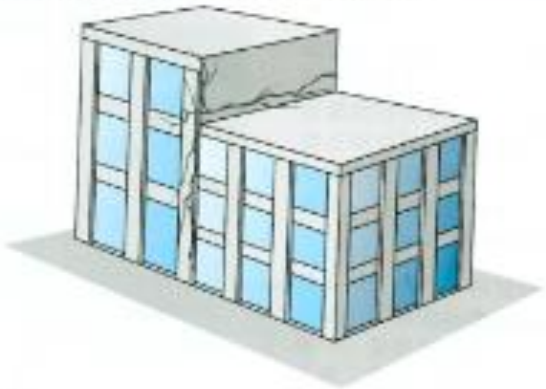
「退縮建築」是指建築的某個或某些樓層，樓地板面積突兀地大改變，建築物的立面形狀突然退縮。地震時，樓層振動產生力行為較為複雜，容易破壞。



退縮建築的樓層與鄰棟容易局部損

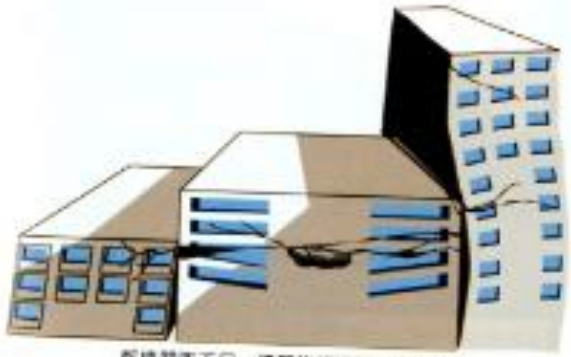
■ 梁線不連貫造成耐震力不佳

一棟建築，樓地板高程不一致，梁線不連貫，當地震發生時，承受左右兩側橫梁與樓板夾擊的柱子，容易破壞。



■ 鄰棟間距不足

建築物彼此間隔距離不足，地震時可能相互碰撞而震損。尤其，高度不同的建築，有不同的自然振動週期，更應預留足夠的變形空間，防範地震過程彼此發生碰撞。



鄰棟間距不足，建築物相互碰撞而震損

SEISMIC DESIGN FOR BRIDGES AND BUILDINGS

1980s

- PENANG BRIDGE
- KOMTAR BUILDING, PENANG
- SABAH FOUNDATION BUILDING, SABAH

2000s

- KLCC TWIN TOWERS

PENANG BRIDGE

KOMTAR BUILDING PENANG

SABAH FOUNDATION BUILDING SABAH

UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Seismic Retrofit Strategies

Base Isolation:

Isolated structures

TWIN TOWERS

KLCC

OWNER:
China Central Properties Ltd. (Current owner is RREEF)

ARCHITECT:
Minoru Yamasaki & Associates

PROJECT LOCATION:
Dalian, China

PROJECT SCOPE:
Structural Engineering, Precast Cladding Engineering and Construction Engineering

\PROJECT DETAILS:
43-stories, 89,000 square meter, precast prestressed concrete, grade-A office tower located near the city centre of Dalian, Liaoning Province.

CHALLENGE:
This building is located in a high seismic zone on the northeast coast of China

SOLUTION:
Structural design for this building involved precast concrete beams, slab soffits and a

precastconcrete façade and parapet cladding system.

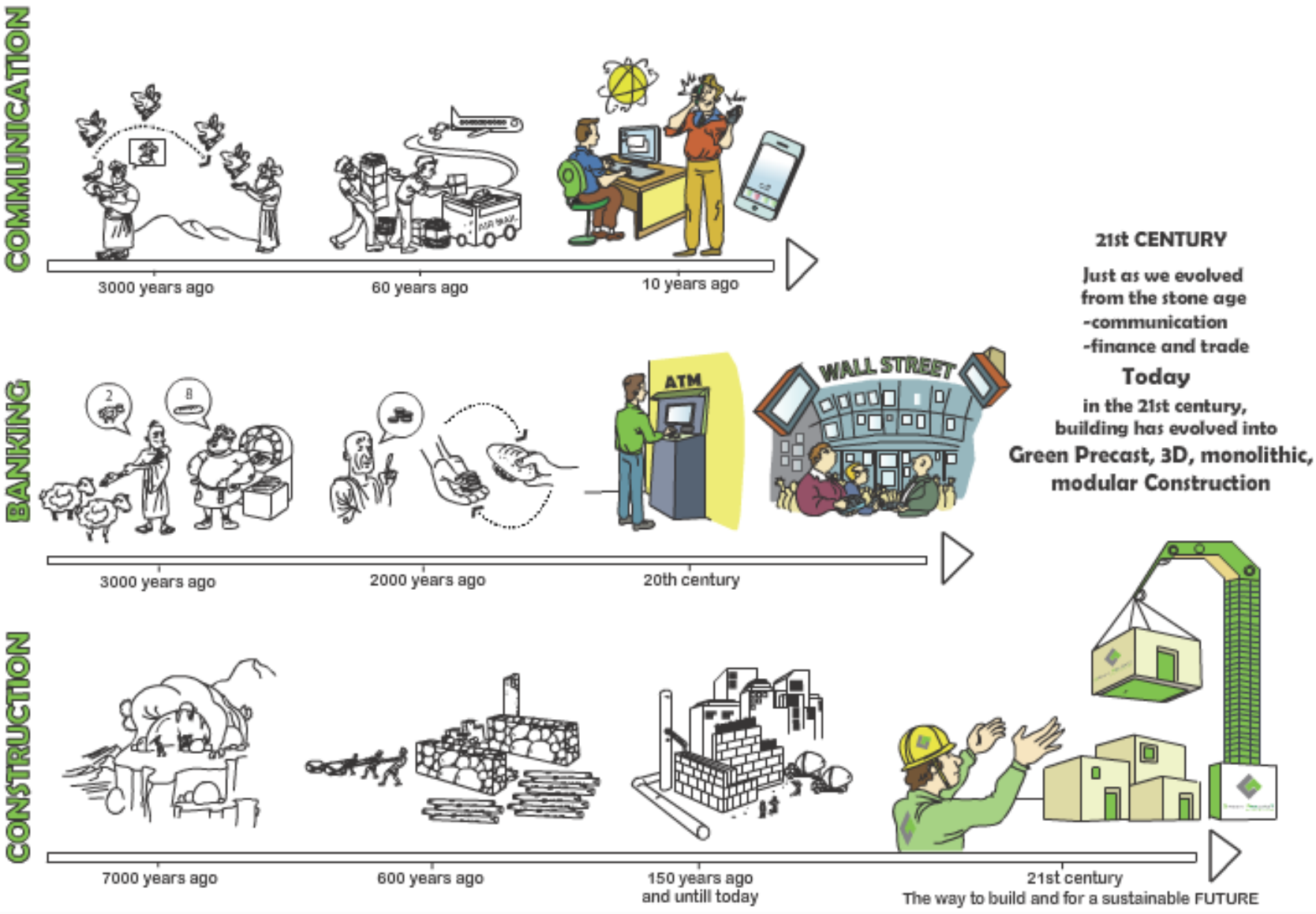
RESULTS:
This project was completed in record time as the precast design allowed erection of the building structure at a rate of one floor every three days. Completed in 1999.

Fig. 2. Artist's rendering of The Paramount. Photo courtesy: Kwan Henmi, Architecture and Planning. Artist: W. Yeliseyev.

At 39 stories and 420 ft (128 m) high, The Paramount (located in San Francisco, California) is the tallest concrete structure in addition to being the tallest precast, prestressed concrete framed building in Seismic Zone 4 (a double record). It is the first major high rise building to be braced by an architecturally finished exposed precast concrete ductile frame. The reinforcement used to create this seismic ductile frame includes post-tensioning and high strength reinforcing steel. All this represents a major milestone in the development of precast/prestressed concrete. The building is basically an apartment complex, although the lower floors accommodate retail space, vehicle parking and recreational amenities. This article presents the design considerations, construction highlights, research and development, and code approval process that led to the realization of this structure.

SEKIAN TERIMA KASIH

IT IS EVOLUTION®™



21st CENTURY

Just as we evolved
from the stone age
-communication
-finance and trade

Today

in the 21st century,
building has evolved into
Green Precast, 3D, monolithic, modular Construction