HDB’s Productivity Journey & Research In Precast & Prefabrication

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Contents

1) HDB’s 50 years of Productivity Journey
2) Prefabrication and Precast Innovations
3) Our Next Lapse -- Gearing Towards Higher Productivity
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
Labour intensive, Low Productivity, Low Level of Mechanisation ....
Productivity & Quality
Improvement Initiatives
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
# Structural Elements – Modular Dimension

## Beam

<table>
<thead>
<tr>
<th>S/N</th>
<th>Component Type</th>
<th>Modular Dimension</th>
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<tbody>
<tr>
<td>1</td>
<td>Beam</td>
<td>Width: 200, 250, 300mm &lt;br&gt; Depth: 500, 600mm with incremental of 50mm</td>
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## Column

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## Slab thickness

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<tr>
<td>3</td>
<td>Slab thickness</td>
<td>125, 150, 175, 200mm incremental sub modules of 25mm</td>
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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
Prefabricated Reinforcement

2 times more productive
Precast Construction & Technology Development
From 1980s – Large Scale Implementation

- Large scale implementation of various fully-precast system
- Developed in-house precast design standard
- Develop precast industry
HDB PREFABRICATED BUILDING SYSTEM
Higher and Denser Development

Develop Precast Solution for Super High-rise Building Design
R&D In Product

Multi-storey production facilities

Reinventing the pre-production concept
Mechanised Production Processes

Production of Flat Panels & Solid Walls

Optimisation of factory production space

Conventional horizontal production using flat moulds

Vertical Production Using Battery Moulds
Productivity Improvement Thru’ Work Process Transformation....

- Encourage more adoption of market available machinery and hand tools
- Develop/customise machinery to re-engineer work processes
Re-engineering of Architectural Materials Handling Processes

Re-Package for Ease of Handling/Hoisting

To repackage these bulky mallets (1.5-2 tons/pallet) to manageable size of 0.5t-1.0t)

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
Automation of Precast Production
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
LEADING THE INDUSTRY IN CONSTRUCTION PRODUCTIVITY

AUTOMATISED PRECAST PRODUCTION SYSTEM

- Increase existing factory production capacity by 20%
- Improve production productivity by 35%
- Optimise labour usage of precast plant
Automated Precast Production System

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

Complementing the precast automation process:
• A need to customise the production system to suit local practice
Development of Precast System For Automated Precast Production
Current PC Planks Produced using Long Bed Lines

- Widths of PC Planks are highly standardised (1.0m & 2.4m)
- Planks lengths required are formed by dividers.
Automated Precast Production System

New Product For Automated Precast Production – Large Panel Slab (LPS)

Casting & de-moulding of LPS slab

High quality off form finish requires minimal touch up on site
Applications of New Components

Geylang C28

Bukit Merah C19C & C19D

- Currently 2 in-house projects are using Large Panel Slab System (LPS)
  More future in-house projects will be identified for usage of LPS
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
Advanced Construction Technology:
• Construction mechanisation & automation
  • Tools & equipment
  • Automation of concrete batching plants
• Automated building system (ABS)
• Computerised & Integrated Construction Management 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
Façade Cleaning: the Current State

- Workers suspended on gondolas or using rope access to perform façade maintenance works

Cleaning of façade  
Painting of buildings
Existing Façade Cleaning System

New developments needed for recessed and protruding façade profiles
Thank you