Modular Integrated Construction (MiC)
1 Company Overview

- Shenzhen Factory (PRC)
- Zhuihai Factory (PRC)
Established in January 1993, a wholly-owned subsidiary of China State Construction International Holdings Ltd. The major products include:

* Precast facade
* Precast partition walls, floor slabs, staircases and balconies
* Precast primary and secondary beams, columns and composite GRC
* Precast integrated kitchens and bathrooms
Company Layout Plan

Area: 50,000 m²
## Production Layout Plan

### Zhuihai Factory

<table>
<thead>
<tr>
<th>Zone</th>
<th>Capacity (MiC Unit)</th>
<th>Area (m²)</th>
<th>Monthly Fabrication (Nos.)</th>
<th>Yearly Fabrication (Nos.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Casting Concrete)</td>
<td>24</td>
<td>3,700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B (Decoration and Finishing)</td>
<td>30</td>
<td>2,000</td>
<td>125</td>
<td>1500</td>
</tr>
<tr>
<td>C (Storage)</td>
<td>90</td>
<td>5,800</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>144</strong></td>
<td><strong>11,500</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Company Overview

Approved precast supplier to HK Government, Property Developers, Main Contractors
Company Overview

Strong in technical supports to various types of building and civil projects
Company Overview

Precast integrated kitchens and bathrooms

Steel Modular Office
Design of Steel MiC
Statutory Submission and Design of MiC system

Elevation
Statutory Submission and Design of MiC system

Design of Fire and Water Resistance System (Steel MiC)

- 60 mins Fire Resistance Rating
- Wet Resistance

[Diagram of floor plan showing areas labeled KITCHEN, BATH, and LIV. FLAT A with the fire and water resistance systems indicated.]
Design of MiC system

Steel Frame of Steel MiC
Design of MiC system

BIM Study of Steel MiC
Design of MiC system

Design of Connection (Steel MiC)
Design of MiC system

Mock Up of Steel MiC

Entrance and Pipe Duct

Living Room
Design of MiC system

Mock Up of Steel MiC

Toilet

Kitchen
Design of MiC system

BIM Study on MEP Services
High Rise Building

Steel MiC
Design of MiC system

Elevation
Design of MiC system

Plan and Sections
Design of MiC system

**STANDARD STUDIO**
(Dual Pipe)

PD AREA PER PAIR OF UNIT = 1.29 m²

**STANDARD STUDIO**
(Shared PD)

PD AREA PER PAIR OF UNIT = 0.85 m²
Design of MiC system

STANDARD UNIT

Foldable Bed

Acoustic wall

Foldable Table
Design of MiC system

FAMILY UNIT 1

Foldable Bunk Bed

Rotating Foldable Table
Design of RC MiC
Statutory Submission

Preparation for Design Proposal **RC-MiC System**

1. The NMB splice sleeve system is submitted to HA and is discussed with HA's project team and CSE / DC. Supplementary information will be submitted on early August 2018.

2. Discussion and study with Centre for Innovation in Construction & Infrastructure Development (CICID) from HKU for the viability of adopting MiC system in public housing construction in HK, which is commissioned by HA.

3. Design study for Concrete+Steel Composite Structure.

4. Based on the modular design in Nam Cheong Street from Hong Kong Council of Social Service (HKCSS), RC MiC system will be submitted to BD.

5. Material study for Lightweight concrete with HKU.
Design of RC MiC

Design of Connection - NMB Splice Sleeve (RC MiC)
Design of Connection - RC+Steel Composite Structure
Design of RC MiC

Mock Up of RC MiC

CARPETABLE AREA 16.5 m²
BATHROOM AREA 3.5 m²
TOTAL INTERNAL AREA 19.8 m²
Design of RC MiC

Mock Up of RC MiC

CARPETABLE AREA 16.3 m²
BATHROOM AREA 3.5 m²
TOTAL INTERNAL AREA 19.8m²
Design of RC MiC

Mock Up of RC MiC 3.3m (W) x 7.2m (L) x 3.3m (H)
Design of RC MiC

Mock Up of RC MiC 3.3m (W) x 7.2m (L) x 3.3m (H)
Mock Up of RC MiC 3.3m (W) x 7.2m (L) x 3.3m (H)
4 Fabrication, Handling And Transportation
Fabrication, Handling and Transportation

Design of Modular units

2.4m < W < 3.5m For ONE Modular
Fabrication, Handling and Transportation

Design of Modular units

2.4m < W < 3.5m For ONE Modular
Fabrication, Handling and Transportation

Design of Modular units

2.4m < W < 3.5m For ONE Modular
Fabrication, Handling and Transportation

Design of Modular units

$2.4m < W < 3.5m$ For ONE Modular
Fabrication, Handling and Transportation

Design of Modular units

2.4m < W < 3.5m For ONE Modular
Handling and Transportation of Steel MiC
Fabrication, Handling and Transportation

Handling and Transportation of RC MiC
Fabrication, Handling and Transportation

Connection of Services

**OFF SITE FIX**
- Electrical Conduit
- Junction box

**ON SITE FIX**
- Wiring
- Connection
Fabrication, Handling and Transportation

$2.4m < W < 3.5m$

$3.1m < H < 4.0m$

$0.6m < H < 1.5m$
Supervision and Quality Assurance
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Essential Information</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General</td>
<td>General Building Plans</td>
<td>AP / RSE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Structural Plans</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fire Safety</td>
<td>Details for fire resistance, fire protection and fire fighting, etc.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use of limited non-combustible materials</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lighting and Ventilation</td>
<td>Window area and ventilation</td>
<td>AP</td>
</tr>
<tr>
<td>4</td>
<td>Drainage</td>
<td>Drainage Plans</td>
<td>BSE</td>
</tr>
<tr>
<td>5</td>
<td>Barrier Free Access</td>
<td>Acess and facilities for the disable</td>
<td>AP</td>
</tr>
<tr>
<td>6</td>
<td>Structure</td>
<td>Structural system and modular design</td>
<td>RSE / HL</td>
</tr>
<tr>
<td>7</td>
<td>Quality Assurance</td>
<td>Quality Assurance System of the prefabrication factory</td>
<td>HL</td>
</tr>
<tr>
<td>8</td>
<td>Fabrication, Storage, Transportation and Installation</td>
<td>Method statement for fabrication, storage, protection, transportation and installation</td>
<td>RSE / HL</td>
</tr>
<tr>
<td>9</td>
<td>Maintenance</td>
<td>Access points for inspection and maintenance</td>
<td>AP</td>
</tr>
<tr>
<td>10</td>
<td>Other Essential Information</td>
<td>Justification and substantiations for modular system (if any)</td>
<td>ALL</td>
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</table>
Supervision and Quality Assurance

Minimum qualification and supervision frequency of Quality Control Supervisory and Co-ordination Team,

<table>
<thead>
<tr>
<th>Qualifications of Supervisory Personnel</th>
<th>AP Stream</th>
<th>RSE Stream</th>
<th>RC Stream</th>
<th>Electricity Work</th>
<th>Water Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3</td>
<td>AP</td>
<td>T3</td>
<td>RSE</td>
<td>T3</td>
<td>AS</td>
</tr>
<tr>
<td>Supervision Frequency</td>
<td>Weekly</td>
<td>Monthly</td>
<td>Weekly</td>
<td>Monthly</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Weekly</td>
<td>Continuous</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>Continuous</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Continuous</td>
</tr>
</tbody>
</table>

T3/T1 refers to Grade T3/T1 Technically Competent Person equivalent as stipulated in the Code of Practice for Site Supervision
AP : Authorized Person
RSE : Registered Structural Engineer
AS : Authorized Signatory
REW : Registered Electrical Worker
LP : Licensed Plumber
Supervision and Quality Assurance

Supervision of Licensed Plumber

或
Supervision and Quality Assurance

**Code 21 PROCEDURES FOR INSPECTION, TESTING AND CERTIFICATION**

21A Inspection of Low Voltage Installations

21B Testing of Low Voltage Installations
   (1) Safety
   (2) Sequence of tests
   (3) Continuity of protective conductors
   (4) Continuity of ring final circuit
   (5) Insulation resistance
   (6) Polarity
   (7) Earth electrode resistance
   (8) Earth fault loop impedance
   (9) Functions of all devices including protective devices
   (10) Additional checks for installations in hazardous environment

21C Inspection of High Voltage (H.V.) Installations

21D Testing of High Voltage Installations
   (1) Safety
   (2) Testing requirements

21E Points to be Noted by Registered Electrical Workers
   (1) Signing of certificates
   (2) Dates of tests, inspections and certification
   (3) Items to be inspected and tested
   (4) Related ordinance and regulations to be observed
   (5) Energisation of installation for testing purposes
   (6) Standard symbols to be used
6 Construction Programme
## Typical Production and Fabrication Cycle for one modular unit

<table>
<thead>
<tr>
<th>Item</th>
<th>Activity</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Steel frame fabrication</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Steel mold installation (Inner)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Steel reinforcement</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Cast-in item installation</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Steel mold installation (Outer)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Window frame installation</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Casting concrete</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Curing</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Demolding</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Waterproofing</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Window / Door installation</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Tiling</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Skin coat and painting</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Fitting installation</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>MEP works</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>General cleaning</td>
<td></td>
</tr>
</tbody>
</table>
Case Study for Use of MiC system

MiC modules to be adopted to floors above transfer plate. Steel frame modular units are under consideration.

Podium to transfer plate to be in-situ reinforced concrete construction.
Fabrication and Installation Programme
### Fabrication and Installation Programme

<table>
<thead>
<tr>
<th>Crane</th>
<th>Radius and Capacity</th>
<th>Install unit per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>40m 40t</td>
<td>13 nos</td>
</tr>
<tr>
<td>T2</td>
<td>40m 40t</td>
<td>13 nos</td>
</tr>
</tbody>
</table>

For T1, 13 nos. x 45 mins/no. = 9.75 hrs  
For T2, 13 nos. x 45 mins/no. = 9.75 hrs  

i.e. One whole floor (26 nos.) can be completed in TWO day.  

Three times faster than conventional construction method.
# Fabrication and Installation Programme

## Installation for One Modular Unit

<table>
<thead>
<tr>
<th>Item</th>
<th>Activity</th>
<th>Duration (Mins)</th>
<th>Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setup for lifting</td>
<td>5</td>
<td>1-3</td>
</tr>
<tr>
<td>2</td>
<td>Lifting to installation level</td>
<td>5</td>
<td>3-5</td>
</tr>
<tr>
<td>3</td>
<td>Levelling and installation</td>
<td>25</td>
<td>5-25</td>
</tr>
<tr>
<td>4</td>
<td>Release the lifting device</td>
<td>5</td>
<td>25-29</td>
</tr>
<tr>
<td>5</td>
<td>Back to G/F</td>
<td>5</td>
<td>29-34</td>
</tr>
</tbody>
</table>

**TOTAL** 45
Fabrication and Installation Programme

Tower Crane Capacity

Crane Model
STT1330
(64m/50t)
Fabrication and Installation Programme

Use of MiC Construction
Fabrication and Installation Programme

Outline Programme for Comparison of MIC and Traditional Construction Method

Use of MiC Construction

- Traditional Construction Method
  - Consent and Plant Mobilization
  - B/F
  - G/F
  - 1/F
  - 2/F
  - 3/F Transfer Plate
  - 7.5m
  - 30 Storeys @ 6 working Day Cycle R/F to UR/F
  - LMR and EGR Builder’s Works
  - 75 days allowed for Lifts Installation Submit of Form LE5
  - Statutory Inspection (Lift + WSD + FS + BD), Obtain OP
  - Finishing Works
  - E&M Works Equipments
  - 11.5m
  - 10m

- MIC Construction Method
  - Consent and Plant Mobilization
  - B/F
  - G/F
  - 1/F
  - 2/F
  - 3/F Transfer Plate
  - 4m
  - 30 Storeys Centre Core @ 3 working Day Cycle
  - MIC (BD + Consent + Fabrication + Ready for Site Installation)
  - Commence Installation of MIC When Centre Core Completed 28 Storeys
  - 75 days allowed for Lifts Installation Submit of Form LE5
  - Statutory Inspection (Lift + WSD + FS + BD), Obtain OP
  - Finishing Works
  - E&M Works Equipments

Save 4 months!!
Fabrication and Installation Programme

Use of MiC Construction

Outline Programme for Comparison of MIC and Traditional Construction Method (40 Storeys)

Traditional Construction Method:
- 1m Consent and Plant Mobilization
- 1.5m B/F
- 1.5m G/F
- 1.5m 1/F
- 1.5m 2/F
- 2.5m 3/F Transfer Plate
- 10m
- 2m 40 Storeys @ 6 working Day Cycle
- 2m R/F to UR/F
- 1m LMR and EGR Builder’s Works
- 2.5m 75 days allowed for Lifts Installation Submit of Form LE5
- 3m Statutory Inspection (Lift + WSD + FS + BO), Obtain OP
- 14m
- 14m Finishing Works
- 12.5m E&M Works Equipments
- 5m

MIC Construction Method:
- 1m Consent and Plant Mobilization
- 1.5m B/F
- 1.5m G/F
- 1.5m 1/F
- 1.5m 2/F
- 2.5m 3/F Transfer Plate
- 5m
- 3.5m Commence Installation of MIC
- 1.5m When Centra Core Completed 20 Storeys
- 1m 40 Storeys Centra Core @ 3 working Day Cycle
- 1m MIC (BD + Consent + Fabrication + Ready for Site Installation)
- 1m 40 Storeys MIC Installation @ 2 working Day Cycle
- 2m R/F to UR/F (with precast elements)
- 1m LMR and EGR Builder’s Works
- 2.5m 75 days allowed for Lifts Installation Submit of Form LE5
- 3m Statutory Inspection (Lift + WSD + FS + BO), Obtain OP
- 7m
- 8m Finishing Works
- 5m E&M Works Equipments

Save 5.5 months!!
THANK YOU