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AUTOMATION SYSTEM FOR CONCRETE PREFAB MANUFACTURING

NDT ENGINEERING & AEROSPACE CO., LTD.

1. Production Process

Concrete Prefab **Automation**

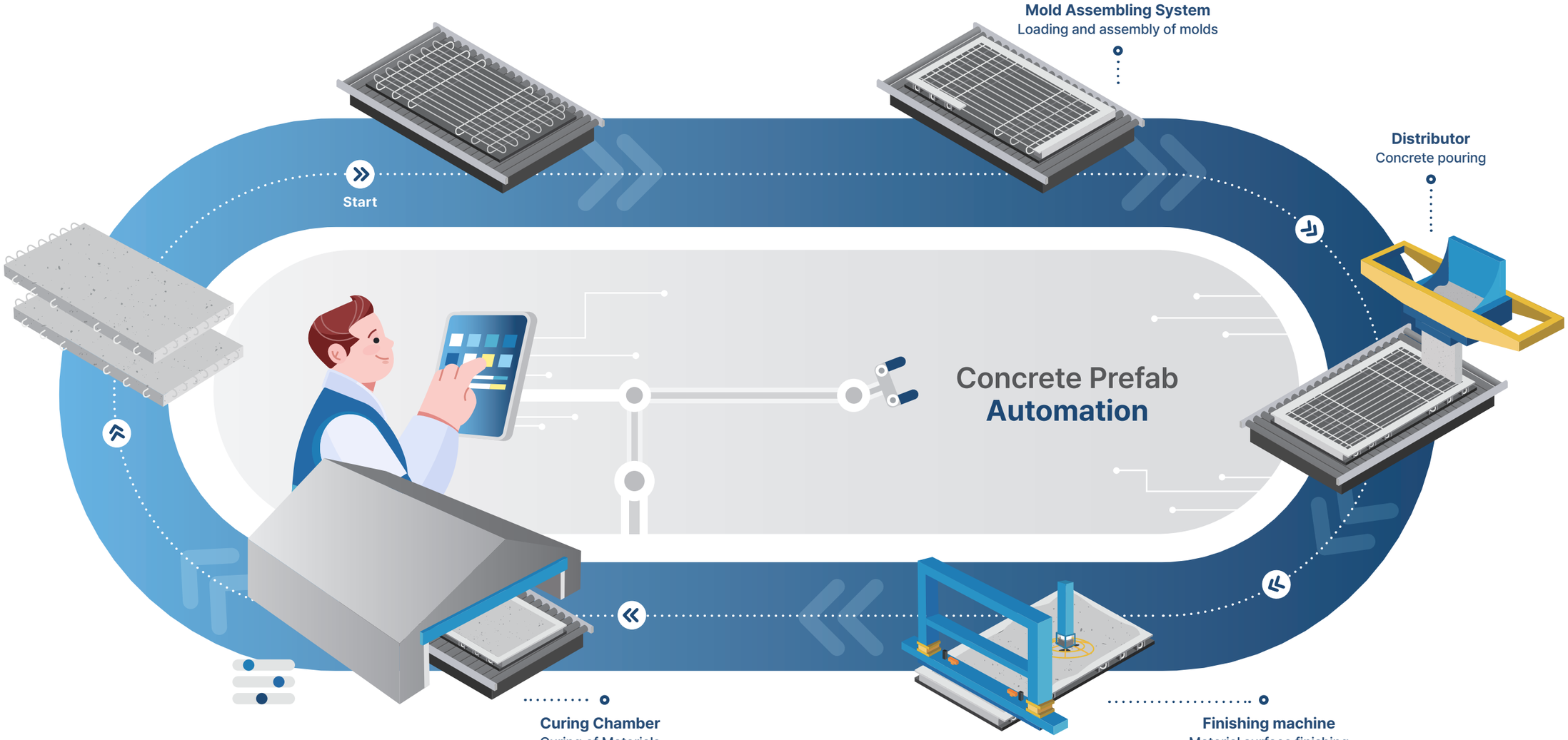
Production process machinery and automation systems for manufacturing concrete prefab components
Computer-controlled operations provide flexibility to accommodate various shapes and sizes of products.
Process continuity is achieved through automated control technology that reflects actual field conditions.

Mold Assembling System
Mold transfer and placement automation technology using the gripper

Concrete Distributor
Automatic concrete pouring technology for placed molds

Surface Finishing Machine
Automatic finishing technology to ensure consistent top surface quality after concrete pouring

Tunnel-type Curing Chamber
Curing management technology through individual temperature and humidity control in curing chambers



2. Technical Background

Existing System

Declining Productivity

Discontinuity between processes

Excessive manpower and working hours

Degradation of quality consistency

Manpower-oriented sub-material production

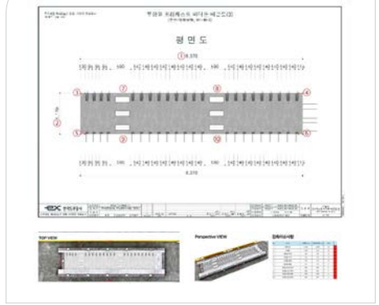
Insufficient adaptability to shape variations

Difficulty in producing various shapes

Inefficient quality control

Visual and non-precision-based quality control

Development System



Integration with a quality management system

Development of automated production equipment and control systems

Variable-setting automation for mold placement, finishing, and production processes

Data-based development of drive and control interface technology

Shape-variable smart mold technology

2. Technical Background

3. Features of Technology

Productivity

Total productivity increased by more than 30%

30 %

Production Time

Before system application — 3 hours

After system application — 2 hours

Manpower

Before system application — 6 persons

After system application — 3 persons

Improved Safety

Improved safety with a **50% reduction in accident rates**

50 %

Before system application

After system application

Customized Production

Flexible production of various shapes and sizes through CAD/CAM integration

Quality Consistency

Ensured quality consistency through the reduction of human error

Production Cycle

Optimized production cycles through data-driven production management

Eco-friendly

Optimized concrete usage reduces material waste and improves energy efficiency

ING

Global Market Development

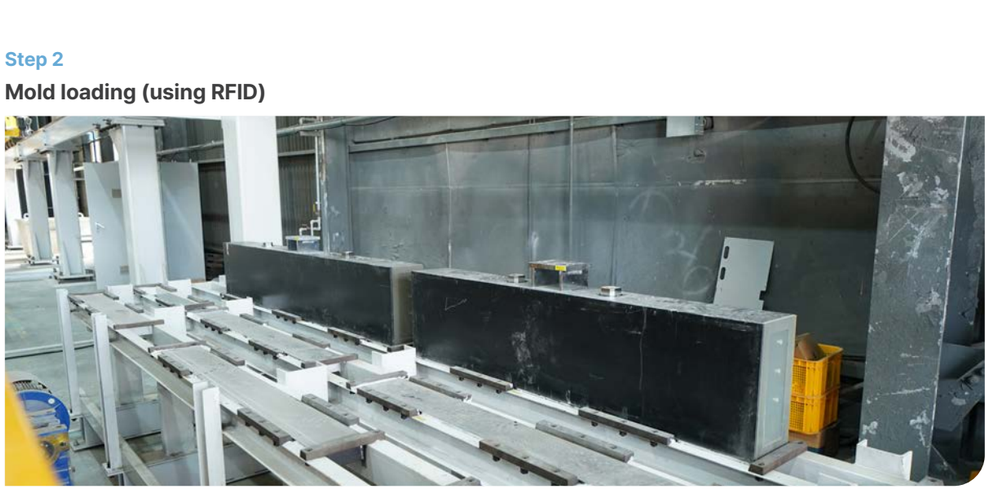
4. Production Process

Step 1

PLC equipment control

Step 2

Mold loading (using RFID)



Step 3

Move mold to gripper

Step 4

Mold positioning and setting

Step 5

Flying bucket concrete pouring

Step 6

Concrete distributor installation

4. Production Process

4. Production Process

Step 7

Vibrator compaction

Step 8

Screed surface finishing

Step 9

Rotary surface finishing

Step 10

Transfer cart movement

Step 11

Tunnel-type curing chamber operation

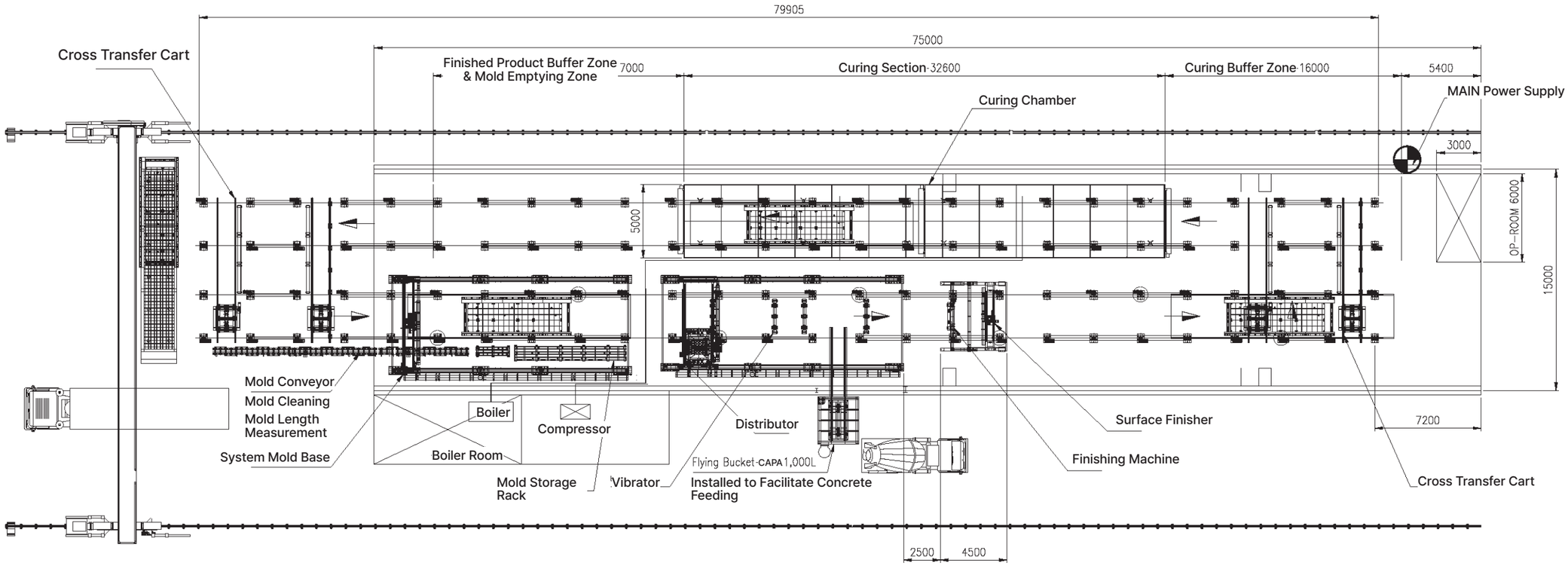
Step 12

Demolding and product transfer

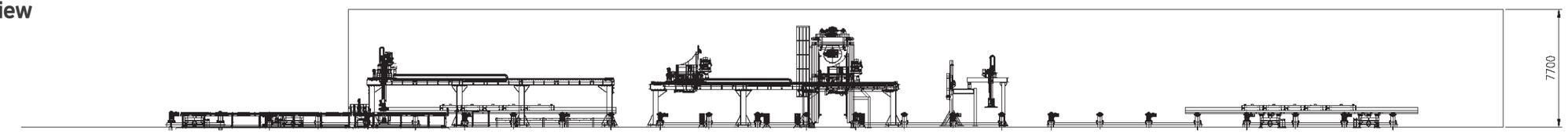
4. Production Process

Layout

Top View



Side View

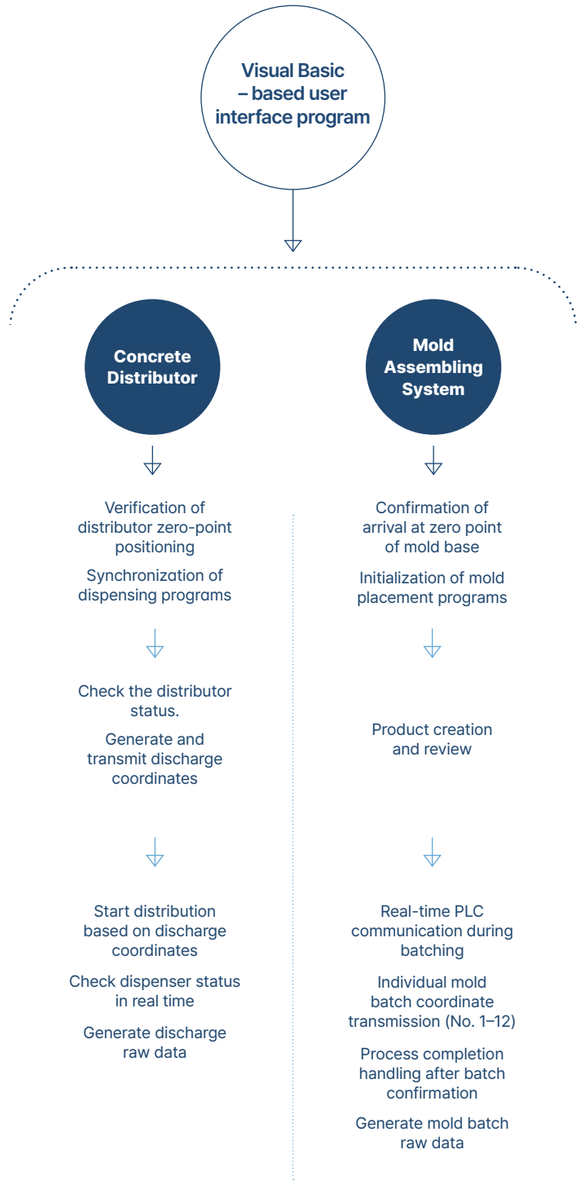


5. Equipment Introduction

Control System

Drive Control Solution

In response to variations in product shape, users can easily optimize available mold arrangements on the PC screen.
A PLC-linked control program is automatically generated, eliminating the need for on-site pre-setting of equipment operation parameters.



Mold Assembling System

Side Mold

The side mold is the outermost structure designed to withstand the lateral load of concrete filled inside the prefab mold.
High-strength permanent magnets are applied to secure the mold against heavy concrete pressure.

Function	- Structure capable of withstanding lateral concrete loads - Permanent magnet descends to secure the mold - Magnet is released by lifting via top-mounted adjustment nut
System Components	- 2,000 kg permanent magnets (2 EA) - Magnet lowering and lifting nuts - Hydraulic cylinder press

5. Equipment Introduction

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Gripper

- Position the mold precisely in the placement coordinates and press the magnetic pin to secure the mold
- Automatically recognize the mold transferred to the roller and load it into the load box and remember its location

Function

- Automatic mold positioning using PC-transmitted coordinates
- Grip range : **54–294 mm**
- Maximum transport weight : **300 kg**

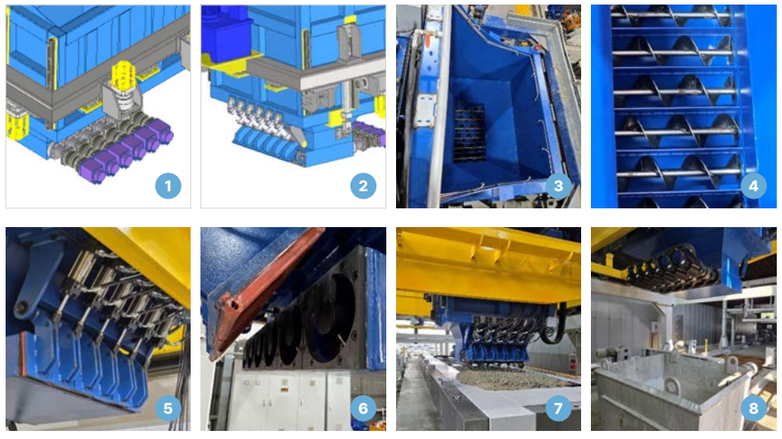
1. Move to pick up location
2. Pick up mold
3. Move to placement coordinates
4. Place mold
5. Press magnet pin
6. Return to standby position

Concrete Distributor

Concrete is transported and poured according to received discharge coordinates.
The discharge system consists of six independently controlled motors, enabling precise control of concrete discharge volume.
The interior of the distributor body is automatically cleaned after operation.

Function

- Maximum storage capacity : **2,100 L**
- Maximum discharge rate : **760 L/min** (assuming a 30% material loss rate)
- Six independent discharge outlets



1. Servo motor 2. Outlet
3. Inside the body 4. Screw
5. Outlet (closed) 6. Outlet (open) 7. Concrete pouring
8. Washing and drainage

5. Equipment Introduction

5. Equipment Introduction

Surface Finisher

After concrete pouring, a vibrating finishing blade descends to level the surface.
The blade then moves in contact with the concrete to complete surface finishing.

Components

- Finishing blade
- Z-axis rack and pinion
- Z-axis AC drive motor
- Finishing blade vibration motor

Motor

- Excitation force: * **120 kgf**
- Frequency : **60 Hz**
- Output : **100 W**

* Excitation force refers to the fundamental force that induces vibration.

Screed Finisher

Rotary Finisher

Tunnel-type Curing Chamber

The curing chamber is a device that performs wet curing of prefab products.
After sealing the chamber, the boiler operates and steam is injected to maintain a temperature of **60 °C** under controlled humidity conditions.

Function

Steam injection with air curtain to maintain stable temperature and humidity

Process

1. Mold base is transported to the limit sensor inside the curing chamber
2. Curing chamber door is closed (each chamber operates independently)
3. Boiler starts operation and steam is injected through wall-mounted nozzles
4. Temperature is gradually increased and maintained at 60 °C
5. PLC automatically controls optimized curing conditions

5. Equipment Introduction

Central Control System

- Overall control and monitoring of the entire production line
  - **PLC control system**
  - **PC control system with user graphic interface**

System Configuration Diagram

Control Room

Ethernet

PLC

Cross Transfer Cart

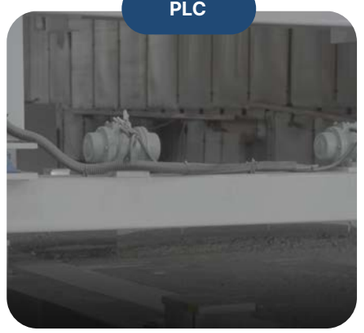
PLC

Mold Base

PLC

Concrete Distributor

PLC



Finishing Machine

PLC

Curing Chamber

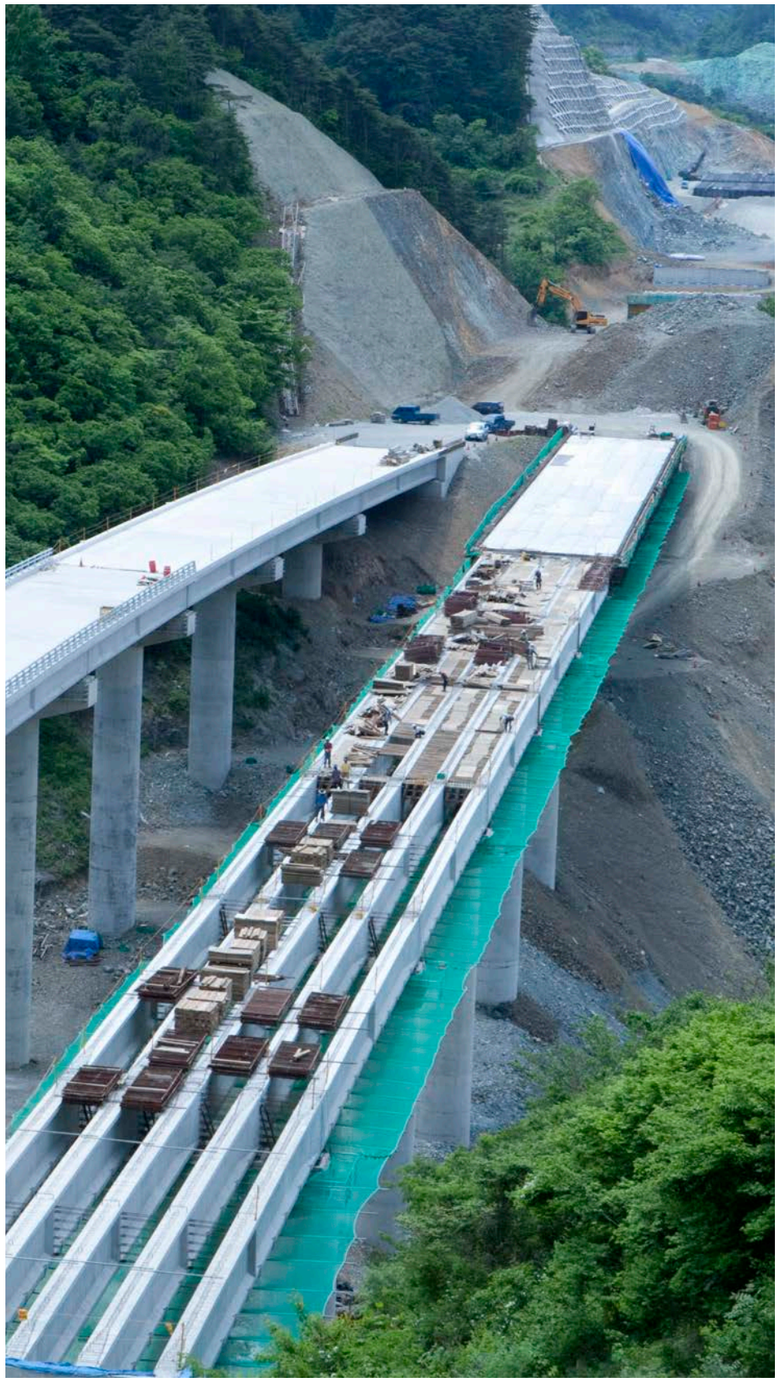
Utilities

- Main power supply : **AC 400 V / 60 Hz / 3-phase**
- Control power : **AC 220 V / DC 24 V**
- Compressed air : **minimum 8 kgf/cm², approx. 40 Nm³/h, maximum moisture 60%**

6. Technical Applications

Bridge

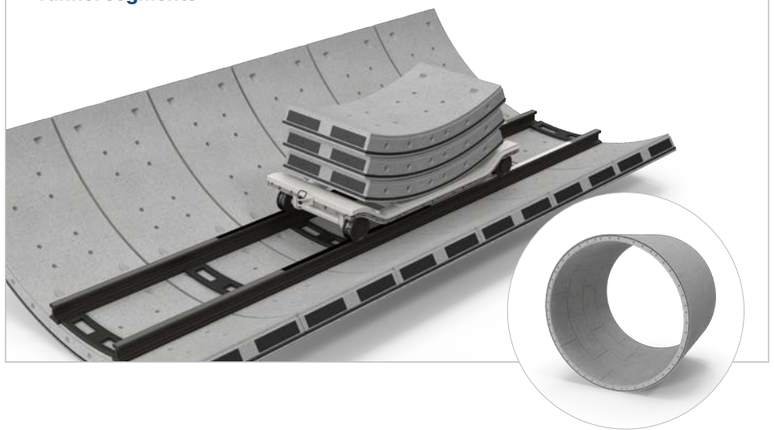
Bridge floor slabs



Tunnel

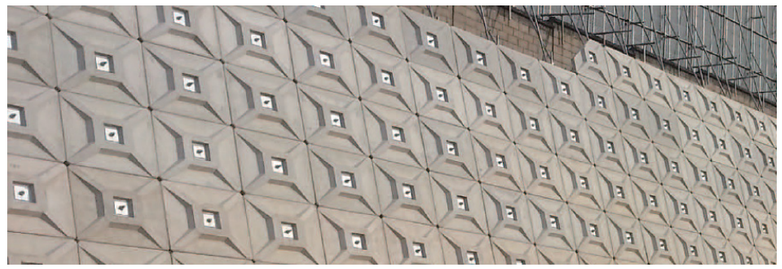
Tunnel duct slabs

Tunnel segments



Retaining Wall

Precast retaining walls



* Applicable to the production of precast concrete components in various construction fields

6. Technical Applications

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Automation System for Concrete Prefab Manufacturing
11, Jayumuyeok 4-gil, Masanhoewon-gu, Changwon-si, Gyeongnam, 51343, Korea

www.ndteng.co.kr

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