GRB System

Overcomes restrictions on working space to build a continuous pressed-in pile wall without constructing temporary facilities

Non-Staging Method

GRB System
Introduction

In construction projects, provisional facilities, such as temporary piers, work platforms, and so on, have generally consumed a great deal of money, time and energy, accounting for around 70% of the total construction costs, with only 30% being spent on the target structure.

But the “Non-Staging Method” solves the problem of wasteful temporary measures, by harnessing the superiority of the press-in principle. This method is based on the “GRB system” which uses the top of completed piles as a work platform to carry out all the steps of the press-in procedure - transporting the pile, pitching the pile and pressing it in. All of the machinery in the system supports itself by gripping installed piles, which means there is no risk of overturning. Also, the area affected by the work is restricted to the width of the actual machine, so various restrictions on the working space can be overcome.

This method has no need at all for temporary facilities, such as piers or roadways, even when working over water, on sloping or uneven ground, in narrow spaces, or with restricted headspace. Freed from these temporary measures, the construction work can focus efficiently on the actual objective, which is building the intended structure. In this way, the Non-Staging Method achieves a truly excellent balance between the Five Construction Principles: Environmental Protection, Safety, Speed, Economy and Aesthetics.

Contents

- Overview of Non-Staging Method ........................................... 1
- System Equipment
  - Clamp Crane CB1 ......................................................... 3
  - Clamp Crane CB2 ......................................................... 3
  - Clamp Crane CB3 ......................................................... 4
  - Clamp Crane CB4 ......................................................... 4
  - Clamp Crane CB5 ......................................................... 4
  - Pile Runner PR1 (for Sheet Piles) ...................................... 5
  - Pile Runner PR217 (for Tubular Sheet Piles and Tubular Piles) 5
  - Unit Runner UR3, Stage ST17 (for UR3) .............................. 5
- Applications & Reference
  - U Sheet Piles .............................................................. 6
  - Zero Sheet Piles (NS-SP-J) ............................................. 6
  - Concrete Sheet Piles ..................................................... 7
  - Hat Sheet Piles ............................................................ 7
  - Tubular Sheet Piles ....................................................... 8
  - Tubular Piles .............................................................. 8
- Standard Press-in Procedures
  - Press-in Procedure Diagram ........................................... 9
  - Clamp Crane Self-moving Diagram .................................. 10
- Sekisan .............................................................................. 11
- Technology : Rail Safe System ............................................ 11
- Work Management
  - EMOS Eco Monitoring System ......................................... 12
A construction system that does away with temporary installations, and the waste they cause in the construction process, and overcomes work space restrictions.

The Non-Staging Method employs the “GRB system” in which all of the equipment involved in the press-in work advances along the top of the installed piles. This removes the need for wasteful temporary structures, so that all of the work is focused efficiently on the wall structure, which is the actual objective. Because the system is light and compact, it doesn’t obstruct water flows or traffic, even when used in water course improvements or trackside construction work in built-up areas, or road widening on busy highways, etc. This saves both time and money.

### Standard Components of GRB system

The GRB system is composed of the press-in machine main body, which is the key element that presses the pile into the ground, accompanied by a power unit providing a source of hydraulic power, a unit runner to move the power unit, a clamp crane to pitch the pile, and a pile runner to transport the pile from the work base.

Without using any temporary structures, a revetment is built with an implant structural design of piles that are integrated with the Earth.

### Features of Non-Staging Method

- **No Temporary Structures are Required**
  With this system, piling work is carried out on top of installed piles, so no temporary pier is necessary. (Saves Time and Costs)

- **Work is Possible in Tight Conditions where Conventional Methods are Difficult**
  The compact size of the system makes it perfect for working in tight conditions, e.g. over water or on sloping ground.

- **Respectful of the Surrounding Area**
  The press-in method uses static load, so it hardly creates any noise or vibration. The area affected by the press-in work is restricted to the width of the machinery only, thus protecting the surrounding area.

- **Excellent Safety with No Risk of Overturning**
  The press-in machine, clamp crane, and other system equipment are designed to grip firmly onto completed piles, which means there is no risk of overturning.

Construction works can be carried out with Environmentally-friendly considerations, lower cost and shorter work duration at any work conditions.
Clamp Crane CB1

<table>
<thead>
<tr>
<th>Models</th>
<th>CB1A</th>
<th>CB1B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crane Capacity</td>
<td>2.95 ton × 5.0 m</td>
<td>2.95 ton × 5.0 m</td>
</tr>
<tr>
<td>Max. Working Radius</td>
<td>15.67 m</td>
<td>15.67 m</td>
</tr>
<tr>
<td>Compatible Piles</td>
<td>U Sheet Pile 400-600 Pitch Hat Sheet Pile 900 Pitch</td>
<td>U Sheet Pile 400-600 Pitch Hat Sheet Pile 900 Pitch</td>
</tr>
<tr>
<td>Mass</td>
<td>5170 kg</td>
<td>5200 kg</td>
</tr>
<tr>
<td>Width</td>
<td>960 mm</td>
<td>960 mm</td>
</tr>
<tr>
<td>Main Body Width</td>
<td>810 mm</td>
<td>900 mm</td>
</tr>
<tr>
<td>Height</td>
<td>2475 mm</td>
<td>2475 mm</td>
</tr>
<tr>
<td>Length</td>
<td>5690 mm</td>
<td>5800 mm</td>
</tr>
</tbody>
</table>

* Product specifications may be changed without prior notice.

Clamp Crane CB2

<table>
<thead>
<tr>
<th>Models</th>
<th>CB2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crane Capacity</td>
<td>2.9 ton × 6.0 m</td>
</tr>
<tr>
<td>Max. Working Radius</td>
<td>22.6 m</td>
</tr>
<tr>
<td>Compatible Piles</td>
<td>U Sheet Pile 400-600 Pitch Hat Sheet Pile 900 Pitch</td>
</tr>
<tr>
<td>Mass</td>
<td>12500 kg</td>
</tr>
</tbody>
</table>

* Product specifications may be changed without prior notice.

Clamp Crane CB3

<table>
<thead>
<tr>
<th>Model</th>
<th>CB3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crane Capacity</td>
<td>10.0 ton × 6.5 m</td>
</tr>
<tr>
<td>Max. Working Radius</td>
<td>30.0 m</td>
</tr>
<tr>
<td>Compatible Piles</td>
<td>Tubular Sheet Pile 700-900</td>
</tr>
<tr>
<td>Mass</td>
<td>18800 kg</td>
</tr>
</tbody>
</table>

* Product specifications may be changed without prior notice.

Clamp Crane CB4

<table>
<thead>
<tr>
<th>Model</th>
<th>CB4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crane Capacity</td>
<td>20.0 ton × 7.0 m</td>
</tr>
<tr>
<td>Max. Working Radius</td>
<td>34.0 m</td>
</tr>
<tr>
<td>Compatible Piles</td>
<td>Tubular Sheet Pile 800-1500</td>
</tr>
<tr>
<td>Mass</td>
<td>46300 kg</td>
</tr>
</tbody>
</table>

* Product specifications may be changed without prior notice.

Clamp Crane CB5

<table>
<thead>
<tr>
<th>Model</th>
<th>CB5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crane Capacity</td>
<td>50 ton × 12 m</td>
</tr>
<tr>
<td>Max. Working Radius</td>
<td>47.0 m</td>
</tr>
<tr>
<td>Compatible Piles</td>
<td>Tubular Sheet Pile 800-1500</td>
</tr>
<tr>
<td>Mass</td>
<td>130000 kg</td>
</tr>
</tbody>
</table>

* Product specifications may be changed without prior notice.
System Equipment

Pile Runner PR1 (For Sheet Piles)

Pile Runner PR217 (For Tubular Sheet Piles and Tubular Piles)

Unit Runner UR3, Stage ST17 (For UR3)

Applications & Reference

U Sheet Piles

Reference
Improvement Work for Coastal Protection Facilities (Tidal Surge Protection), Kitanoe Aihara District, Embankment Strengthening Project No. 2
Yamaguchi Prefecture

No temporary platform required, resulting in shorter timeframe and reduced costs. Rapid completion with no impact on the ecosystem, working on the inside of an embankment in an area inhabited by endangered species.

Reference
Route 10-1-3 Kandagawa District, River Repair Work
Kochi Prefecture

Using the GRB system with its safe and compact machinery, the distance between the sheet pile retaining wall and the houses was minimized to ensure the largest possible water course.

*NS-SP-J* is a sheet pile made by Nippon Steel and Sumitomo Metal.

\* Product specifications may be changed without prior notice.

**Construction Revolution Non-Staging Method**

No temporary platform required, resulting in shorter timeframe and reduced costs. Rapid completion with no impact on the ecosystem, working on the inside of an embankment in an area inhabited by endangered species.

Using the GRB system with its safe and compact machinery, the distance between the sheet pile retaining wall and the houses was minimized to ensure the largest possible water course.

*NS-SP-J* is a sheet pile made by Nippon Steel and Sumitomo Metal.

* Product specifications may be changed without prior notice.
Applications & Reference

Concrete Sheet Piles

Reference: Hiraishiebisuno District, Drainage Channel Section 1
Tokushima Prefecture

By adopting the Non-Staging Method with pre-fabricated concrete sheet piles, the effects on the surrounding area are minimized, and the work time is shortened.

Hat Sheet Piles

Reference: Akaike Revetment Construction Work
Ibaragi Prefecture

Due to the effective pile width of 900 mm, the number of piles was cut by 33% compared to wide sheet piles (600 mm), and when combined with the Non-Staging Method, this brought cost savings and faster completion.

Tubular Sheet Piles

Reference: Ujigawa Bridge No. 1 Revetment Repair Work
Kyoto Prefecture

The compact equipment built a highly rigid and durable revetment without obstructing traffic.

Tubular Piles

Reference: Furukawa River Channel Repairs (1)
Tokyo

Tubular piles pressed into mudstone and concrete layer. Work completed in narrow space without vibration and noise, leaving the surrounding houses and apartment blocks unaffected.
Standard Press-in Procedures

Press-in Procedures Diagram

1. The press-in machine main body is set in position and press-in work is started.
2. When a specified number of piles have been pressed in, the power unit, and clamp crane are moved from the work base and set up on top of the completed piles.
3. Pile runners are laid down and piles are transported to the next installation point.
4. When pile installation is completed, the assembly reverse-walks back to the work base.
5. Precast reinforced concrete / fronting panels are transported on continuous pile runners, and set in place by the clamp crane.

Precast reinforced concrete / fronting panels are transported on continuous pile runners, and set in place by the clamp crane.

Clamp Crane Self-moving Diagram

For Sheet Piles

1. Clamp No.1 is opened.
2. Clamp No.1 is raised and the crane body is moved forwards.
3. Clamp No.1 is lowered and closed.
4. Clamps No.2 and 3 are opened and raised.
5. Clamps No.2 and 3 are moved forwards.
6. Clamps No.2 and 3 are lowered and closed, and the self-walking procedure ends.

For Tubular Sheet Piles

1. Boom raised.
2. Clamp No.2 is opened and raised, and the equipment is moved forwards.
3. Clamp No.2 is lowered and closed.
4. Clamp No.1 is opened and raised.
5. The clamp crane main body is moved forwards.
6. The clamp crane main body is lowered and the self-moving procedure ends.
The technical data published by the Japan Press-in Association can be applied to the Non-Staging Method.

Standard technical data can be downloaded from the Association's website. http://www.atsunyu.gr.jp

Introducing Technology

Rail Safe System

The Rail Safe System can of course be implemented near railway tracks, and due to the superiority of the Press-in Principle, piles can be installed at great speed, without any temporary structures, while maintaining a normal train schedule and ensuring the safety of railway traffic. Using the EMOS Eco Monitoring System (p. 12), every detail of the work environment can be monitored scientifically, even in locations with very strict safety requirements, such as Shinkansen tracks.

 Movements of the Pile Setter

1. Grips the pile to be pressed in
2. Lifts the pile
3. Turns the pile to the press-in alignment
4. Pitches the pile in the pile driver

The innovative pile pitching action of the GRB system, using the pile setter, means even better work safety.

Construction machinery stopped automatically by image data processing (Systematic Control of Safety)

EMOS uses camera monitoring equipment and image processing to automatically control the operations of the construction machines, so that work is carried out within the established safe area. This safety control system enables fast and cost-effective work that makes maximum use of the space inside the clearance limits, while ensuring excellent safety with regard to nearby structures, cables, and railway and road traffic.
If we analyse all the parties involved in any construction work, we can categorise them into three main groups: the client, the contractor and the general public. The ideal situation is when all three parties are in agreement and satisfied with the successful outcome of the construction work. Problems arise when one of the parties becomes a victim of imbalance in this relationship. The conventional construction methods based upon principles that "more is paid for less efficient work" are no longer appropriate to present-day society. Universally acceptable construction methods must embody the Five Construction Principles.

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Protection</td>
<td>Construction work should be environmentally friendly and free from pollution.</td>
</tr>
<tr>
<td>Safety</td>
<td>Construction work has to be carried out in safety and comfort with a method implementing the highest safety criteria.</td>
</tr>
<tr>
<td>Speed</td>
<td>Construction work should be completed in the shortest possible period of time.</td>
</tr>
<tr>
<td>Economy</td>
<td>Construction work must be done rationally with an inventive mind to overcome all constraints at the lowest cost.</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Construction work must proceed smoothly and the finished product should portray cultural and artistic flavour.</td>
</tr>
</tbody>
</table>