Jack Methods

Lift-up Method
Up & Down Method
Slide Method

Lift-up Method and Up & Down Method
(Jack systems that safely and accurately lift up and lower heavy structures and equipment. Heaviest structure ever lifted: 6,500 tons)

Features
1. Use of step rods - Less slip than with a wire system (highly reliable)
2. Adjustments of positioning in millimeter orders is available.
3. Integrated, remote operation and automated control of multiple jacks (accurate optical-fiber control)
4. Synchronous and automated control of up to 48 jacks is available.
5. Accident-free operation for 35 years since being developed and entering practical use in 1969.
6. The up & down method was put into practical use in 1981.
7. Engineering, installation guidance and operations are tailored to the size, weight and rigidity of the structures and equipment to be moved.

Lift-up of large roof at Saitama Super Arena
(lifting weight: 3,540 tons)

Remote control panel

Pump unit
Hydraulic jack

Optical fiber

Weight: 3,540 tons

Lifting height 40.4m

Conceptual Drawing of Lift-up and Up & Down Methods

Type and Capacity of Hydraulic Jack

<table>
<thead>
<tr>
<th>Type</th>
<th>Max output (T)</th>
<th>Stroke (mm)</th>
<th>Outside diameter (mm)</th>
<th>Weight (kg)</th>
<th>Step rod diameter (mm)</th>
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<tbody>
<tr>
<td>KUH-JUD-2500</td>
<td>250</td>
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<td>Ø140</td>
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<td>KUH-JUD-25</td>
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<td>Ø380 × H1713</td>
<td>350</td>
<td>Ø55</td>
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Lift-up Method

This safe, labor-saving method lessens work at high elevations and allows one-block lifting operations.

Flat Structures
- Top roof of airport building
- Gymnasiums and airplane hangers
- Building sites
- Lifting of building structures
- LNG and LPG tank roofs
- Bridge girders and other girders

Cylindrical Structures
- High-voltage towers and structures
- Steel internal cylinders of stacks
- Steel conductors
- Nuclear plant reactors

Flat-arch Method

Conference building of Tokyo Big Sight (lifting weight: 6,500 tons)

Fuji-Sanuki Building (lifting weight: 1,200 tons)

Cylindrical Method

Kisogawa Monument Tower (lifting weight: 3,200 tons)

Blast furnace at JFE Steel's Kurasaki Works (lifting weight: 4,300 tons)

Up & Down Method

The Up & Down method safely and easily raises and lowers many kinds of heavy structures and equipment that are conventionally regarded as difficult to handle. This method meets the needs of complex and diversified lifting and lowering operations.

Installation, Repair and Dismantle of Heavy Equipment
- Power generators, turbines, transformers, motors, nuclear reactor facilities, heavy steel structures, heavy machinery

Construction and Disassembly of Structures
- Construction and adjustment methods for oil tanks
- Lifting methods for concrete slab forms of high-rise structures
- Overhead Switching Method (not above structures)
- Dismantling methods for various tanks, stacks

Raising Process

1. Step rod-type hydraulic jack
2. Pushing up of piston
3. Piston extension: 150 mm (in two phases)
4. Piston extension: 15 mm

Lowering Process

1. Closing of collet
2. Ascending by 60 mm after closing
3. Descending of piston by 150 mm
4. Descending by 150 mm after releasing at the collet side

Temporary ascending of lifting structure (descending by 15 mm)
**Slide Method**

The slide method carries out concrete placing and the arrangement of reinforcing bars in a way that enables the continuous construction of structures. It can produce a diversity of sectional configurations that are high in dimensional accuracy and design performance.

- **OSF method for semi-circular structure of Saitama Super Arena**
- **Coal silo for Maizuru P/P of Kansai Electric Power Co.**
- **Stuck at Hiroko P/P of Tokyo Electric Power Co.** (lifting height: 200 m)
- **Climbing scaffolding method for M.M. DoCoMo Building**
- **Climbing scaffolding method for main tower for Yahagi River cable-stayed bridge at Second Tomei Expressway**

### Identical Section Method
- Grain silos
- Rice silos
- Cement silos

### Deformed Section Method
- Observatories, air traffic control towers
- Building elevator cores
- Concrete columns, bridge piers
- Dam intake towers, lining of shafts
- Caisson manufacture

This method secures open areas in the upper section of a structure. By arranging rods and jacks around the exterior of a structure, it can carry out the major assembly of reinforcing bars.

**Other Methods**

- **HSF JUMPUP CLIMBING**

  - Wrapping of PC strands and concrete placing can be executed continuously by means of HSF devices.
  - HSF (Hybrid Slip Form) method for High Pier
  - Jump-up method for stuck at waste incineration plant of Tokyo Chuo Area

**SLIDE**

- **Guiding plate**
- **Slide support column**
- **Steel form**
- **Hydraulic jack**
- **Rod**

The slide work can be conducted under conditions where the steel roof structure is assembled at a lower level and then placed on devices.
Slide Method

Greatly reduces construction term
(Concrete placement at a rate of 1.8 m³/hour/day and continuous 24-hour placement are available)

Secures safe and reliable work

Enables structuring of various deformed sections and wall surfaces with various designs

The slide method is used for the continuous construction of concrete structures. In order to achieve this, the slide method synchronizes concrete placing and the arrangement of reinforcing rods with the curing speed of the concrete, while simultaneously using hydraulic jacks to raise concrete forms that are integrated into the equipment. The slide jack system adopts a one-jack/one-pump system, and the reaction force generated when the jacks are raised is supported by rods that are successively inserted into the structure.

Water-level Control System

The jacks ascend at a stroke of 30~40 mm/cycle, and a water-level control system is adopted to maintain synchronous control of multiple jacks. Under this system, both levels of each jack and the main tank are pipe-connected. When the main tank is initially raised to the prescribed cycle height, the water level in each jack level rises. During sliding, the water levels fall, then electrodes are used to sense these changes of water level in order to complete the sliding operation at an identical water level. In this way, the system permits the synchronous operation of multiple jacks.

Design Center

Matsue Plant

Type and Capacity of Slide-type Hydraulic Jack

<table>
<thead>
<tr>
<th>Type</th>
<th>Max output (T)</th>
<th>Stroke (mm)</th>
<th>Outside diameter (mm)</th>
<th>Weight (kg)</th>
<th>Diameter of rod (mm)</th>
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<tbody>
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<td>KSH-J-15</td>
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Up & Down Method used in relining of No. 2 blast furnace at JFE Steel's Kurekai Works