HALFEN HBT REBEND CONNECTION
TECHNICAL PRODUCT INFORMATION

Complies with ACI 318-14
HALFEN HBT Rebend Connection

Reinforcement continuity and structural integrity for segmental pours in reinforced concrete structures

The HBT Rebend Connection is cast into the concrete member leaving the reinforcement legs housed inside of the steel casing until the contractor is ready to pour the adjoining member.

Traditional Concrete Joint

- Requires complicated and time consuming formwork
- Projecting bars create safety hazard
- Restricts site access
- Complicated key ways or roughening of surface required

HALFEN HBT Rebend Connection

- Accelerates pour schedules
- Reduces field labor cost
- No roughening of narrow areas around and between the reinforcement
- Simplifies formwork design
- Improves safety and working access
- Prevents damage/waste of formwork
- No post-drilling in concrete areas with high density of reinforcement

Many advantages with one result: HALFEN provides safety, reliability and efficiency for you and your customers.
HALFEN HBT REBEND CONNECTION

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HALFEN HBT REBEND CONNECTION

Product overview

An engineered system which provides a simple, time-saving, and cost-effective solution to maintain reinforcement continuity across structural joints in concrete members.

HALFEN HBT Rebend Connections utilize reinforcement bars subjected to a special process that increases their yield strength and ductility. The bars are pre-bent and housed in a pre-galvanized steel casing. The steel casing is engineered to provide sufficient shear friction within the joint, eliminating the need for traditional joint preparation.

The unit is placed at the front face of the first pour. The unit can be nailed to the formwork or tied back to the main reinforcement. The concrete is then cast. After the concrete cures, the form work is struck and the lid is removed to reveal the connection legs (or starter bars) lying inside the casing. The legs are bent out by the contractor, ready for lapping the main reinforcement of the subsequent pour.

The dimpled casing remains embedded in first pour, forming a rebate which provides a key to the next pour. This eliminates the need for traditional preparation of cold joints such as scabbling, sand blasting, high-pressure water blasters, etc.

HBT Rebend Connection suits today’s fast track building methods.

Applications

Simple to use, the HBT Rebend Connection has the potential to replace any construction joint in concrete members. Common applications include:

- Large floor slabs
- Walls
- Staircase landings and flights
- Corbels
- Diaphragm walls
- Pile caps
- Brick support nibs
- Precast and tilt up
- Gullies and chambers
- Future structure expansion

HALFEN HBT Rebend Connections comply with the ACI 318-14 Building Code Requirements
HALFEN has carefully designed the HBT Rebend Connection to optimize its performance while providing a simple installation. When two concrete structures cast at different times are expected to act in a composite manner, the solution is HALFEN.

**Quality Features:**

Provides the required development length in order for the reinforcing steel to achieve the full tensile capacity.

The profiled back provides an optimal bond and shear transfer to the adjacent concrete member. [The Carrier Casing is left in the concrete ensuring that shear load transfer is maintained.]

Ensures a constant roughened surface along the entire length and width of the joint. [In current construction practices, this result is quite challenging to achieve in addition to being time consuming.]

Ductile reinforcement steel grade allows the bars to be rebent. Damage of the formwork is prevented without compromising the structural integrity of the connection.

Flanges of casing engineered with the strength to minimize deformation, preventing the ingress of concrete into the case.

The geometry of the Cover and Carrier Casing forms a keyway which permanently locks the two pours.

The pre-punched cover simplifies its removal after curing of the concrete.
Reinforcement Bend-ability
The rebending of the reinforcement was the most critical design aspect of the HBT Rebend Connection taken into consideration. ACI 318 states "Reinforcement shall not be field bent, except as shown in the contract documents or permitted by the licensed design professional". Licensed Professionals can use the HBT Rebend Connection with complete confidence knowing the system utilizes a rebar manufactured using a specialty process that produces reinforcement bars with a high yield strength, high ductility, and excellent fabrication characteristics. The HBT reinforcement bars are certified to meet ASTM A615 but possess higher yield strength and elongation values. This results in excellent bend-ability and rebend-ability of the reinforcement bars.

What are the loading differences between HBT Rebend Connection and traditional loose/unbent rebar?
Structural tests showed that the flexural and shear strength of construction joints formed with HBT Rebend Connection are equivalent if not greater than those of traditionally formed construction joints.

HALFEN HBT complies with the following sections of the Building Code Requirements for Structural Concrete ACI 318:
- Development length of reinforcing steel
- Development length of hooks
- Minimum bend diameters
- Concrete protection for reinforcement
- Shear friction

How should the reinforcing bars be re-bent?
HALFEN provides the proper tools to rebend the bars quickly and easily without compromising the integrity of the connection.

The HBT Straightening Tools provide a smooth and progressive straightening of the bars. Hence, undesirable irregular movements are avoided.

Both tools are specially designed to minimize undesirable point contact of the tube on the bar (especially at the stress concentrated area) and most importantly, to provide continuous support to the outside of the bend during the straightening of the reinforcing steel.

Installation instructions can be downloaded from our website, www.halfenusa.com.

For confined areas, the HBT-RZ tool (0064.010-00001) is recommended.

For typical conditions, the HBT-Rebend tool (0064.010-00011) is recommended.
HALFEN HBT REBEND CONNECTION

Application examples

- Corbel connection to concrete wall
- Connection of thick slabs or stair-landings to concrete walls
- Stairs flight and landing slab connection to a concrete wall
- Connection of a thick concrete wall with 2 HBT Elements
- Wall connection to concrete ceiling
- Wall connection to floor slab
- Wall connections to concrete column
- Bridge parapet connection to structure
- Wall connection
- Wall corner detail with single or double connection
- Connection of precast parapet to balcony
The HALFEN HBT Rebend Connection allows easy and efficient connection of concrete components at different phases of construction. Perfect connections for numerous applications with multiple combinations of rebar types and profile widths. HALFEN HBT Rebend Connections are available in #4 reinforcing steel bar size.

Multifunctional Arena Stadium, Duesseldorf, Germany. The HBT Rebend Connections connect columns, walls, and stairs.

Deutsche Post Tower, Bonn, Germany. The HBT Rebend Connections connect stairs and walls.
HALFEN HBT REBEND CONNECTION

Product range: Profiles, Variants, Bar Types

Single and double row layouts

Single row
for profile HBT 85 and 120

Double row
for profile HBT 120, 150, 190 and 220

HBT Rebend Connection Carrier Casing information

<table>
<thead>
<tr>
<th></th>
<th>HBT 85</th>
<th>HBT 120</th>
<th>HBT 150</th>
<th>HBT 190</th>
<th>HBT 220</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element width B (in)</td>
<td>3 ³/₈</td>
<td>4 ³/₄</td>
<td>5 ⁷/₈</td>
<td>7 ⁵/₁₆</td>
<td>8 ³/₄</td>
</tr>
</tbody>
</table>

Standard reinforcing steel bar types

Single row connections

Type 1

Type 2

Double row connections

Type 3

Type 4

Type 5

NOTE: custom HBT configurations are available upon request.

Custom HBT configurations are available to accommodate specific rebar spacings, development lengths, hook lengths, and box lengths. The box width (B), rebar diameter and hole layout (excluding longitudinal spacing) are fixed variables and cannot be modified. To request a custom HBT unit, fill out the Engineering Request Form on Pg 13 and submit to engineering@halfenusa.com.
HALFEN HBT REBEND CONNECTION

Standard element single row

HBT 85 and HBT 120

Type 1

HBT Type 1 — System configuration

<table>
<thead>
<tr>
<th>Element Length L</th>
<th>Bar spacing s [in]</th>
<th>No. of bars</th>
<th>End distance a [in]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard element L = 48 in</td>
<td>8</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

HBT Type 1 - Standard element details

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<tbody>
<tr>
<td>Profile 0054.220 85</td>
<td>0054.220</td>
<td>000002</td>
<td>19</td>
<td>9 1/2</td>
<td>8</td>
<td>≥ 11</td>
<td>≥ 4</td>
<td>3 3/8</td>
<td>1/2</td>
<td>1 3/8</td>
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<tr>
<td></td>
<td>000003</td>
<td>19</td>
<td>9 1/2</td>
<td>8</td>
<td>≥ 11</td>
<td>≥ 4</td>
<td>3 3/8</td>
<td>1/2</td>
<td>1 3/8</td>
<td></td>
</tr>
<tr>
<td>Profile 0054.240 120</td>
<td>0054.240</td>
<td>000003</td>
<td>19</td>
<td>9 1/2</td>
<td>8</td>
<td>≥ 11</td>
<td>≥ 5</td>
<td>4 3/4</td>
<td>1/2</td>
<td>1 3/8</td>
</tr>
<tr>
<td></td>
<td>000004</td>
<td>19</td>
<td>9 1/2</td>
<td>8</td>
<td>≥ 11</td>
<td>≥ 5</td>
<td>4 3/4</td>
<td>1/2</td>
<td>1 3/8</td>
<td></td>
</tr>
<tr>
<td></td>
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<td>≥ 5</td>
<td>4 3/4</td>
<td>1/2</td>
<td>1 3/8</td>
<td></td>
</tr>
</tbody>
</table>

* Standard dimension; based on f'c = 4000 psi and normal weight concrete
** Standard dimension; calculated using ACI 318-14 Eq. 25.4.2.3a, based on \( \psi_e=1.0, \psi_c=1.0, \psi_s=0.8, f'_c = 4000 \) psi, \( K_{tr} = 0 \), Type B lap splice and normal weight concrete

Reinforcing bar dimensions are out to out of bars.

Minimal element lengths for the rebend connection HBT, position of reinforcement in the metal case

<table>
<thead>
<tr>
<th>Minimal element length for standard ( l_d )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Theta )</td>
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<tr>
<td>#4</td>
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<tr>
<td></td>
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<tr>
<td></td>
</tr>
</tbody>
</table>

s = desired rod spacing

* Expanded polystyrene

* not available as type 1
HALFEN HBT REBEND CONNECTION

Standard element single row

HBT 85 and HBT 120

Type 2

HBT Type 2 — System configuration

<table>
<thead>
<tr>
<th>Element Length L</th>
<th>Bar spacing s [in]</th>
<th>No. of bars</th>
<th>End distance a [in]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard element L = 48 in</td>
<td>4</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

HBT Type 2 — Standard element details

<table>
<thead>
<tr>
<th>Designation</th>
<th>Part no.</th>
<th>dimension of starter bars</th>
<th>for element thickness</th>
<th>case dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBT 85</td>
<td>0054.220</td>
<td>#4/6</td>
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<td>9 1/2</td>
</tr>
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<td></td>
<td></td>
<td>#4/8</td>
<td>19</td>
<td>9 1/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#4/10</td>
<td>19</td>
<td>9 1/2</td>
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<td></td>
<td></td>
<td>#4/12</td>
<td>19</td>
<td>9 1/2</td>
</tr>
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<td>Profile</td>
<td>0054.240</td>
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<td>19</td>
<td>9 1/2</td>
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<td>HBT 120</td>
<td>00001</td>
<td>#4/4</td>
<td>19</td>
<td>9 1/2</td>
</tr>
<tr>
<td></td>
<td>00002</td>
<td>#4/6</td>
<td>19</td>
<td>9 1/2</td>
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<td></td>
<td>00003</td>
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<tr>
<td></td>
<td>00005</td>
<td>#4/12</td>
<td>19</td>
<td>9 1/2</td>
</tr>
</tbody>
</table>

* Standard dimension; based on f\(\text{c} = 4000\) psi and normal weight concrete

** Standard dimension; calculated using ACI 318-14 Eq. 25.4.2.3a, based on \(\psi_e=1.0, \psi_c=1.0, \psi_s=0.8, \text{f}_c = 4000\) psi, \(K_r = 0\), Type B lap splice and normal weight concrete

Reinforcing bar dimensions are out to out of bars.

Description example:  

HBT 85 · #4/8 · 2 · 48

Element length L [in]  
Bar type  
Bar number/bar spacing s [in]  
Profile size
HALFEN HBT REBEND CONNECTION

Standard element double row

HBT 120, HBT 150, HBT 190, and HBT 220

**Type 5** Double-row connection, standard rebar

System:

HBT Type 5 - System configuration

<table>
<thead>
<tr>
<th>Element Length L</th>
<th>Bar spacing s [in]</th>
<th>No. of bars</th>
<th>End distance a [in]</th>
</tr>
</thead>
<tbody>
<tr>
<td>standard element</td>
<td>L = 48 in</td>
<td></td>
<td></td>
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<tr>
<td>6</td>
<td>8</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>4</td>
<td></td>
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<tr>
<td>10</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

HBT Type 5 - Standard element details

<table>
<thead>
<tr>
<th>Designation</th>
<th>Article No.</th>
<th>Connecting reinforcement dimensions</th>
<th>For element thickness</th>
<th>Case dimensions</th>
</tr>
</thead>
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<tr>
<td>HBT 120</td>
<td>spacing [in]</td>
<td>0054.240</td>
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<td>00011</td>
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<tr>
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<td>#4/12</td>
<td>00014</td>
</tr>
<tr>
<td>HBT 150</td>
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<td>0054.250</td>
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<td>HBT 190</td>
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<td>0054.260</td>
<td>#4/6</td>
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<td>#4/12</td>
<td>00004</td>
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<tr>
<td>HBT 220</td>
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<td>0054.270</td>
<td>#4/6</td>
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<td>#4/12</td>
<td>00004</td>
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</tbody>
</table>

* Standard dimension; based on f’c = 4000 psi and normal weight concrete

** Standard dimension; calculated using ACI 318-14 Eq. 25.4.2.3a, based on \( \psi_e=1.0, \psi_c=1.0, \psi_s=0.8, f’c = 4000 \) psi, \( K_{tr} = 0 \), Type B lap splice and normal weight concrete

Reinforcing bar dimensions are out to out of bars.

NOTE: custom HBT configurations are available upon request.
HALFEN HBT REBEND CONNECTION

HBT technical specifications

- Reinforcing Steel Grade: 60 meets ASTM A615/A615M
- Reinforcing steel size: #4 bar
- Bending diameters meet ACI 318 minimum requirements
- Six standard profiles to suit different structural configurations
- Casing available for single or double bars, 5 standard bar shapes
- Standard element lengths: 48"
- Custom solutions available

Making incisions in the HBT-Casing

Using an angle-grinder, cut approximately 3/8 in. deep incisions symmetrically into both sides of the casing at regular intervals. As a result the HBT Housing loses its rigidity, easing fixing to the formwork. To achieve a better fit to smaller curvature (< 10 ft.), up to seven incisions per side are possible. After fixing the HBT Housing to the formwork, cover the incisions with adhesive tape to prevent concrete seeping into the casing.

Caution when working with an angle-grinder!
The reinforcing steel bars in the HBT-Casing must not be damaged.

HBT-Element fitted to a convex curvature
RV radius ≥ ca. 10 ft.; smaller radius is achieved with more incisions.

HBT-Element fitted to a concave curvature
RC radius ≥ ca. 10 ft.; smaller radius is achieved with more incisions.
In order for us to be able to select the most efficient system for your project, please:
1. Provide the required information, questions 1 to 5 in the section 'Project Information'.
2. Provide the information about the project.
3. Fax to 877-683-4910, e-mail to engineering@halfenusa.com, or e-mail to sales representative.

### Project Information

1. Project Name: 

2. Project Address: 

3. Location, City: ____________________________ State: __________________

4. Company: ________________________________

5. Contact Person: ___________________________

6. Please provide the following HBT information:

<table>
<thead>
<tr>
<th>Connection ℓd (ft)</th>
<th>HBT profile</th>
<th>Bar #</th>
<th>Bar type</th>
<th>Bar spacing (in)</th>
<th>ldh (in)</th>
<th>ld (in)</th>
<th>b (in)</th>
<th>y (in)</th>
<th>Element length (in)</th>
<th>Quantity (ea)</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

7. Please provide the following project information:

<table>
<thead>
<tr>
<th>Connection ℓd (ft)</th>
<th>* Maximum factored shear, ( V_u ) (kip/ft)</th>
<th>* Maximum factored moment, ( M_u ) (kip/ft)</th>
<th>Connection description</th>
</tr>
</thead>
<tbody>
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</table>

* LRFD factored loads

8. Concrete Strength, \( f'_c \): ____________________ [ksi]
Fixing the HBT to the formwork

1. Nail (3 nails minimum) the HBT Rebend Connection through the casing to the formwork or alternatively securely tie the projecting anchorage reinforcing bars back to the main reinforcement. When using steel formwork, use suitable fixings. In both cases, the HBT Rebend Connection Box shall be securely fixed to avoid displacement while concrete is poured. The casing shall be tight against the formwork. Pour concrete.

Fixing the HBT to the formwork

2. After the concrete has cured, strike the formwork to reveal the cover. Place a wood block in the long groove in the cover and tap lightly with a hammer until the cover loosens.

Fixing the HBT to the formwork

3. Use a hammer claw to punch in the perforated hole in the sheet metal cover. Hook the hammer in the hole and pull the lid out to expose the pre-bent bars.

Caution! The edges of the sheet metal are sharp. Protective gloves shall be used while removing the sheet metal cover.

The sheet metal cover can be recycled.

Straightening the reinforcing steel

4. The bars should be straightened only once and gradually. To avoid damage to adjacent concrete, it is prudent to allow a concrete curing period of seven days. See “Straightening of Bars” on page 6 for more information. Once the bars are straightened and aligned, they are ready for lapping with the reinforcement steel (provided by others) of the subsequent reinforced concrete member.

- Straightening of reinforcing steel without an appropriate tool is not recommended.
- Do not straighten the reinforcing steel at temperatures lower than 41° Fahrenheit.
HALFEN has a global network of Subsidiary Companies to assist you. The main contact information for North America and the European Headquarter is provided below. For a full list of offices please visit www.HALFEN.com.

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E-Mail: bhughes@ucci.ca
Web: www.ucci.ca
Fax: +1 905.831.5872
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E-Mail: info@halfen.de
Web: www.halfen.de
Fax: +49 2173 970-123

HALFEN is also represented by distributors in Argentina, Australia, Azerbaijan, Belarus, Brazil, Bulgaria, Chile, China, Colombia, Croatia/Bosnia-Herzegovina/FYROM/Montenegro, Cyprus, Estonia, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Japan, Jordan, Kingdom of Saudi-Arabia, Latvia, Lebanon, Lithuania, Luxembourg, Malaysia, Malta, Mexico, New Zealand, Peru, Philippines, Republic of Kazakhstan, Romania, Russia, Serbia, Singapore, Slovenia, Spain, South Korea, Taiwan/ROC, Thailand, Turkey, Ukraine, United Arab Emirates, Uruguay, Vietnam

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