BRACE STIFFNESS CALCULATIONS

Stiffness Determination of a Composite Element

\[ K_{bc,sep} = \frac{A_s E}{\ell_p} \]

- Assumed stiffness of pinching core
- \( K_{bc,sep} \) unadjusted in earthquake

Frame Deflection

\[ f_{bc} = \frac{K_{bc} E}{\ell_p} \sum \frac{1}{f_i} \]

- Effective (actual) stiffness of BRB for use in deflection analysis
- \( K_{bc} E/\ell_p \) supplied by CoreBrace

Frame Stiffness

- The effective horizontal stiffness can be summarized by the following statement:

\[ K_{bc} E/\ell_p \approx 1.67 K_{bc,sep} \]

- Assumed stiffness approximation provided by CoreBrace
- \( K_{bc,sep} \) unadjusted in earthquake

For design assistance please contact CoreBrace:

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801.280.0701
www.corebrace.com

BRACE STIFFNESS MODIFICATION FACTORS, KF

Approximate Stiffness Modification Factor

\[ K_{bc} = K_{bc,sep} \text{KF} \]

- \( K_{bc} \) is the effective stiffness of BRB for use in deflection analysis
- \( K_{bc,sep} \) is the stiffness of the pinching core
- \( \text{KF} \) is defined as the ratio of the effective stiffness to the stiffness of the pinching core

Approximate Stiffness Modification Factor Table

<table>
<thead>
<tr>
<th>Bay Width, ft (m)</th>
<th>2.0 (13)</th>
<th>3.0 (19)</th>
<th>7.0 (45)</th>
<th>10.0 (65)</th>
<th>15 (4.6)</th>
<th>22.0 (142)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 ft (4.8)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>14 ft (4.2)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>12 ft (3.7)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>10 ft (3.0)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>8 ft (2.4)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Notes:

1. \( K_{bc,sep} \) is the stiffness of the pinching core
2. \( K_{bc} \) is the effective stiffness of BRB for use in deflection analysis
3. \( \text{KF} \) is defined as the ratio of the effective stiffness to the stiffness of the pinching core
4. \( \ell_p \) is the pinching core length
5. \( A_s \) is the cross-sectional area of the pinching core
6. \( E \) is the modulus of elasticity
7. \( f_i \) is the deflection of the pinching core

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<tr>
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<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>
## Approximate Casing Sizes 1/8 in (4 mm)

<table>
<thead>
<tr>
<th>Bay Width, ft (m)</th>
<th>Casing Sizes (inches)</th>
<th>Casing Sizes (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>8-W18×97</td>
<td>28</td>
</tr>
<tr>
<td>12</td>
<td>8-W18×97</td>
<td>25.4</td>
</tr>
<tr>
<td>14</td>
<td>8-W18×97</td>
<td>25.4</td>
</tr>
<tr>
<td>16</td>
<td>8-W18×97</td>
<td>25.4</td>
</tr>
<tr>
<td>18</td>
<td>8-W18×97</td>
<td>25.4</td>
</tr>
<tr>
<td>20</td>
<td>8-W18×97</td>
<td>25.4</td>
</tr>
<tr>
<td>24</td>
<td>8-W18×97</td>
<td>25.4</td>
</tr>
<tr>
<td>26</td>
<td>8-W18×97</td>
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<tr>
<td>30</td>
<td>8-W18×97</td>
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<td>35</td>
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<td>25.4</td>
</tr>
<tr>
<td>40</td>
<td>8-W18×97</td>
<td>25.4</td>
</tr>
</tbody>
</table>

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**CoreBrace Superior Seismic Performance**

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### BOLTED LUG BRACE AND CASING INFORMATION

#### Pinned Brace and Casing Information

- **Casings**
  - Factor of safety against buckling:
    - **1:** for elastic stability
    - **2:** for plastic stability
  - **Casings** for diameters equal to or less than 16" may be subjected to limited yielding. For diameters equal to or more than 16", casings must maintain the same minimum moment of inertia about the critical axis. Contact CoreBrace for assistance with alternate configurations.

- **Sizes shown are representative of typical BRB sizes. Information on intermediate and larger sizes is available upon request.**

#### Brace Lengths

- **Workpoint Length, ft (m)**
  - **F**
    - **6.0 (39)**
    - **9.0 (58)**
  - **A**
    - **12.0 (3.7)**

#### Casing Diameters

$$P_r = \frac{P \cdot t^2}{I}$$

- **P** = factored load
- **P_r** = plastic resistance
- **t** = thickness of casing
- **I** = moment of inertia

#### Workpoint Load, ft (m)

- **A**
  - **6.0 (39)**
  - **9.0 (58)**
- **F**
  - **12.0 (3.7)**

#### For the indicated frame geometry and beam/column sizes. Different beam/column sizes will affect brace length based on the lower-bound of the yield stress range. Typ yield stress range = 42 ksi ±4 ksi (290 MPa ±28 MPa).

#### Schematic BRB Behavior

- **BRB PROTECTED ZONES**

#### Approximate Casing Size

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