BRACES

Crossarm Braces..................................B-1
Special Purpose Braces.....................B-11
Transmission....................................B-15
   Knee & Vee..................................B-18
   Tension.....................................B-22
   X-Braces....................................B-25
Wood Distribution Crossarm Braces

Hughes Brothers distribution crossarm braces are manufactured from clear, straight grained Douglas-fir and pressure treated with Pentachlorophenol in oil. End fittings are hot dip galvanized per ASTM-A153. Each brace has been designed with double nut connections by tapping metal through holes, to eliminate radio frequency interference and ensure tight connections. Metal connections are designed to allow full drainage of moisture, leaving no place for decay to develop.

Electrically, wood distribution braces take full advantage of the insulating properties of wood crossarms. Any short circuit path between conductors is eliminated.

Special length braces can be furnished in any practical spacing or drop.
Hughes Brothers 1152 crossarm braces differ from other braces we manufacture in that they feature a longer tongue on the arm fitting. This allows for the use of a socket wrench at installation. Right and left hand braces complete each pair. Fittings are hot dip galvanized per ASTM-A153.

Furnished with 13/16" hole in arm fitting and 11/16" hole in pole fitting unless otherwise specified.

### 1152 Wood Crossarm Brace

**Stock No.** | **Span** | **Drop** | **Wt. Lbs.** | **Wood Section**
---|---|---|---|---
1152.5 | 42 | 12 | 10 | 1-15/16" x 2-15/16"
1152.6 | 42 | 21 | 11 |
1152.7 | 48 | 18 | 11 |
1152.8 | 48 | 24 | 12 |
1152.9 | 60 | 18 | 12 |
1152.10 | 60 | 30 | 14 |
1152.11 | 62 | 23-5/8 | 14 |
1152.12 | 72 | 22 | 14 |
1152.13 | 72 | 36 | 16 |
1152.14 | 84 | 24 | 16 |
1152.15 | 86 | 33-5/8 | 17 |

Use "5T" designation for 1/2" tapped attachment holes.

Special Length Braces furnished for any practical span or drop.

Standard package quantity 5 pair.
Hughes Brothers 2002 Inverted Crossarm Braces are used primarily in tension applications although they can be used as a standard brace. End fittings and connections have been designed accordingly. Fittings are hot dip galvanized per ASTM A-153 after fabrication. Right and left hand braces complete each pair.

Unless specified otherwise, end fittings are furnished with 11/16" bolt holes.

### Ordering Information

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Span Inches</th>
<th>Drop Inches</th>
<th>Wt. Lbs. Per Pair</th>
<th>Wood Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002.5</td>
<td>60</td>
<td>18-1/4</td>
<td>17</td>
<td>1-15/16&quot; x 2-15/16&quot;</td>
</tr>
<tr>
<td>2002.6</td>
<td>60</td>
<td>30</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>2002.7</td>
<td>62</td>
<td>23-7/8</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>2002.8</td>
<td>66</td>
<td>20</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>2002.9</td>
<td>72</td>
<td>22</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>2002.10</td>
<td>72</td>
<td>36</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>2002.11</td>
<td>84</td>
<td>23-1/2</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>2002.12</td>
<td>84</td>
<td>42</td>
<td>25</td>
<td></td>
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<tr>
<td>2002.13</td>
<td>84</td>
<td>27-3/8</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>2002.14</td>
<td>86</td>
<td>33-5/8</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>2002.15</td>
<td>88</td>
<td>38</td>
<td>24</td>
<td></td>
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<tr>
<td>2002.16</td>
<td>90</td>
<td>33-5/8</td>
<td>24</td>
<td></td>
</tr>
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<td>2002.17</td>
<td>90</td>
<td>45</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>2002.18</td>
<td>96</td>
<td>36</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>2002.19</td>
<td>96</td>
<td>48</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>2002.20</td>
<td>108</td>
<td>42-1/4</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>2002.21</td>
<td>110</td>
<td>34</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>2002.22</td>
<td>110</td>
<td>54-5/8</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>2002.23</td>
<td>112</td>
<td>37-13/16</td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>

Standard Package Quantity 5 Pair.
Hughes Brothers flat steel galvanized crossarm braces, when installed in pairs, provide an economical method for stabilizing light distribution construction.

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Hole Spacing Center to Center</th>
<th>Length Inches</th>
<th>Metal Section</th>
<th>Approximate Weight Lbs. Per Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>2809.1</td>
<td>18&quot;</td>
<td>20</td>
<td>1/4&quot; x 1-1/4&quot;</td>
<td>3.5</td>
</tr>
<tr>
<td>2809.2</td>
<td>20&quot;</td>
<td>22</td>
<td></td>
<td>3.9</td>
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<tr>
<td>2809.3</td>
<td>22&quot;</td>
<td>24</td>
<td></td>
<td>4.3</td>
</tr>
<tr>
<td>2809.4</td>
<td>24&quot;</td>
<td>26</td>
<td></td>
<td>4.6</td>
</tr>
<tr>
<td>2809.5*</td>
<td>26&quot;</td>
<td>28</td>
<td></td>
<td>4.8</td>
</tr>
<tr>
<td>2809.6</td>
<td>28&quot;</td>
<td>30</td>
<td></td>
<td>5.3</td>
</tr>
<tr>
<td>2809.7</td>
<td>30&quot;</td>
<td>32</td>
<td></td>
<td>5.7</td>
</tr>
<tr>
<td>2819.1</td>
<td>18&quot;</td>
<td>20</td>
<td>3/16&quot; x 1-1/4&quot;</td>
<td>2.7</td>
</tr>
<tr>
<td>2819.2</td>
<td>20&quot;</td>
<td>22</td>
<td></td>
<td>2.9</td>
</tr>
<tr>
<td>2819.3</td>
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<td>24</td>
<td></td>
<td>3.2</td>
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<tr>
<td>2819.4</td>
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<td>3.4</td>
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<td>2819.5</td>
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<td>3.7</td>
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<td>30</td>
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<tr>
<td>2819.7</td>
<td>30&quot;</td>
<td>32</td>
<td></td>
<td>4.2</td>
</tr>
</tbody>
</table>

*RUS accepted

Note: Other sizes are available on request. The braces are furnished with one 9/16" and one 7/16" hole unless specified otherwise.

**Ordering Information**

**2809.5**

Specify by C to C length.
Hughes Brothers 2023 flat wood braces are a direct replacement for flat steel braces, and provide superior mechanical strength due to their compression capability. Use of a wood distribution brace also improves the BIL of the pole top.

Each brace in a pair is identical and interchangeable (right or left hand side), and furnished with 7/16” hole in the arm fitting and 9/16” hole in the pole fitting. Other hole sizes are available.

Wood components are made of clear, straight grained Douglas-fir, 1” x 1-3/4” wood section. Fittings are formed from 11 ga. plate, hot-dip galvanized, threaded and attached to the wood with washer head bolts.

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Brace Bolt Hole C. to C. Spacing</th>
<th>Span</th>
<th>Drop</th>
<th>Wt. Lbs. Per 100 Pr.</th>
<th>Wood Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>§ 2023*</td>
<td>26”</td>
<td>38”</td>
<td>18”</td>
<td>390</td>
<td>1” x 1-3/4”</td>
</tr>
<tr>
<td>2023-18-3/4</td>
<td>18-3/4”</td>
<td>27-1/2”</td>
<td>12-3/4”</td>
<td>345</td>
<td>1” x 1-3/4”</td>
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<tr>
<td>2023-30</td>
<td>30”</td>
<td>44”</td>
<td>20-1/2”</td>
<td>409</td>
<td>1” x 1-3/4”</td>
</tr>
</tbody>
</table>

Any practical special length can be furnished.

Standard Package Quantity 10 Pair or Multiple Thereof

*RUS accepted

§ Stock item

**Ordering Information**

Use information above.
Crossarm Braces

2023 Test Data

2023 Brace ready for testing in accordance with REA specs.

Pair of 2023 braces removed after 20 years of service ready for testing. These braces performed to full capacity when tested.
The 2045 reversible crossarm brace is Hughes Brothers most popular distribution brace. The 2045 brace is Hughes Brothers best all purpose brace, and is able to withstand all normal and many excessive loads imposed on distribution lines. Each brace pair has identical right and left hand components. Each nutted connection is tapped to make a double nut connection ensuring permanently tight hardware. The 2045 has a wood section of 1-5/8” x 2-1/4”.

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Span Inches</th>
<th>Drop Inches</th>
<th>Wood Length Inches</th>
<th>Fitting Angle</th>
<th>Wt Lbs. Per Pair</th>
</tr>
</thead>
<tbody>
<tr>
<td>2045-A30-9-11</td>
<td>42</td>
<td>12</td>
<td>18-1/2</td>
<td>30°</td>
<td>7.4</td>
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<tr>
<td>2045-AB45-9-11</td>
<td>37</td>
<td>18-1/2</td>
<td>21</td>
<td>45°</td>
<td>7.6</td>
</tr>
<tr>
<td>2045-B30-9-11</td>
<td>48</td>
<td>14-3/4</td>
<td>23</td>
<td>30°</td>
<td>8.0</td>
</tr>
<tr>
<td>2045-B45-9-11</td>
<td>42</td>
<td>21</td>
<td>24-1/2</td>
<td>45°</td>
<td>8.8</td>
</tr>
<tr>
<td>2045-BB30-9-11</td>
<td>48</td>
<td>18</td>
<td>24-1/2</td>
<td>30°</td>
<td>9.0</td>
</tr>
<tr>
<td>2045-C45-9-11</td>
<td>48</td>
<td>24</td>
<td>28-1/2</td>
<td>45°</td>
<td>10.2</td>
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<tr>
<td>2045-CC30-9-11*</td>
<td>60</td>
<td>18</td>
<td>29-1/2</td>
<td>30°</td>
<td>11.8</td>
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<tr>
<td>2045-D45-9-11*</td>
<td>60</td>
<td>30</td>
<td>37</td>
<td>45°</td>
<td>12.5</td>
</tr>
<tr>
<td>2045-E45-9-11</td>
<td>72</td>
<td>36</td>
<td>45-1/2</td>
<td>45°</td>
<td>8.8</td>
</tr>
<tr>
<td>2045-EE30-9-11</td>
<td>72</td>
<td>22</td>
<td>37</td>
<td>30°</td>
<td>7.7</td>
</tr>
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<td>2045-F30-9-11</td>
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<td>12-3/4</td>
<td>19</td>
<td>30°</td>
<td>11.1</td>
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<td>2045-G45-9-11</td>
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<td>26-1/2</td>
<td>34-1/2</td>
<td>45°</td>
<td>12.5</td>
</tr>
<tr>
<td>2045-K30-9-11</td>
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<td>14</td>
<td>22-1/2</td>
<td>30°</td>
<td>13.8</td>
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<tr>
<td>2045-L30-11-11</td>
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<td>17</td>
<td>28-1/2</td>
<td>30°</td>
<td>13.8</td>
</tr>
<tr>
<td>2045-M30-9-11</td>
<td>84</td>
<td>24</td>
<td>42</td>
<td>30°</td>
<td>13.8</td>
</tr>
<tr>
<td>2045-W30-13-11</td>
<td>86</td>
<td>33-3/8</td>
<td>49</td>
<td>30°</td>
<td>13.8</td>
</tr>
</tbody>
</table>

* RUS accepted

See next page for ultimate load information

Ordering Information

2045 - C C 30 - 9 - 1 1

Brace to pole fitting hole size in sixteenths (11/16”)
Brace to arm fitting hole size in sixteenths (9/16”)
Brace type (span, drop & fitting angle)

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2045 Crossarm Brace Test Data

2045-CC30-9-11 Crossarm Brace
Unbalanced loading (44” Lever Arm)
2500 Pounds Shown
4300 Pound Ultimate Load

2045-D45-9-11 Crossarm Brace
Unbalanced loading (44” Lever Arm)
2500 Pounds Shown
5100 Pound Ultimate Load

NOTE: Please contact the Hughes Engineering Department for strength ratings of individual brace stock numbers.
Heavy Duty, Face Mounting Crossarm Braces 2016, 2017 & 2018

The Hughes 2016, 2017 & 2018 series braces are the strongest distribution braces available.

These braces are ordered by specifying brace length from mounting hole to mounting hole.

Face mounted braces are furnished in pairs (right & left side). Should it be necessary, braces can be converted from right to left side in the field by simply reversing one end fitting.

### Table 1

<table>
<thead>
<tr>
<th>Fitting Angle</th>
<th>Arm Mounting Hole Size* 2016/17</th>
<th>Arm Mounting Hole Size* 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 30°</td>
<td>13/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>B 37°</td>
<td>13/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>C 45°</td>
<td>13/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>D 52°</td>
<td>13/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>E 60°</td>
<td>13/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>F 30°</td>
<td>11/16&quot;</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>G 37°</td>
<td>11/16&quot;</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>H 45°</td>
<td>11/16&quot;</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>J 52°</td>
<td>11/16&quot;</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>K 60°</td>
<td>11/16&quot;</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>L 55°</td>
<td>11/16&quot;</td>
<td>13/16&quot;</td>
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</table>

* Hole Oversized 1/16" from mounting bolt

### Ultimate Ratings

<table>
<thead>
<tr>
<th></th>
<th>2016 / 2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension</td>
<td>15,000 lbs</td>
<td>20,000 lbs</td>
</tr>
</tbody>
</table>

### Ordering Information

Stock No. (Arm) Table 1 (Pole) Table 2

2016HB108PR

PR- pair
RT- right hand only
LT- left hand only
C-C Length in inches
Crossarm Braces

2016

11/16" Standard

11/16" Mounting holes are standard. Brace can be furnished with 13/16" holes when specified.

2-1/8" x 3-3/8" Wood Section

2017

13/16" Standard

13/16" Mounting holes are standard. Brace can be furnished with 11/16" holes when specified.

2-3/4" x 3-1/2" Wood Section

2018

15/16" Standard

15/16" Mounting holes are standard. Brace can be furnished with 13/16" holes when specified.

2018

3-3/8" x 4-3/8" Wood Section

2018.5

3-3/8" x 5-3/8" Wood Section

2018M

Specify Hole Size

3" x 3" Steel Tube

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Special Purpose Braces

1096 Alley Arm Brace

Hughes Brothers 1096 Wood Alley Arm Braces are designed for greater strength than alley arm braces made from formed angle iron. The 1096 Alley Arm Brace is made from 2-3/4" x 3-1/2" straight grained, pressure treated Douglas-fir. The brace is furnished with an 11/16" hole at the arm fitting and an 11/16" hole at the pole fitting unless otherwise specified. Metal step is made from 3/16" x 1-3/16" stock.

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Brace Bolt Hole C. to C. Spacing</th>
<th>Crossarm Bolt Hole C. to C. Spacing</th>
<th>Wt. Lbs. Each</th>
<th>Wood Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>1096.5</td>
<td>5'-0&quot;</td>
<td>3'-10&quot;</td>
<td>16</td>
<td>2-3/4&quot; x 3-1/2&quot;</td>
</tr>
<tr>
<td>1096.6</td>
<td>6'-0&quot;</td>
<td>4'-8&quot;</td>
<td>18</td>
<td>2-3/4&quot; x 3-1/2&quot;</td>
</tr>
<tr>
<td>1096.7</td>
<td>7'-0&quot;</td>
<td>5'-4&quot;</td>
<td>21</td>
<td>2-3/4&quot; x 3-1/2&quot;</td>
</tr>
</tbody>
</table>

The spacing from the arm fitting bolt hole to the upper bolt hole of the metal step is 2'-6" unless otherwise specified.

An "R" suffix designates a "Reversed Brace", i.e., the arm fitting of the Alley Arm Brace is for attachment under the arm and pole fitting is on face of pole. (See illustration at left).

Ordering Information

Use information above
1096.1C Vertical Arm Brace

For multi-arm alley construction, Vertical Brace No. 1096.1C should be ordered. This vertical brace is made from 3/16" x 2" x 2-1/2" angle. Center to center spacing between 9/16" bolt holes varies by arm spacing. For longer vertical brace lengths, specify desired crossarm vertical spacing and mounting hole sizes.

Mounting bolts ordered separately.

### Ordering Information

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Arm Spacing</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1096.1C-24</td>
<td>24&quot;</td>
<td>5.5 lbs</td>
</tr>
<tr>
<td>1096.1C-36</td>
<td>36&quot;</td>
<td>9.3 lbs</td>
</tr>
<tr>
<td>1096.1C-46</td>
<td>46&quot;</td>
<td>10.5 lbs</td>
</tr>
<tr>
<td>1096.1C-48</td>
<td>48&quot;</td>
<td>12.0 lbs</td>
</tr>
</tbody>
</table>
**Special Purpose Braces**

**1097 Steel Alley Arm Brace**

The 1097 Steel Alley Arm Brace is used where the arms are mounted on one side of the pole. The brace end is flattened for the pole or arm attachment. Manufactured from plate, which is folded and bent.

**Ordering Information**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1097.1A60-9</td>
<td>60&quot;</td>
<td>30&quot;</td>
<td>9/16&quot;</td>
</tr>
<tr>
<td>1097.1A84-11</td>
<td>84&quot;</td>
<td>30&quot;</td>
<td>11/16&quot;</td>
</tr>
</tbody>
</table>

**NOTE:**

To order the brace reversed such that the brace mounts under the crossarm, add an "R" to the part number (i.e. 1097.1AR60-9).

---

**AS2329 Welded Steel Alley Arm Brace**

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS2329</td>
<td>7'-0&quot;</td>
<td>2'-6&quot;</td>
<td>16.3 lbs</td>
</tr>
<tr>
<td>AS2329-D</td>
<td>- Same as AS2329 but reversed so that flat end mounts against pole.</td>
<td></td>
<td>16.3 lbs</td>
</tr>
</tbody>
</table>

The Hughes Brothers AS2329 Brace is manufactured from plate which is notched, bent and welded.
B Special Purpose Braces

AS2309 Steel Angle Brace

A face mounted steel brace, the pole mounting end is flattened so the brace can be used as either a right hand or left hand member. A gap of 1/16" is left in the flattened portion of the brace to allow for moisture drainage.

The AS2309 is typically used in RUS construction as illustrated in this TSS-1 configuration.

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Section Size</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
<th>Hole #1</th>
<th>Hole #2</th>
<th>°</th>
<th>Wt/lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS2309-A</td>
<td>3/16&quot;x1 3/4&quot;x1 3/4&quot;</td>
<td>50&quot;</td>
<td>3’6&quot;</td>
<td>11/16&quot;</td>
<td>11/16&quot;</td>
<td>30°</td>
<td>9.0</td>
</tr>
<tr>
<td>AS2309-B</td>
<td>3/16&quot;x1 3/4&quot;x1 3/4&quot;</td>
<td>36&quot;</td>
<td>2’6&quot;</td>
<td>13/16&quot;</td>
<td>11/16&quot;</td>
<td>35°</td>
<td>6.7</td>
</tr>
<tr>
<td>AS2309-C</td>
<td>3/16&quot;x1 3/4&quot;x1 3/4&quot;</td>
<td>50&quot;</td>
<td>3’6&quot;</td>
<td>13/16&quot;</td>
<td>11/16&quot;</td>
<td>30°</td>
<td>8.6</td>
</tr>
<tr>
<td>AS2309-D</td>
<td>3/16&quot;x1 1/2&quot;x1 1/2&quot;</td>
<td>30&quot;</td>
<td>2’0&quot;</td>
<td>9/16&quot;</td>
<td>11/16&quot;</td>
<td>38°</td>
<td>4.7</td>
</tr>
<tr>
<td>AS2309-E</td>
<td>3/16&quot;x1 1/2&quot;x1 1/2&quot;</td>
<td>35&quot;</td>
<td>2’6&quot;</td>
<td>9/16&quot;</td>
<td>11/16&quot;</td>
<td>32°</td>
<td>7.0</td>
</tr>
<tr>
<td>AS2309-G*</td>
<td>3/16&quot;x1 3/4&quot;x1 3/4&quot;</td>
<td>47&quot;</td>
<td>2’6&quot;</td>
<td>11/16&quot;</td>
<td>11/16&quot;</td>
<td>0°</td>
<td>8.5</td>
</tr>
<tr>
<td>AS2309-H</td>
<td>3/16&quot;x1 3/4&quot;x1 3/4&quot;</td>
<td>40-1/4&quot;</td>
<td>3’0&quot;</td>
<td>11/16&quot;</td>
<td>11/16&quot;</td>
<td>30°</td>
<td>7.4</td>
</tr>
</tbody>
</table>

* AS2309-G is a straight brace folded on both ends.

Ordering Information
Use stock numbers at right
Hughes Brothers Knee & Vee Braces

Hughes Brothers Knee & Vee Braces are made of select, straight grained Douglas-fir. The timbers are surfaced, graded, bored, pressure treated with Penta and assembled with steel end fittings. End fitting through holes are tapped to provide double nut connections to ensure tight hardware as the wood shrinks over time. All end fittings are hot dip galvanized per ASTM-A153.

Wood members used in our braces are transmission grade timbers (more exacting standards than crossarms.)

Knee Braces
End fittings oriented perpendicular to each other.

Vee Braces
End fittings oriented parallel to each other.
2010 Light Duty Brace

The 2010 brace uses a 2-1/8"x 3-3/8" wood section. The 2010 is typically used when the spacing and drop does not exceed 5'-0" or the overall brace length does not exceed 7'-0". End fittings are fabricated from 3/16" steel. 11/16" mounting holes are standard.

<table>
<thead>
<tr>
<th>Fitting Angle</th>
<th>Mounting Hole Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 30°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>B 37°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>C 45°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>D 52°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>E 60°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>F 30°</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>G 37°</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>H 45°</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>J 52°</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>K 60°</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>L 55°</td>
<td>11/16&quot;</td>
</tr>
</tbody>
</table>

Ultimate Ratings

- Tension: 15,000 lbs
- Compression: 7,500 lbs @ 7' 0" C-C

Ordering Information

2010 G J K 59.5

C-C length in inches
Knee or Vee
Table I, 2nd end fitting
Table I, 1st end fitting
The 1135 uses a 2-3/4" x 3-1/2" wood section and is typically used when the spacing & drop does not exceed 7'-0" or the overall brace length does not exceed 10'-0".

End fittings are fabricated from 1/4" steel and hot dip galvanized per ASTM-A153. 13/16" mounting holes are standard.

### Table I

<table>
<thead>
<tr>
<th>Fitting Angle</th>
<th>Mounting Hole Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 30°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>B 37°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>C 45°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>D 52°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>E 60°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>F 30°</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>G 37°</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>H 45°</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>J 52°</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>K 60°</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>L 45°</td>
<td>15/16&quot;</td>
</tr>
</tbody>
</table>

### Ultimate Ratings

- **Tension**: 15,000 lbs
- **Compression**: 7,500 lbs @ 10' 0" C-C Length

### Ordering Information

- **1135 B D V 123.8**
  - C-C length in inches
  - Knee or Vee
  - Table I, 2nd end fitting
  - Table I, 1st end fitting
2025 Knee & Vee Brace

The 2025 uses a 3-3/8" x 4-3/8" wood section and the 2025.5 a 3-3/8" x 5-3/8" wood section. The 2025 is typically used when the spacing & drop does not exceed 9'-6" or the overall brace length does not exceed 13'-6". For heavier compression loads the 2025.5 is used.

End fittings are fabricated from 1/4" steel and hot dip galvanized per ASTM-A153. 15/16" mounting holes are standard, 13/16" are available.

**Ultimate Ratings**

<table>
<thead>
<tr>
<th>Tension</th>
<th>20,000 lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression</td>
<td>Dependent on C-C length and wood size</td>
</tr>
</tbody>
</table>

**Ordering Information**

2025 2025 B D V 1 5 4 7

- C-C length in inches
- Knee or Vee
- Table I, 2nd end fitting
- Table I, 1st end fitting

**Table I**

<table>
<thead>
<tr>
<th>Fitting Angle</th>
<th>Mounting Hole Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>30°</td>
</tr>
<tr>
<td>B</td>
<td>37°</td>
</tr>
<tr>
<td>C</td>
<td>45°</td>
</tr>
<tr>
<td>D</td>
<td>52°</td>
</tr>
<tr>
<td>E</td>
<td>60°</td>
</tr>
<tr>
<td>F</td>
<td>30°</td>
</tr>
<tr>
<td>G</td>
<td>37°</td>
</tr>
<tr>
<td>H</td>
<td>45°</td>
</tr>
<tr>
<td>J</td>
<td>52°</td>
</tr>
<tr>
<td>K</td>
<td>60°</td>
</tr>
<tr>
<td>L</td>
<td>25°</td>
</tr>
<tr>
<td>M</td>
<td>25°</td>
</tr>
</tbody>
</table>

B-18

Hughes Brothers, Inc.

P.O. Box 159 / 210 N 13th / Seward, NE 68434 / Phone (402) 643-2991 / Fax (402) 643-2149

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2025M Steel Knee & Vee Brace

The 2025M uses the same end fittings as standard 2025 braces but substitutes a 3" x 3" tubular steel member for the Douglas-fir timber.

End fittings are fabricated from 1/4" steel and hot dip galvanized per ASTM-A153. 15/16" mounting holes are standard, 13/16" available.

Ultimate Ratings

<table>
<thead>
<tr>
<th></th>
<th>20,000 lbs</th>
<th>Dependent on C-C length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ordering Information

2025M - BDV 154.7

C-C length in inches
Knee or Vee
Table I, 2nd end fitting
Table I, 1st end fitting

Table I

<table>
<thead>
<tr>
<th>Fitting Angle</th>
<th>Mounting Hole Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 30°</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>B 37°</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>C 45°</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>D 52°</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>E 60°</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>F 30°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>G 37°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>H 45°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>J 52°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>K 60°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>L 25°</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>M 25°</td>
<td>13/16&quot;</td>
</tr>
</tbody>
</table>
B2498-A Steel Angle Knee Brace

Ultimate Strength

| Tension | 20,000 lbs |

Ordering Information

B 2 4 9 8 - A - B D 1 2 0 7

*C-C length in inches
Fittings, from Table I

Table I

<table>
<thead>
<tr>
<th>Fitting Angle</th>
<th>Mounting Hole Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 30°</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>B 37°</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>C 45°</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>D 52°</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>E 60°</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>F 30°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>G 37°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>H 45°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>J 52°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>K 60°</td>
<td>13/16&quot;</td>
</tr>
<tr>
<td>L 25°</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>M 25°</td>
<td>13/16&quot;</td>
</tr>
</tbody>
</table>

Note: 2025M Tubular Steel Brace is located on page B-19.
2038B, 2038C Heavy Duty Braces

The 2038 series knee/vee braces incorporate a 6-bolt, channel type end fitting and are used primarily for high loading conditions. The 2038B uses a 3-1/2" x 4-1/2" wood section, and the 2038C a 3-1/2" x 5-1/2" wood section. End fittings are fabricated from 3/8" steel and hot dip galvanized per ASTM-A153. 15/16" mounting holes are standard.

We recommend contacting the Hughes Brothers engineering department to ensure proper application of the 2038 Heavy Duty Brace.

Ultimate Strength

Tension - 30,000 lbs

Ordering Information

<table>
<thead>
<tr>
<th>2038C - BDV 154.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-C length in inches</td>
</tr>
<tr>
<td>Table I, 2nd end fitting</td>
</tr>
</tbody>
</table>

**Table I**

<table>
<thead>
<tr>
<th>Fitting Angle</th>
<th>C-C</th>
<th>Mounting Hole Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 30°</td>
<td>15/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>B 37°</td>
<td>15/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>C 45°</td>
<td>15/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>D 52°</td>
<td>15/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>E 60°</td>
<td>15/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>F 55°</td>
<td>15/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>G 25°</td>
<td>15/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>H 37°</td>
<td>1-1/16&quot;</td>
<td>1-1/16&quot;</td>
</tr>
<tr>
<td>J 52°</td>
<td>1-1/16&quot;</td>
<td>1-1/16&quot;</td>
</tr>
<tr>
<td>K 34°</td>
<td>1-1/16&quot;</td>
<td>1-1/16&quot;</td>
</tr>
<tr>
<td>L 42°</td>
<td>15/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>M 48°</td>
<td>15/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>N 45°</td>
<td>1-1/16&quot;</td>
<td>1-1/16&quot;</td>
</tr>
<tr>
<td>P 30°</td>
<td>1-1/16&quot;</td>
<td>1-1/16&quot;</td>
</tr>
</tbody>
</table>
2038D, 2038E Heavy Duty Tension Braces

Both the 2038D & 2038E Tension Braces use a 3-1/2" x 4-1/2" wood section. The 2038D end fittings are made of 1/4" steel while the 2038E has fittings made of 3/8" steel.

All end fittings are hot dip galvanized per ASTM-A153. The 2038D tension brace has 15/16" mounting holes, 2038E has 1-1/16" mounting holes.

Ultimate Strength

<table>
<thead>
<tr>
<th></th>
<th>2038D</th>
<th>2038E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension</td>
<td>30,000 lbs</td>
<td>50,000 lbs</td>
</tr>
</tbody>
</table>

Ordering Information

2038D - 208

C-C length in inches

*2038D has 1/4" steel fittings. 2038E has 3/8" steel fittings.
Hughes Brothers 2038 tension braces incorporate a 6-bolt type end fitting with a 3-1/2” x 4-1/2” wood section. End fittings are fabricated from 1/4” & 3/8” steel, and hot dip galvanized per ASTM-A153. 15/16” mounting holes are standard.

We recommend contacting the Hughes Brothers engineering department to ensure proper application of the 2038 Heavy Duty Brace.

### Ordering Information

**2038A - B - 204**

- **C - C** length in inches
- Table I, fitting angle & hole size

### Ultimate Strength

<table>
<thead>
<tr>
<th>Fitting Angle</th>
<th>Mounting Hole Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 30°</td>
<td>15/16”</td>
</tr>
<tr>
<td>B 37°</td>
<td>15/16”</td>
</tr>
<tr>
<td>C 45°</td>
<td>15/16”</td>
</tr>
<tr>
<td>D 52°</td>
<td>15/16”</td>
</tr>
<tr>
<td>E 60°</td>
<td>15/16”</td>
</tr>
<tr>
<td>F 55°</td>
<td>15/16”</td>
</tr>
<tr>
<td>G 25°</td>
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</tr>
<tr>
<td>H 37°</td>
<td>1-1/16”</td>
</tr>
<tr>
<td>J 52°</td>
<td>1-1/16”</td>
</tr>
<tr>
<td>K 34°</td>
<td>1-1/16”</td>
</tr>
<tr>
<td>L 42°</td>
<td>15/16”</td>
</tr>
<tr>
<td>M 48°</td>
<td>15/16”</td>
</tr>
</tbody>
</table>

Table I

Note: The 2038TB has the clevis fitting rotated 90° from the 2038A.
2043 Tension Brace
2043-A Adjustable Tension Brace

Hughes Brothers 2043 & 2043A tension braces have a wood section of 3-3/8" x 4-3/8". End fittings are formed from 1/4" steel with 15/16" standard mounting holes. All end fittings are hot dip galvanized per ASTM-A153.

The 2043-A tension brace includes a 7/8" x 12" turnbuckle. The turnbuckle provides for plus or minus 6" of adjustment from the centered position.

Ultimate Ratings

| Tension     | 30,000 lbs |

Ordering Information

2043-130

C-C length in inches

2043-A

Turnbuckle (included with 2043-A). See Fastener Section for Turnbuckle Details.
Wood X-Bracing for Transmission Structures

When the first unbraced H-Frame structure was erected on our testing site (in the late 1920’s), excessive deflection under relatively small loads was obvious. Hughes Brothers immediately accepted the challenge of developing bracing to reduce deflection and to strengthen transmission and distribution structures. After hundreds of tests on fittings and full size structures, X-Braces were developed which today are as much a part of an “H-Frame” as the poles and crossarms.

Maintenance costs of X-Braced structures are lower than unbraced structures because X-Braced structures remain straight and true for the life of the line.

Many years of experience in testing full scale, X-Braced structures plus years of actual operating experience enable our engineering department to provide practical assistance. There are many subtleties involved in the design of a Hughes X-Brace that cannot be duplicated by simple timber X-Bracing. Let the Hughes Engineering staff help you determine the optimal size & placement of your next X-Brace application. You are invited to submit your structural design requirements without obligation.

Please refer to the Engineering section for analysis of X-Brace design and location in structure systems.

Unbraced and X-Braced Hughes Brothers structures under the same load. Circa 1928

Unbraced

Top Deflection 58 in.
Calculated Strength 4060 lbs.

Hughes X-Braced

Top Deflection 6 in.
Calculated Strength 13,600 lbs.
Hughes Brothers 1042 X-Braces are widely used because they increase the strength of H-Frames, reduce earth pressures and structure deflection, eliminate the necessity of storm guys, make possible the use of smaller poles, require no additional right of way and reduce to a minimum the overall maintenance costs. In addition to transmission lines, X-Braces are used on structures for river crossings, long span highway crossings, railroad crossings, switches, alleys and substations. Our engineering department will assist you with the correct application of X-Braces.

Hughes No. 1042 X-Braces are made of select Douglas-fir timber, and pressure treated with pentachlorophenol. The 1042 series incorporates a wood section of 3-3/8" x 4-3/8" for pole spacings up to 14'-0" and 3-3/8" x 5-3/8" for spacings 14'-6" and over.

All fittings, washer plates, center clamps, washers and bolts are hot dipped galvanized. Fittings are made from 1/4" material. Washer plates are threaded for 1/2" bolts, locking the bolt for "Static Proof" hardware. Mounting bolt holes are 15/16". Center clamps keep the brace in alignment under compression loads while permitting free movement of the wood. Center clamp straps are made from 1/4" x 1-3/4" stock, center clamp bolts are made from 1/2" steel rods with forged shoulders and cut threads on each end.

Hughes Brothers 1042 X-Braces are shipped as a complete set, assembled, mounting hardware packaged, ready to install, when ordered complete (CPT).

When ordering X-Braces, please specify center to center pole spacing and length of bolts. Unless otherwise specified, 50% of total bolts furnished are 7/8" x 14" and 50% are 7/8" x 16" cut thread machine bolts.

### Ordering Information

```
1042 - 12 - 6 - CPT
```

- Pole spacing in feet & inches*.
- Complete with mounting bolts, curved washers & center clamp.
- X-Brace with center clamp only.
- Provides just X-Brace assembly. No mounting hardware or center clamp.
- One member only with fittings.

*Use 6" increments only.

### Ultimate Rating

The 1042 series has an ultimate rating of **20,000 lbs in tension**. It is recommended that the Hughes Brothers Engineering staff assist you in specifying the use of X-Bracing.
### 1042 X-Brace

**Pole Spacing Center to Center** | **Approx. Wt. - Lbs. Per Set** | **Wood Section**
--- | --- | ---
1042-7-0 | 7'-0" | 121
1042-7-6 | 7'-6" | 128
1042-8-0 | 8'-0" | 131
1042-8-6 | 8'-6" | 133
1042-9-0 | 9'-0" | 141
1042-9-6 | 9'-6" | 147
1042-10-0 | 10'-0" | 149
1042-10-6 | 10'-6" | 158
1042-11-0 | 11'-0" | 164
1042-11-6 | 11'-6" | 166
1042-12-0 | 12'-0" | 174
1042-12-6 | 12'-6" | 181
1042-13-0 | 13'-0" | 186
1042-13-6 | 13'-6" | 192
1042-14-0 | 14'-0" | 197
1042-14-6 | 14'-6" | 232
1042-15-0 | 15'-0" | 245
1042-15-6 | 15'-6" | 252
1042-16-0 | 16'-0" | 252
1042-16-6 | 16'-6" | 267
1042-17-0 | 17'-0" | 272
1042-17-6 | 17'-6" | 281
1042-18-0 | 18'-0" | 287

**Stock No.**

- **1042-7-0**
- **1042-7-6**
- **1042-8-0**
- **1042-8-6**
- **1042-9-0**
- **1042-9-6**
- **1042-10-0**
- **1042-10-6**
- **1042-11-0**
- **1042-11-6**
- **1042-12-0**
- **1042-12-6**
- **1042-13-0**
- **1042-13-6**
- **1042-14-0**
- **1042-14-6**
- **1042-15-0**
- **1042-15-6**
- **1042-16-0**
- **1042-16-6**
- **1042-17-0**
- **1042-17-6**
- **1042-18-0**

**Pole Spacing Center to Center**

- **7'-0"**
- **7'-6"**
- **8'-0"**
- **8'-6"**
- **9'-0"**
- **9'-6"**
- **10'-0"**
- **10'-6"**
- **11'-0"**
- **11'-6"**
- **12'-0"**
- **12'-6"**
- **13'-0"**
- **13'-6"**
- **14'-0"**
- **14'-6"**
- **15'-0"**
- **15'-6"**
- **16'-0"**
- **16'-6"**
- **17'-0"**
- **17'-6"**
- **18'-0"**

**Approx. Wt. - Lbs. Per Set**

- **121**
- **128**
- **131**
- **133**
- **141**
- **147**
- **149**
- **158**
- **164**
- **166**
- **174**
- **181**
- **186**
- **192**
- **197**
- **232**
- **245**
- **252**
- **252**
- **267**
- **272**
- **281**
- **287**

**Wood Section**

- **3 3/8" x 4 3/8"** for pole spacings 14'-0" and under unless specified otherwise.
- **3 3/8" x 5 3/8"** for pole spacings 14'-6" and over unless specified otherwise.

*Note:

- Available for special order
- **1042-12-6-LWCPT**

**LW** - Designates larger wood section, 3-3/8" x 5-3/8" on X-Braces with pole spacing less than 14'-6". (Always provided for pole spacing 14'-6" & over).

**SW** - Designates 3-3/8" x 4-3/8" wood section on X-Braces for 14'-6" pole spacing & greater.

---

1042 End Fitting with 7/8" thru-bolt and CW80 curved washer.

2840 Center Clamp
See last page of section for further details.
B  X-Braces

1150 X-Brace

Hughes No. 1150 X-Braces are made of select Douglas-fir, 2-3/4" x 3-1/2", pressure treated with pentachlorophenol, for pole spacings up to 11'-0".

All fittings, washer plates, center clamps, curved washers and bolts are hot dip galvanized. Fittings are made from 1/4" material. Pole mounting holes are 13/16".

Center clamp straps are made from 1/4" x 1-3/4" stock. Center clamp bolts are made from steel rods which have cut threads for 1/2" nuts.

Hughes No. 1150 X-Braces are shipped as a complete set, assembled, mounting hardware packaged, ready to install. When ordering X-Braces, please specify center to center pole spacing and length of bolts.

Unless otherwise specified, 50% of total bolts furnished are 3/4" x 14" and 50% are 3/4" x 16" cut thread machine bolts, when ordered complete (CPT).

Ordering Information

<table>
<thead>
<tr>
<th>1150 - 8 - 6 - C P T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole spacing in feet &amp; inches*</td>
</tr>
<tr>
<td>Complete with mounting bolts, -CPT curved washers &amp; center clamp.</td>
</tr>
<tr>
<td>X-Brace with center clamp only. -CCO</td>
</tr>
<tr>
<td>Provides just X-Brace assembly. No mounting hardware or center clamp.</td>
</tr>
<tr>
<td>*Use 6&quot; increments only.</td>
</tr>
</tbody>
</table>

Ultimate Ratings

The 1150 X-Brace has an ultimate rating of 15,000 lbs. in tension. It is recommended that our engineers assist you in determining proper applications of X-Bracing.
### 1150 X-Brace

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Pole Spacing Center to Center</th>
<th>Pole Approx. Wt. - Lbs. Per Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>1150-5-0</td>
<td>5'-0&quot;</td>
<td>69</td>
</tr>
<tr>
<td>1150-5-6</td>
<td>5'-6&quot;</td>
<td>73</td>
</tr>
<tr>
<td>1150-6-0</td>
<td>6'-0&quot;</td>
<td>77</td>
</tr>
<tr>
<td>1150-6-6</td>
<td>6'-6&quot;</td>
<td>81</td>
</tr>
<tr>
<td>1150-7-0</td>
<td>7'-0&quot;</td>
<td>85</td>
</tr>
<tr>
<td>1150-7-6</td>
<td>7'-6&quot;</td>
<td>89</td>
</tr>
<tr>
<td>1150-8-0</td>
<td>8'-0&quot;</td>
<td>92</td>
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<tr>
<td>1150-8-6</td>
<td>8'-6&quot;</td>
<td>96</td>
</tr>
<tr>
<td>1150-9-0</td>
<td>9'-0&quot;</td>
<td>100</td>
</tr>
<tr>
<td>1150-9-6</td>
<td>9'-6&quot;</td>
<td>104</td>
</tr>
<tr>
<td>1150-10-0</td>
<td>10'-0&quot;</td>
<td>108</td>
</tr>
<tr>
<td>1150-10-6</td>
<td>10'-6&quot;</td>
<td>111</td>
</tr>
<tr>
<td>1150-11-0</td>
<td>11'-0&quot;</td>
<td>115</td>
</tr>
</tbody>
</table>

Specify spacing C to C poles

Install 3/4" thru-bolt with head end to fitting

1150 End Fitting with 3/4" thru-bolt and CW70 curved washer.

2840 Center Clamp

See last page of section for further details.
Hughes Brothers 2094 X-Braces were designed specifically for larger pole spacings such as found in long span, angle, river or railroad crossings. The brace is recommended for pole spacings up to 20'-0".

Hughes No. 2094 X-Braces are made of select Douglas-fir or glue laminated timbers, 3-3/4" x 5-3/4", pressure treated with pentachlorophenol.

All fittings, washer plates, center clamps, curved washers and bolts are hot dip galvanized. Fittings are made from 3/8" material. Pole mounting holes are 15/16".

Hughes Brothers 2094 X-Braces are shipped with end fittings assembled and complete with mounting bolts and center clamp, when ordered complete (CPT).

Unless otherwise specified, 50% of total bolts furnished are 7/8" x 14" and 50% are 7/8" x 16" cut thread machine bolts.

Ordering Information

- 2 0 9 4 - 1 4 - 6 - C P T
  - Pole spacing in feet & inches*
  - Complete with mounting bolts, curved washers & center clamp.
  - X-Brace with center clamp only.
  - Provides just X-Brace assembly. No mounting hardware or center clamp.
  - No Code

*Use 6" increments only.

Ultimate Rating

The 2094 X-Brace has an ultimate rating of 25,000 lbs. in tension. It is recommended that our engineers assist you in determining proper applications of X-Bracing.

B-30

Hughes Brothers, Inc.
P.O. Box 159 / 210 N 13th / Seward, NE 68434 / Phone (402) 643-2991 / Fax (402) 643-2149
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## 2094 X-Brace

### Specification

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Pole Spacing Center to Center</th>
<th>Approx. Wt. - Lbs. Per Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>2094-14-6</td>
<td>14'-6&quot;</td>
<td>298</td>
</tr>
<tr>
<td>2094-15-0</td>
<td>15'-0&quot;</td>
<td>314</td>
</tr>
<tr>
<td>2094-15-6</td>
<td>15'-6&quot;</td>
<td>322</td>
</tr>
<tr>
<td>2094-16-0</td>
<td>16'-0&quot;</td>
<td>322</td>
</tr>
<tr>
<td>2094-16-6</td>
<td>16'-6&quot;</td>
<td>340</td>
</tr>
<tr>
<td>2094-17-0</td>
<td>17'-0&quot;</td>
<td>346</td>
</tr>
<tr>
<td>2094-17-6</td>
<td>17'-6&quot;</td>
<td>357</td>
</tr>
<tr>
<td>2094-18-0</td>
<td>18'-0&quot;</td>
<td>364</td>
</tr>
<tr>
<td>2094-18-6</td>
<td>18'-6&quot;</td>
<td>370</td>
</tr>
<tr>
<td>2094-19-0</td>
<td>19'-0&quot;</td>
<td>381</td>
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<tr>
<td>2094-19-6</td>
<td>19'-6&quot;</td>
<td>389</td>
</tr>
<tr>
<td>2094-20-0</td>
<td>20'-0&quot;</td>
<td>394</td>
</tr>
</tbody>
</table>

- **Wood Section**: 3-3/4" x 5-3/4"
- **Specify Spacing C to C Poles**
- **2840 Center Clamp**
  See last page of section for further details.

---

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2061 & 2061-A X-Braces

Hughes Brothers 2061 X-Braces were designed specifically for pole spacings from 16 feet to 21 feet. A single bolt is used to connect the X-Brace to the pole.

2061 X-Braces are made from select Douglas-fir or glue laminated timbers, 3-5/8"x7-1/2", pressure treated with pentachlorophenol.

The 2061 X-Brace mounts to the pole with 7/8" bolts. The 2061-A X-Brace mounts to the pole with 1" bolts and grid gains.

Hughes 2061 X-Braces are shipped with end fittings assembled and complete with mounting bolts and center clamp, when ordered complete (CPT).

Ultimate Ratings

The 2061 X-Brace has an ultimate rating of 25,000 lbs. in tension. It is recommended that our engineers assist you in determining proper applications of X-Bracing.
Heavy Duty X-Brace, Pin Type Connection

Hughes Brothers Pin Type X-Braces are designed for the demands of EHV H-Frame construction with pole spacings of 18' to 30'. The X-Braces are furnished complete with mounting bolts, tees, pin bolts, center clamps and grid gains when required.

The pin type connection greatly simplifies structure framing operations while providing an excellent pole to brace connection.

**Ordering Information**

- **2093-200-CPT**
  - Pole spacing in feet & inches
  - Complete with mounting hardware
  - X-Brace with center clamp only
  - Provides just X-Brace assembly
  - No mounting hardware or center clamp

*Use 6" increments only.

**Ultimate Ratings**

The Heavy Duty Pin Type Connection X-Braces are rated at **35,000 lbs. ultimate in tension**. It is recommended that our Engineering staff assist you in specifying and applying these Heavy Duty X-Braces. For more detailed information, contact Hughes Brothers Engineering Department.

*30,000 lbs ultimate in tension.
+These X-Braces do not include grid gains.
Heavy Duty X-Braces, Wrap Around Type

Hughes Brothers wrap around type X-Braces provide the maximum strength obtainable from a two-piece X-Brace design. The load transfer between the X-Brace and pole is accomplished exceptionally well because of the unique end fitting design. The braces are normally recommended for use on structures with pole spacings up to 30’ and are available in several wood sections.

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Wood Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>2086</td>
<td>5-1/8” x 7-1/2” Laminate</td>
</tr>
<tr>
<td>2086A</td>
<td>5-1/8” x 6” Laminate</td>
</tr>
<tr>
<td>2087</td>
<td>4-5/8” x 5-5/8” Solid Sawn</td>
</tr>
</tbody>
</table>

**Ordering Information**

- **2 0 8 6- 2 0 - 0 - C P T**
  - Pole spacing in feet & inches*.
  - Complete with mounting hardware. -CPT
  - X-Brace with center clamp only. -CCO
  - Provides just X-Brace assembly. No mounting hardware or center clamp. -No Code

*Use 6” increments only.

**Ultimate Ratings**

The Heavy Duty Wrap Around Type X-Braces are rated at **35,000 lbs. ultimate in tension**. It is recommended that our Engineering staff assist you in specifying and applying these Heavy Duty X-Braces. For more detailed information, contact Hughes Brothers Engineering Department.
Hughes Brothers Type 2122 X-Brace is designed for use on EHV two pole structures. The end fitting configuration will develop the very high loading capabilities required of these braces. The 2122 X-Braces can be furnished complete with mounting bolts, tees, pin bolts, center clamps and grid gains. Pin type connections greatly simplify structure framing operations while providing an excellent pole to brace connection.

Specifications:

- Pole spacing in feet & inches*: Use 6" increments only.

Ordering Information:

- Stock No.: 2122
- Wood Section: 6" x 6-3/4" Laminate

- Code:
  - CPT: Complete with mounting hardware.
  - CCO: X-Brace with center clamp only.
  - No Code: Provides just X-Brace assembly. No mounting hardware or center clamp.

Ultimate Ratings:

The Extra Heavy Duty Pin type X-Braces are rated at 40,000 lbs. ultimate in tension. It is recommended that our Engineering staff assist you in specifying and applying these Heavy Duty X-Braces. For more detailed information, contact Hughes Brothers Engineering Department.
B2508 Tubular Steel X-Brace

The B2508 Steel X-Brace is designed to compliment concrete and steel transmission poles. In certain applications, it can be justified for wood pole construction.

Ordering Information

**B2508 - 15-0 - CPT**

- Pole spacing in feet & inches*.
- Complete with mounting bolts, curved washers & center clamp. -CPT
- X-Brace with center clamp only. -CCO
- Provides just X-Brace assembly. No mounting hardware or center clamp. -No
- Code

*Use 6" increments only.

When using with concrete poles, please specify CC length and pole diameters.

Ultimate Ratings

The B2508 Tubular Steel X-Brace is rated at **25,000 lbs. ultimate in tension**. It is recommended that our Engineering staff assist you in specifying and applying these Heavy Duty X-Braces. For more detailed information, contact the Hughes Brothers Engineering Department.
The B2508-B Steel X-Brace is designed to compliment concrete and steel transmission poles. In certain applications, it can be justified for wood pole construction.

**Ordering Information**

**B 2 5 0 8 - B - 1 8 8 C C**

Center to center length, C-C in inches

To specify, reference B2508-B and the X-brace member length in inches. Contact Hughes Brothers engineering department and reference pole spacing and pole diameter for assistance in determining C-C length.

**Ultimate Ratings**

It is recommended that our Engineering staff assist you in specifying and applying these Heavy Duty X-Braces. For more detailed information, contact the Hughes Brothers Engineering Department.
B Center Clamps

2840 X-Brace Center Clamp

Center Clamps play a very important role in an X-Brace assembly. By clamping the center of an X-Brace, the effective length of the compression member is reduced by half. It is also important that the center clamp is free to move as the structure is loaded, since an H-frame is flexible, not rigid. Hughes Brothers center clamps are the result of years of full scale testing of H-Frames and a thorough understanding of the proper use of X-Bracing.

- N50 1/2" Nut,
- MF50 1/2" Locknut

1-3/4" x 1-3/4"

9/16" Dia.

1/4" x 1-3/4"

Material

End of rod coned 30°

"A"

R3/8"
### 2840 X-Brace Center Clamp

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Type</th>
<th>Wood Section in Inches</th>
<th>Component Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rod</td>
<td>Strap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Part No. &quot;A&quot; (in.)</td>
<td>Part No. &quot;B&quot; (in.)</td>
<td></td>
</tr>
<tr>
<td><strong>2840-A</strong></td>
<td>X-Brace 3-3/8 x 4-3/8</td>
<td>2840.1B 6-7/8</td>
<td>2840.2B 7-1/4</td>
</tr>
<tr>
<td><strong>2840-B</strong></td>
<td>X-Brace 3-3/4 x 4-3/4</td>
<td>2840.1C 7-5/8</td>
<td>2840.2C 7-3/8</td>
</tr>
<tr>
<td><strong>2840-C</strong></td>
<td>X-Brace 3-3/8 x 5-3/8</td>
<td>2840.1B 6-7/8</td>
<td>2840.2E 8-1/2</td>
</tr>
<tr>
<td><strong>2840-D</strong></td>
<td>X-Brace 4 x 5</td>
<td>2840.1D 8-1/8</td>
<td>2840.2D 8-1/8</td>
</tr>
<tr>
<td><strong>2840-E</strong></td>
<td>X-Brace 4-3/4 x 5-3/4</td>
<td>2840.1E 9-5/8</td>
<td>2840.2F 9-1/8</td>
</tr>
<tr>
<td><strong>2840-F</strong></td>
<td>X-Brace 2-3/4 x 3-1/2</td>
<td>2840.1A 6-5/8</td>
<td>2840.2A 6</td>
</tr>
<tr>
<td><strong>2840-G</strong></td>
<td>X-Brace 3-3/4 x 8-3/4</td>
<td>2840.1C 7-5/8</td>
<td>2840.2I 13-1/2</td>
</tr>
<tr>
<td><strong>2840-H</strong></td>
<td>A-Frame 3-3/8 x 4-3/8</td>
<td>2840.1B 6-7/8</td>
<td>2840.2E 8-1/2</td>
</tr>
<tr>
<td><strong>2840-I</strong></td>
<td>A-Frame 3-3/4 x 4-3/4</td>
<td>2840.1C 7-5/8</td>
<td>2840.2F 9-1/8</td>
</tr>
<tr>
<td><strong>2840-J</strong></td>
<td>A-Frame 3-3/8 x 5-3/8</td>
<td>2840.1B 6-7/8</td>
<td>2840.2H 10</td>
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<tr>
<td><strong>2840-K</strong></td>
<td>A-Frame 4 x 5</td>
<td>2840.1D 8-1/8</td>
<td>2840.2G 9-3/4</td>
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<tr>
<td><strong>2840-L</strong></td>
<td>A-Frame 2-3/4 x 3-1/2</td>
<td>2840.1A 5-5/8</td>
<td>2840.2B 7-1/4</td>
</tr>
<tr>
<td><strong>2840-M</strong></td>
<td>X-Brace 2-1/8 x 3-1/8</td>
<td>2840.1F 4-3/8</td>
<td>2840.2J 5-3/4</td>
</tr>
<tr>
<td><strong>2840-N</strong></td>
<td>A-Frame 4 x 6</td>
<td>2840.1D 8-1/8</td>
<td>2840.2K 11-1/4</td>
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<tr>
<td><strong>2840-P</strong></td>
<td>A-Frame 5-1/2 x 7-1/2</td>
<td>2840.1G 11-1/8</td>
<td>2840.2L 14-1/4</td>
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<tr>
<td><strong>2840-Q</strong></td>
<td>X-Brace 4 x 6</td>
<td>2840.1D 8-1/8</td>
<td>2840.2G 9-3/4</td>
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<td>X-Brace 5-1/2 x 7-1/2</td>
<td>2840.1G 11-1/8</td>
<td>2840.2M 12</td>
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<td><strong>2840-T</strong></td>
<td>X-Brace 3-3/4 x 7-1/2</td>
<td>2840.1C 7-5/8</td>
<td>2840.2M 12</td>
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<td><strong>2840-W</strong></td>
<td>X-Brace 3-3/4 x 5-3/4</td>
<td>2840.1C 7-5/8</td>
<td>2840.2G 9-3/4</td>
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<tr>
<td><strong>2840-X</strong></td>
<td>X-Brace 4-3/4 x 6-3/4</td>
<td>2840.1E 9-5/8</td>
<td>2840.2P 10-1/2</td>
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<tr>
<td><strong>2840-Y</strong></td>
<td>X-Brace 5-1/4 x 9</td>
<td>2840.1H 10-5/8</td>
<td>2840.2R 14</td>
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<td><strong>2840-Z</strong></td>
<td>X-Brace 4-1/2 x 9</td>
<td>2840.1J 9-1/8</td>
<td>2840.2R 14</td>
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