### Table 2.7.1

**EHV Line Characteristics**

Tabulation of 345-kV, 500-kV, and 765-kV Parameters* (continued)

<table>
<thead>
<tr>
<th>345 kV =&gt;</th>
<th>Western Area Power Administration</th>
<th>Wisconsin Electric Power Co.</th>
<th>Wisconsin Public Service Corp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line name or no.</td>
<td>Hayden-Ault</td>
<td>Watertown-Sioux City</td>
<td>L2221</td>
</tr>
<tr>
<td>Voltage (nominal), kV; AC or DC</td>
<td>345; AC</td>
<td>345; AC</td>
<td>345; AC</td>
</tr>
<tr>
<td>Length, miles; total miles</td>
<td>141</td>
<td>177.419</td>
<td>12: 28</td>
</tr>
<tr>
<td>Altitude range, ft.</td>
<td>5,000-11,000</td>
<td>1,100-2,000</td>
<td>800-700</td>
</tr>
<tr>
<td>Design load district</td>
<td>NESC Heavy</td>
<td>NESC Heavy</td>
<td>NESC Heavy</td>
</tr>
</tbody>
</table>

#### STRUCTURES

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>Avg. no./mile</th>
<th>Avg. wt./structure, lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>S</td>
<td>3L2</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.6</td>
<td>18,240</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>13,600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18,240</td>
<td>13,600</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>14,000</td>
</tr>
</tbody>
</table>

#### CONDUCTORS

<table>
<thead>
<tr>
<th>Type</th>
<th>Dia., in.; stranding</th>
<th>Weight, lbs/ft.</th>
<th>No. phase; spacing, in.</th>
<th>Avg. span length, ft.</th>
<th>Final sag, ft; @ °F</th>
<th>Tension, 10^3 lb; @ °F</th>
<th>% of Ultimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACSR</td>
<td>1.345; 45/7</td>
<td>1.195; 54/7</td>
<td>2; 18</td>
<td>2; 18</td>
<td>41; 8 to 120</td>
<td>42; 8 to 120</td>
<td>12; 8 to 90</td>
</tr>
<tr>
<td></td>
<td>1.434</td>
<td>1.229</td>
<td>2; 18</td>
<td>2; 18</td>
<td>41; 8 to 120</td>
<td>42; 8 to 120</td>
<td>12; 8 to 90</td>
</tr>
</tbody>
</table>

#### MINIMUM CLEARANCES

<table>
<thead>
<tr>
<th>Amps/phase</th>
<th>Phase to tower, ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3.03</td>
</tr>
<tr>
<td>2</td>
<td>2.03</td>
</tr>
<tr>
<td>2</td>
<td>2.03</td>
</tr>
<tr>
<td>2</td>
<td>2.03</td>
</tr>
</tbody>
</table>

#### SUSPENSION STRINGS

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Insulator size, in.; strength, 10^3 lb.</th>
<th>No. springs/phase</th>
<th>No. units/string</th>
</tr>
</thead>
<tbody>
<tr>
<td>V; I</td>
<td>5% x 10; 40</td>
<td>2; 1</td>
<td>19-21</td>
</tr>
<tr>
<td></td>
<td>5% x 10; 30</td>
<td>2; 1</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>5% x 10; 15</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>V; I</td>
<td>5% x 10; 15</td>
<td>1</td>
<td>18</td>
</tr>
</tbody>
</table>

#### STRAIN STRINGS

<table>
<thead>
<tr>
<th>Insulator size, in.; strength, 10^3 lb.</th>
<th>No. strings/phase</th>
<th>No. units/string</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 x 11; 50</td>
<td>2</td>
<td>19-21</td>
</tr>
<tr>
<td>7 1/4 x 12; 66</td>
<td>2</td>
<td>19</td>
</tr>
</tbody>
</table>

#### LIGHTING PROTECTION

<table>
<thead>
<tr>
<th>Shield wires; material</th>
<th>Diameter, in.</th>
<th>Sag, ft; @ °F</th>
<th>Tension, 10^3 lb; @ °F</th>
<th>Separation at tower, ft</th>
<th>Shield angle, deg. @ tower; @ midspan</th>
<th>Grounding method</th>
<th>Tower footing resistance, ohms</th>
<th>Insulator surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>0.5</td>
<td>34.28; 120</td>
<td>7.0; 90</td>
<td>38</td>
<td>20; 15</td>
<td>None</td>
<td>5-10 (est.)</td>
<td>50</td>
</tr>
</tbody>
</table>

#### CONDUCTOR MOTION SUPPRESSION

<table>
<thead>
<tr>
<th>Damper, type</th>
<th>Damper, no./cond./span</th>
<th>Damper, location, ft</th>
<th>Spacers, type</th>
<th>Spacers, spacing, ft</th>
<th>Spacers-damper, type</th>
<th>Spacers-damper, spacing, ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stockbridge</td>
<td>1</td>
<td>1</td>
<td>2.9</td>
<td>225 max.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>2.67</td>
<td>225 max.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>225 max.</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

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*See notes on page 30.
Figure 2.7.1. Typical lattice-type structures for 345-kV transmission systems.
Figure 2.7.2. Typical lattice- and pole-type structures for 345-kV transmission systems.
Figure 2.7.3. Typical H-frame-type structures for 345-kV transmission systems.
Figure 2.7.4. Typical Y-type structures for 345-kV transmission systems.
Figure 2.7.5. Typical 500-kV lattice-type structures used on present systems.
Figure 2.7.6. Typical 500-kV lattice-, pole-, H-frame-, and guyed Y-type structures used on present systems.
Figure 2.7.7. Typical 735- to 800-kV ac designs and dc structures used on present systems.