Roof-Purlin Spacing for Multicombination Pole-Type Construction

L. W. Bonnicksen
ROOF-PURLIN SPACING FOR MULTICOMBINATION POLE-TYPE CONSTRUCTION

L. W. Bonnicksen*

The information in this paper is an expansion of the information in Station Bulletin 557, "Multicombination Pole-Type Construction." This additional information describes a method of spacing 2 x 6 purlins every two feet measured horizontally.

Features of this method of purlin spacing are:

It is standardized so that -

- it is compatible with many shapes as shown in the next two pages.
- a combination of 7-, 9-, or 11-foot lengths of roof sheets will fit any roof width.

The outside roof purlin can be set vertical. Thus it can -

- be fastened directly to the outer pole.
- provide a base for an eave trough.

The outside roof purlin can have the siding nailed to it, thus -

- eliminating the top wall girt.
- completely covering the outside purlin and end of the rafters.
- giving better overall building bracing by the joining of the sidewall and roof diaphragms.

It can be adapted to other types of roof construction, such as -

- other slopes
- other purlin sizes
- other purlin systems
- other horizontal spacings

Page 4 is a table of the strength of these purlins in terms of allowable total loads, snow loads and wind velocities.

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# Allowable Total Loads, Snowloads and Wind Velocities on Roof Purlins

**Dead Load** = 2.1 \( \frac{lb}{ft^2} \) (28 ga. Steel) (2 X G Purlins)

**Allowable Load** = \( \frac{2.65}{(1.053 \text{ increase factor due to slope})} \) (Clear Span)^2

## Farm Economy (When Failure Will Not Endanger Human Life)

<table>
<thead>
<tr>
<th>Type of Allowable Load</th>
<th>Units (Action of Dead Load)</th>
<th>Duration</th>
<th>Increase Factor</th>
<th>Const. 1500</th>
<th>Std. 1200</th>
<th>Const. 1500</th>
<th>Std. 1200</th>
<th>Const. 1500</th>
<th>Std. 1200</th>
<th>Const. 1500</th>
<th>Std. 1200</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL LOAD</td>
<td>lbs/hoz ft^2 (includes dead load)</td>
<td>10 yr.</td>
<td>0</td>
<td>32.42</td>
<td>25.9</td>
<td>24.52</td>
<td>20.61</td>
<td>33.80</td>
<td>27.04</td>
<td>24.40</td>
<td>21.52</td>
</tr>
</tbody>
</table>

## Snow Load

<table>
<thead>
<tr>
<th>Windward Side of Building</th>
<th>Miles per hour</th>
<th>1-day</th>
<th>1-hr.</th>
<th>5-min.</th>
<th>1-min.</th>
<th>(Dead Load of 2.1 ( \frac{lb}{ft^2} ) has been added)</th>
</tr>
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<td>(Dead Load of 2.1 ( \frac{lb}{ft^2} ) has been added)</td>
</tr>
</tbody>
</table>

## Deflection at Center of Purlin Span

<table>
<thead>
<tr>
<th>Span</th>
<th>Total Load ( \frac{lb}{horiz. ft^2} )</th>
<th>2.1</th>
<th>3</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 X G X 12 FT. PURLINS (11.3 FT Clear)</td>
<td>DEFLECTION</td>
<td>( \frac{0.052}{200} )</td>
<td>( \frac{0.052}{1500} )</td>
<td>( \frac{0.052}{300} )</td>
<td>( \frac{0.052}{350} )</td>
<td>( \frac{0.052}{410} )</td>
<td>( \frac{0.052}{475} )</td>
<td>( \frac{0.052}{540} )</td>
<td>( \frac{0.052}{615} )</td>
<td>( \frac{0.052}{700} )</td>
<td>( \frac{0.025}{885} )</td>
</tr>
</tbody>
</table>

**Deflection** = \( \frac{W \text{(Purlin Spacing)}(L)^{4}}{E \text{(Slope Increase Factor)}} \) = \( \frac{(20)(1.053)(1726.1^{3})(1.053)}{(584)(1.75)(10,000)(1.053)(24.1 in^{2})(1.053)} \)