Moisture Content of Dimension Lumber in Supply Yard

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Lafayette, Indiana
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LUMBER IN SUPPLY YARDS

by

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INTRODUCTION

Dimension lumber has long been the most practical and widely accepted building material for residential and other types of light framing. Continued extensive use of dimension lumber for framing will depend upon its ability to compete with new products of metal, precast concrete, ceramics, and other materials. Custom alone is not sufficient to assure a continuing market for wood framing.

Some of the most serious problems associated with the use of dimension lumber framing have been a direct result of high moisture content. Excessive shrinkage of wood framing material, due to "in service" drying, can result in many structural defects -- cracked plaster, uneven floors, nail pops in drywall construction, sticking doors, structural weaknesses, and other defects which result in an unsatisfactory finished building. The U. S. Forest Products Laboratory has stated: (3) "If the moisture content of the framing lumber at the time the wall and ceiling finish is applied is not more than about five percent above that which it will reach in service, there will be little or no evidence of defects caused by shrinkage of the frame." It has been fairly well established that in the area included in this survey, the "in service" moisture content of framing material will vary from 5 to 12 percent (3, 4, 7). Thus, moisture contents of 17 percent and higher at the time of finishing can most certainly create potential trouble. From this information, it is obvious that good framing practice requires lumber that has been dried to, at most, 17 percent moisture content at time of finishing. The question is -- can the builder buy lumber this dry?

In the fall of 1956, a pilot study of the moisture content of two-inch dimension lumber, currently available in lumber yards in a limited area, was conducted in cooperation with the Small Homes Council, University of Illinois. This survey included 29 lumberyards in Indiana, Illinois and Kentucky, figure 1. Of the 511 boards sampled, approximately three-fourths were 2" x 4" and 2" x 6" material. The other quarter was approximately equally distributed among 2" x 3", 2" x 10", and 2" x 12" material. Although the scope of the survey was limited, it was considered to be of sufficient size to yield definite general information concerning the moisture content of currently marketed two-inch dimension material.

Method of Collecting the Data

The data were gathered over a four month period during the fall and early winter of 1956. In addition to average moisture content, the following items of data were recorded for each board.

1. Lumberyard location.
2. Size of the material.
3. Species of wood.
4. Whether under cover or exposed to the weather.
5. Length of time in stock.
6. Whether or not grade marked.

* Numbers in parentheses refer to the bibliography
Average moisture content was determined with an electric moisture meter, figure 2. This meter is accurate to approximately 1% moisture content when corrections for various species and wood temperatures are made. (2) Fresh dimension lumber is usually undergoing a continuing drying process, which means that the boards contain a relatively higher percentage of moisture in their centers. Moisture content, as treated herein, is an average obtained at one-fifth the depth of the two inch dimension. (2) All readings were taken as near to mid-length of the boards as practicable in order to avoid the localized and misleading effects of rapid drying at the ends.

In view of the fact that this was a pilot survey, lumber yards were sampled as the opportunity arose to do so. A more rigorous study would require a sampling plan.

Results of the Survey

For convenience of manipulation and analysis, all data taken in the survey were transferred to punch cards. This made it possible to conduct most of the data processing on automatic machines. Three moisture content groupings consisting of low, medium, and high moisture content values were selected arbitrarily. They are as follows:

- **Low**: All meter readings from 7 percent to and including 11 percent moisture content.
- **Medium**: All meter readings from 12 percent to and including 16 percent moisture content.
- **High**: All meter readings from 17 percent to and including 28 percent moisture content and over.

Table 1 is a compilation of all data grouped into these selected moisture content classes. It is interesting to note that while only 7 percent of the total number of boards tested fell into the low (7 - 11 percent) moisture content group, nearly half of the total number had an average moisture content of 17 percent or greater. As previously mentioned, framing lumber with an average moisture content this high is potentially a source of trouble due to excessive shrinkage in reaching its "in service" moisture content.

The data were grouped also according to the size of the material tested, e.g., 2" x 4", 2" x 6", etc. The distribution, average moisture contents, and ranges of moisture content are given in Table 2. The grand average of the moisture contents of all boards was calculated to be 16.9 percent. This value is not considered excessive, but the range of values indicates that much of the framing lumber was at a dangerously high moisture level.

*Readings below 7 percent and above 28 percent moisture content cannot be taken on the instrument used.*
Figure 1. Map showing locations of lumberyards included in the survey. North-South division, as indicated by the dotted line, was arbitrarily selected.

Numbers in circles refer to number of lumberyards sampled in each location.

Figure 2. The Electrical Resistance Moisture Meter used in the survey. The probe at left is shown driven into the wood while the moisture content appears on the dial at right.
Table 1. The Distribution of 2 inch Dimension Lumber Within Arbitrarily Selected Moisture Content Classes.

<table>
<thead>
<tr>
<th>Location of Lumberyards</th>
<th>Number of Boards in Moisture Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low 1% - 11%</td>
<td>Medium 12% - 16%</td>
</tr>
<tr>
<td>North, Ind. &amp; Ill.</td>
<td>16</td>
<td>124</td>
</tr>
<tr>
<td>South, Ind. &amp; Ill.</td>
<td>20</td>
<td>106</td>
</tr>
<tr>
<td>&amp; North, Ky.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>230</td>
</tr>
<tr>
<td>Percentage of Total</td>
<td>7%</td>
<td>45%</td>
</tr>
</tbody>
</table>

Table 2. The Distribution of 2 inch Dimension Lumber by Size Showing Average Moisture Content and Ranges.

<table>
<thead>
<tr>
<th>Size of Lumber</th>
<th>Number in the Size</th>
<th>Average Moisture Content in Percent*</th>
<th>Range of the Readings Taken in Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 3/4 x 4 3/4</td>
<td>224</td>
<td>16.7</td>
<td>7 - 26</td>
</tr>
<tr>
<td>2 1/2 x 6 1/2</td>
<td>129</td>
<td>16.4</td>
<td>10 - 25</td>
</tr>
<tr>
<td>2 1/4 x 8 1/4</td>
<td>46</td>
<td>17.4</td>
<td>11 - 24</td>
</tr>
<tr>
<td>2 1/4 x 10 1/4</td>
<td>58</td>
<td>18.0</td>
<td>10 - 26</td>
</tr>
<tr>
<td>2 1/4 x 12 1/4</td>
<td>34</td>
<td>17.9</td>
<td>14 - 22</td>
</tr>
</tbody>
</table>

Total 511

*Although all moisture content readings were taken to the nearest 1%, averages are reported to the nearest 0.1%.

Species of material tested were later classified only as to origin, western woods or southern woods. Over 97 percent of the lumber was manufactured from western species, while less than three percent was from southern species. The data also show that 60 percent of all the material was grade-marked, and the remaining 40 percent showed no visible signs of grade-marking.

"Length of time in stock" data were available on only 283 of the 511 boards tested. Table 3 contains the average lengths of time in stock for each size. The grand average time in stock figure of 12 weeks has been weighted on the basis of the numbers of boards in each size going into the calculation of the average.
Table 3. Average length of time in lumberyard storage for each size

<table>
<thead>
<tr>
<th>Size of Lumber</th>
<th>Number of Pieces</th>
<th>Average number of weeks in Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2\textsuperscript{ii} x 4\textsuperscript{ii}</td>
<td>142</td>
<td>11</td>
</tr>
<tr>
<td>2\textsuperscript{ii} x 6\textsuperscript{ii}</td>
<td>76</td>
<td>10</td>
</tr>
<tr>
<td>2\textsuperscript{ii} x 8\textsuperscript{ii}</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>2\textsuperscript{ii} x 10\textsuperscript{ii}</td>
<td>31</td>
<td>18</td>
</tr>
<tr>
<td>2\textsuperscript{ii} x 12\textsuperscript{ii}</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>283</td>
<td></td>
</tr>
</tbody>
</table>

Of the 511 boards tested, 429 were under adequate cover while 82 were exposed to the weather in varying degrees. It is significant to note that the average moisture content of the unexposed lumber was 16.4 percent, while that of the exposed lumber was 19.5 percent -- over three percent higher than the unexposed material.

Recommendations

Because sample sizes and the geographical scope of the survey were restricted, firm and final conclusions cannot be drawn. The work has, however, exposed serious proportions of higher moisture content material that are likely to be found in many areas of the country.

The customer buys dimension lumber under the assumption that it is of adequate quality for the job. This includes lumber’s fourth dimension, moisture content. Often this good faith is not justified -- material is delivered that is sub-standard for a quality framing job. In the long run, it seems possible that other materials could replace wood in framing, if for no other reason that they would do away with the problems of excessive shrinkage. The lumber industry should face up to the situation immediately in order to insure future markets for what is now the favorite framing material.

Lumber dealers and builders should maintain surveillance over moisture content through the use of relatively inexpensive moisture measuring devices that are readily available and simple to use. Only one bad job need be avoided by moisture checking to justify the investment cost of such an instrument.

Lumber dealers and builders should provide adequate shelter for framing material. The survey, although limited in scope, showed that protection from the weather makes a marked difference in the moisture content of stored lumber.
Bibliography


