

## MOISTURE CONTENT REQUIREMENTS OF THE NEW AMERICAN LUMBER STANDARDS

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You are well aware of the controversies within the lumber industry, during the past several years relating to size standards and strength values for lumber.

This discussion will give you a more complete understanding of those problems and the status of their solutions.

### HISTORY OF THE AMERICAN LUMBER STANDARDS

The American lumber standards were originally established in the early 1920's. They were administered by the central committee on lumber standards from that time until 1941 when as the result of an antitrust action brought by the United States, the National Lumber Manufacturers Association entered into a consent decree directing the Association, among other things, to seek certain modifications in the ALS program, including establishment of an independent administrative body. Because of World War II, however, revisions of the standards and their administration was deferred until the late 1940's.

In 1953, the American Lumber Standards Committee, hereafter called committee, and a board of review were established and approved by the court as impartial agencies qualified to administer the American Lumber Standards program and pass upon the adequacy of grading rules and the competence and reliability of grading and inspection agencies. At the same time, the American Lumber Standards for softwood lumber were substantially revised and simplified practices recommendation 16-53 was promulgated by the Department of Commerce.

At the time SPR 16-53 was issued, the effect of lumber shrinkage upon standardization was recognized and attempts were made to establish sizes related to moisture content. Sharp disagreement developed within the industry on the matter, however, and a general consensus could not be achieved. The committee believed that establishment of a lumber size standard agreeable to all elements of the industry was of paramount public importance. Accordingly, spr 16-53 was promulgated with reference to moisture content which permitted application of the standard size to both green and dry lumber and which, ever since, has caused confusion in the specification and use of lumber.

Beginning in 1957, continuing efforts were directed at solving the size problem. Finally, in November 1962, after thorough consideration of the opinions expressed by diversified sectors of the industry, the committee adopted the principle that the sizes of American standard lumber should be related to moisture content; and since then, the committee has labored to accomplish an acceptable revision implementing this principle.

The committee's efforts have been fraught with controversy. Twice it has recommended revisions which the Department of Commerce distributed to industry members for acceptance, but on both occasions, despite clear majority support for the proposals, opposition from an industry minority led the department to conclude that they were not supported by a consensus.

In 1967, a three-man panel, appointed by the Secretary of Commerce, published a report which concluded that SPR 16-53 was technically inadequate and not in the public interest. For example: referring to a U. S. Forest Products Laboratory publication which has been out of print since 1948, design values for structural lumber grades were completely obsolete. It, also, advised the Secretary to submit legislation to Congress for a mandatory lumber standard. He rejected this advice and announced that he would publish his own recommended lumber standards. After considerable controversy, the Secretary abandoned the idea of a recommended standard and called upon responsible leaders in the lumber industry to develop a truly national lumber standard under the Department's voluntary products standards program and offered the assistance of the Department in any appropriate manner.

In response to the Secretary's charge, representatives of the three rules-writing agencies, WWPA, WCLIB and SPIB, began a series of meetings aimed at developing a proposal for revising the standard which they all could support and which they could jointly present to the committee.

In October, 1968, representatives of the three agencies submitted a joint proposal to the committee. This proposal, with certain modifications, was adopted by the committee and recommended to the Department of Commerce with the endorsement of 20 of the 22 members. Simplified practices recommendation 16-53 has, therefore, been revised. The revised standard is denominated as voluntary product standard 20-70 (VPS 20-70).

#### NATIONAL GRADING RULES

The proposal for a single national grading rule for all dimension size softwood lumber, regardless of species, is perhaps the most revolutionary of the committee's recommendations. Historically, also regional agencies have jealously guarded their individual rules-writing prerogatives, and prior proposals for national grading rules were firmly resisted. The primary reason for a change of position was the realization that a truly standardized product, regardless of species or region of origin with uniform nomenclature and product description, would benefit both the industry and the consumer.

#### RELATING SIZE TO MOISTURE CONTENT

After lumber is cut from logs, its moisture content is out of balance with the relative humidity of the surrounding atmosphere. Natural evaporation takes place until a moisture content balance is established with the new conditions. Until the free water in the cell cavities has evaporated, there is no appreciable effect on its size; thereafter, however, water begins to leave the cell walls and shrinkage occurs. This point is generally reached at a moisture content of about 30 percent and is called the fiber saturation point.

Although shrinkage occurs from the fiber saturation point all the way down to 0% moisture content, the proposed revision established 19% maximum moisture content as the basis for size standards and for the definition of dry lumber. The reasons for doing so are as follows: First, 19% moisture content can generally be attained by open air drying without the necessity of kiln drying; second, 19% is a standard for dry lumber currently accepted by FHA and numerous building codes; third, 19% has been adopted as a standard for dry lumber in the grading rules applicable in many parts of the country; and fourth, development of stain fungi is arrested at about 20% moisture content. Moreover, both the Battelle report and the Mahaffey report for the National Bureau of Standards, prepared in connection with the revision proposed in 1964, found this to be an acceptable basis for differentiation between green and dry lumber.

The commercial relevance of this aspect of the recommended revision arises by virtue of its use as a reference point for the establishment of different size standards for green and dry lumber.

#### ESTABLISHMENT OF NEW STANDARD SIZES

Under the old standard, SPR16-53, both green and dry lumber are dressed to the same standard size at the mill. Since green lumber shrinks as it dries, however, it is generally smaller than standard size by the time it reaches its point of use. One of the principal objectives of the committee's efforts was to establish separate size standards for green and dry lumber which make allowance for shrinkage and, thereby, minimize disparities between green and dry lumber sizes at the point of use. While the objective of relating size to moisture content was accepted in general terms by nearly all lumbermen, there was great difficulty in finding an acceptable formula to implement it.

Three fundamental considerations were simultaneously reconciled in the size proposal recommended by the committee: equivalency, modularity and efficiency.

**EQUIVALENCY:** The primary consideration was to come up with a related size for green and dry lumber -- i. e. sizes that compensate for the shrinkage that occurs after green lumber is dressed and which provide equivalent strength and stiffness values under identical end-use conditions.

Representatives of the Forest Products Laboratory recommended that the choice of equivalent sizes be based on average shrinkage values at 15% average moisture content, resulting in shrinkage factors of 2.35% in thickness and 2.80% in width, and recommended that the resulting green sizes be within about 1% of the exact equivalence. None of the new green 2 inch and thinner sizes, when shrunk down to its size at 19% maximum moisture content (15% average) are more than 1.2% narrower than their surfaced dry counterparts. Further, the shrunken green thickness of the new 2 inch sizes exceeds the surfaced dry thickness by 1.7% so that in all widths of 2 inch dimension, the volume of wood fiber in the shrunken green sizes slightly exceeds that of their surfaced dry counterparts. In the case of 3 and 4 inch thickness, the proximity of the new VPS 20-70 sizes to exact technical equivalence is even closer. Consequently, while some slight deviations from the 1% recommended limitation were necessary to achieve practical sizes for lumber manufacture and use, they represent an acceptable compromise to secure a workable standard.

**MODULARITY:** One of the continuing difficulties faced throughout the entire revision process was the vital interest of producers in obtaining modular sizes i. e., sizes that can be ripped and resawn into smaller standard sizes without substantial waste. The new VPS 20-70 sizes meet this objective on every count and are compatible for use both in timber sizes and in dimension sizes. For example, a normal 2 x 12 piece, green or dry, can be ripped into two 2 x 6's or three 2 x 4's; 12 x 12 timbers can be manufactured into six 2 x 12's, three 4 x 12's or two 6 x 12's, and so on.

**EFFICIENCY:** The smaller sizes are more efficient than the old sizes. The result is a fuller utilization of existing softwood resources which is manifestly in the public interest. In addition, the smaller dimensions, when reflected in reduced volume and weight for shipment, can be expected to depress transportation costs significantly.

#### APPLICATION OF MOISTURE CONTENT REQUIREMENTS

Paragraph 5.6.1 of the new lumber standard sets forth the manner in which moisture content determination is made and provides a number of advantages from the consumer's standpoint.

First, it requires that grading rules provisions express moisture content limitations in terms of a maximum rather than an average moisture content.

Second, it provides that the moisture content provision shall apply to any point of each piece.

Third, the paragraph provides that moisture content restrictions shall apply at the time of dressing, time of shipment, and at the time of any reinspection for moisture content, as provided for in the applicable grading rules,

thereby, insuring a uniform standard for enforcement of moisture content specification.

Fourth, the paragraph recognizes electric moisture meters as the most practical means of determining moisture content. It limits the types of meters which are acceptable, and the manner in which they are to be used, by reference to the appropriate provisions of an established standard, ASTM D 2016-65.

SUMMARY: The fundamental concern over a period of nearly six years was to develop acceptable green-dry sizes related to moisture content. The new sizes accomplish precisely this objective. Implementation of these sizes will enable lumber producers to supply a more uniform product and will, thereby, enhance the industry's ability to compete successfully with competitive building products which are encroaching on its traditional markets.

There is a big revolution in building and its use of non-wood products. Lumbermen can no longer comfortably say let the producers of other products battle for markets; lumber is immune because it is so easy to work with and so easy to buy. Not any more. Lumber is still workable and available, but our competitors are helping the customer forget it - with new products and promotions of every kind.

We can no longer afford to scoff at competitive products. They are winning some of our key markets. In the past, their impact subsided as lumber prices declined. But no more. Builders continue to talk about steel and plastic studs, steel doors and floor systems, plastic siding, prestressed concrete joists, slab floors and other substitutes which are poised to permanently replace wood. And they are using them - more all the time.