# THE IMPACT OF CURRENT AND FUTURE METRICATION TRENDS UPON CONSTRUCTION USES OF FOREST PRODUCTS[1]

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The National Forest Products Association has made a preliminary assessment of the impact of metrication trends upon current and future forest products markets and uses in the construction field. In implementation of Public Law 90-472 by the Department of Commerce, it seems likely that only through the contemplated study of all factors relating to the trend toward the metric system can its current and future impact upon American industry be properly evaluated. Absence of such a study would suggest that an attempt was being made to thrust the S.I. System upon an inadequately informed industry.

The National Forest Products Association is a federation of 23 lumber and wood products associations. The members of these organizations produce the full range of softwood and hardwood products that are widely used throughout the construction industry. While this conference deals specifically with construction applications, conversion to the metric system will also have to be considered by our industry for its impact upon the myriad other wood uses.

As a basis for these observations, all wood products associations were notified of the Department of Commerce study, and individual views from member associations and wood products manufacturers were solicited. Detailed data on a subject as complex as metrication from an industry having such a wide range of products and interests, are difficult to assemble in a limited time. However, the general commentary obtained should facilitate the type of detailed analysis envisioned in Public Law 90-472. Inquiries to the various segments of the wood products industry have also stimulated establishment of study groups that should prove valuable sources of more specific information.

The attitudes encountered most frequently in the wood products industry on metrication seem to be: (1) that the trend is unavoidable; (2) that its benefits to most segments of the industry have not been fully explained or understood; and (3) that the total cost over the period of conversion may be difficult to justify in terms of direct benefits.

Significantly, however, the consensus suggests a willingness to evaluate all implications of metric conversion in order to accomplish the least disruptive change when such a change is deemed to be warranted. No comments received have advocated direct opposition to metrication efforts.

As a matter of interest, some in the wood products industry have suggested that wood products manufacturing equipment may be more generally adaptable to conversion than manufacturing equipment in use in other industries. This is considered to be true, particularly if metrication were to be a simple conversion of current standard product sizes, rounded to the nearest metric unit.

Wood industry attitudes toward metrication are generally more favorable where a significant portion of the species or wood product is presently exported to other nations already operating under the metric system. With basic framing lumber and wood products used in construction, present and future housing needs within the con-

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tinental United States will continue to assure that the major volume of such products will be domestically consumed. Therefore, the influence of foreign market requirements for metric sizes upon this substantial volume might be expected to be minimal. However, some forest products manufacturers in the United States are looking beyond continental boundaries toward foreign housing markets and foreign sources of timber supply. Thus even in this category, presently dominated by internal demand, a future metric system influence might be expected in raw material measurement, product sizes, and industrialized building dimensioning.

For specialty wood species and products, such as redwood and decorative plywood, a significant foreign market currently exists. These segments of the industry generally tend to favor the trend toward metrication. In addition to the opportunity for international uniformity it provides, they believe that conversion to metric units will permit elimination of the present nominal system of lumber size reference which has been confusing the consumer.

### PRESENT IMPACT OF INCREASING WORLDWIDE METRICATION TRENDS

There is little evidence, other than stimulation of industry interest, that the increasing worldwide trend toward metrication is exerting a measurable effect upon the marketing and use of wood products for construction purposes within the United States. Of the 37-plus billion board feet of hardwood and softwood lumber annually produced in the United States, only 3%, or 1.6 billion board feet, was exported in 1968. And of this export volume, 25% was shipped to Canada, a nation that is still on the inch-pound system. Therefore, the influence of foreign demand for lumber produced to metric units is presently not significant.

The United Kingdom conversion to the metric system is undoubtedly exerting a strong influence upon Canadian attitudes. In a white paper on metric conversion published in January of this year, the Canadian government concluded that the eventual adoption of the metric system should be an objective of Canadian policy. This conclusion notwithstanding, the Canadian Minister of Industry, Trade, and Commerce also stated that no legislative action is contemplated that would make mandatory a general use of metric in place of inch-pound units. The statement also contained the view of certain sectors of Canadian industry that an attempt toward metric conversion should not be made independently of the United States.

In the specific area of forest products, Canadian lumber manufacturers, through the Canadian Wood Council, are members of the National Forest Products Association, and Canadian lumber is considered an essential factor in our nation's building materials inventory. Thus, the effect of the change to the metric system underway in the United Kingdom, as presently being experienced by Canada, may, to a lesser but still significant extent, be expected to be transmitted to the United States through the influence of Canadian lumber imports.

Recommendations of the Federal Trade Commission and the National Bureau of Standards that the traditional nominal size classification for lumber in the United States be discarded have stimulated some to view the metrication trend as an opportunity to overcome the nominal size system. Nominal lumber sizes such as $1 \times 6$, $2 \times 4$, $2 \times 8$, etc., have long been used by manufacturers and consumers and it is generally recognized that actual dimensions of surfaced lumber are less than the nominal reference system implies. With increasing attention being given to elimination of consumer confusion, however, the nominal or board foot system has received a fair degree of criticism. For this reason, mill invoices under the new softwood lumber standard PS 20–70 will include the actual surfaced sizes of the lumber being shipped. A change to metric units would eliminate the fractional surfaced sizes.

### IMPACT IF METRICATION PROCEEDS WITH MINIMAL COORDINATION

The primary market for building materials and related services is within the

continental United States. It is likely, therefore, that the construction industry would be affected to a lesser degree than other industries if the metric trend were to continue on an evolutionary basis. Designers, builders, and building materials manufacturers are increasingly cost-conscious, however. They will observe and assess carefully the benefits proposed as the basis for metric conversion. The extent to which such benefits can be translated into simplification of the building process and demonstrable construction economies will be a major factor in determining the pace of metrication and the degree to which coordination of the effort will be encouraged and supported.

Some architectural and engineering design firms operate internationally. Certain building materials are similarly distributed. These segments would be handicapped to a greater extent than the remainder of the construction industry if metrication were to proceed on an evolutionary basis.

It is probably unrealistic to suggest that the construction and building materials industries would permit a trend toward metrication, evolutionary or stimulated, to proceed without coordination. While there are critics of the procedure, a substantial degree of voluntary modular coordination has developed within the building industry. Likewise, the impetus for coordination of metric conversion efforts can be expected to arise from the construction industry, as benefits become apparent.

## EFFECTS OF A COORDINATED PROGRAM

Coordination of metric conversion activities within the construction industry is essential, as it is in all other fields. Beginning with the standards and regulatory agencies, such coordination should also involve architectural planning, modular coordination and engineering design, as well as product development and use.

Where the coordination effort includes responsibility for promotion and acceleration of the metrication trend, particularly in advance of an adequate education program demonstrating direct and indirect benefits, opposition can be expected; and such promotional efforts may stimulate resentment rather than engender support.

Should a coordinated program to increase the use of the metric system by the wood products industries be undertaken, additional information in the following areas would appear to be essential.

1. *Unit conversion or size adjustment.* Whether metrication in the wood products industry should be one of simple adaptation of standard sizes to the nearest metric equivalent or whether product size changes (conversion) should be made to capitalize upon the simplicity of the metric system is highly significant. Adaptation, for example, to the nearest even unit, would be the least complicated. It would involve a minimum of machine adjustment and require minor education of mill personnel. This procedure, particularly in the case of lumber, would require that a similar direct adaptation be made by regulatory, design, and construction services in spacing of members and assignment of design criteria.

Should change to the metric system be accompanied by a substantive modification of actual product sizes (conversion), then the added delays of commodity and product standards development can be anticipated. For example, the newly approved size standard for softwood lumber, which involved a rather minor adjustment in dimensions, required more than ten years to develop and implement.

2. *Metric uniformity.* If metric conversion is to be a simple transposition from English to metric units, the international uniformity benefits attributed to the metric system may not be readily apparent. Domestic and foreign lumber dimensions presently do not coincide, irrespective of the units of measure. It can be argued, however, that adoption of the metric system can be the first step toward securing international lumber size uniformity.

3. *Estimating log yield.* The current method of determining log yield for its various product possibilities is through application of experience factors to a standard unit of tally called the board foot. This is an arbitrary unit 1″ × 12″ × 12″ or 1/12 cubic foot. Considerable experience is re-

quired to be able to determine the value of a log on the basis of its product yield related to its volumetric content in board feet. While similar experience would be required for the metric system, the units of volume are limited to the cubic centimeter, the cubic decimeter, and the cubic meter. Although the cubic decimeter approaches the size of the American board foot (being approximately equal to three board feet), the standard metric measure of log volume is the cubic meter. This unit equals 424 board feet or 35.3 cubic feet. It seems likely that a major program of indoctrination and experience will be required before buyers and sellers of logs can achieve their present skills in determining log product yield in the absence of a ready metric approximation of the board foot or cubic foot.

4. *Initiation of conversion program.* Engineering design, construction, and product manufacture in the construction industry involve independent disciplines. Thus for the wood products industry to consider conversion of its product to metric sizes will also require the modular planning of the architect and the engineering calculations of the designer to be based on metric units. These disciplines, in turn, will probably be confronted with problems similar to those described in the previous discussion of the board foot. For the architect or builder, the standard 16-inch spacing of wood members becomes 40.6 centimeters and the engineer's pound-per-square-inch becomes 0.0703 kilograms per square centimeter, in each case requiring conceptual adjustments on the part of the user.

Preceding utilization of metric units by the architect, engineer, and building contractor, the specifications and standards for use of building products will require conversion, and building codes must be revised to reflect such changes. In this category, perhaps the most extensive educational program required will be the indoctrination of the building official, who presently must be conversant with quantitative factors applicable to a broad range of building products. Substitution of a completely new schedule of units, standards, design criteria, and engineering data at this level may suggest the major area of education need in any metric conversion effort.

5. *Effect upon land measurements.* Metric conversion will affect land surveying in several ways. Principal areas of concern are field, block and lot, metes and bounds, and U.S. public land surveys. Areas described by the first three types of land survey are usually irregular in shape and generally not limited to specific or preconceived sizes. Therefore these can be fairly easily converted from a ½ acre lot to an approximate ⅕ hectare lot.

The public land survey is of primary importance for land location and legal description, as well as measurement. To replace it as a land location tool would take a complete resurvey of all Western lands. Since lands have been conveyed, subdivided, and developed with reference to the public land survey, these recorded legal descriptions should continue to be used. Permissive tolerances of numeric approximations will have to be developed for future conveyances.

Lands described and pursuant to the U.S. public land survey present both linear and area conversion difficulties. A standard section (a 1-mile-square unit) becomes a 2.59-square-kilometer unit. The 6 by 6 township would be approximately 83.24 square kilometers instead of the 36-square-mile township. Corners are presently separated in ¼-mile units. In the metric system, corners would be 402.336 meters apart.

Although the area of an acre is an awkward 43,560 square feet, a chain measuring unit (66 feet) permits quick decimal conversion. Since 10 square chains equal 1 acre, the product of multiplying the length times the width converts directly to acres and fractions thereof. A section theoretically contains 640 acres and by a subsectionalizing process can be conveniently reduced to a 2.5-acre unit. Since a hectare equals about 2.47 acres, there is close correlation for the individual unit. The error would progress, however, as the unit size approached 640 acres = 259 hectares.

Linear measurement becomes equally dif-

ficult to calculate. A 1-mile section line equals 80 chains, which is readily divided into equal segments for corner location. In the metric system, this line would be about 1609.3 meters. Either 1,000 or 2,000 meters would permit convenient and quick subdivision. Such a change, however, would mean a complete resurvey of the lands in order to gain the advantage of the metric system.

In summary, reaction to metric conversion in the wood products industry at this point is mixed, ranging from enthusiasm, through cautious optimism, to concern for cost and disruption of production and marketing practices. It is generally believed that simple conversion of present English units to the metric system at the product level can be accomplished with minimal adjustment of equipment and training of production personnel. Volumetric determinations of log yield and conversion of land measurements to the metric system, however, are thought to be significant constraints where a dual system may be required for some time.