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FOREST SERVICE
U.S.DEPARTMENT OF AGRICULTURE
P.O. BOX 245, BERKELEY, CALIFORNIA 94701

LUMBER AND PLYWOOD used in California APARTMENT CONSTRUCTION, 1969

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USDA Forest Service
Research Note PSW-279
1973

Abstract: The volume of lumber and plywood products used in apartment construction in California was estimated from a sample of apartments for which architectural plans were completed in 1969. Excluding wood mouldings, doors, cabinets, and shelving, an average of 4.85 board feet of lumber and 2.03 square feet (3/8-inch basis) of plywood per square foot of floor area were used in the 17 structures studied. The ability of wood to meet fire and seismic standards at the least cost was the factor cited most often for its use. The outlook for wood in future apartment construction will probably depend heavily on the availability and cost of wood products treated by fire retardants.

Oxford: 721.1:833.1:832.282.
Retrieval Terms: apartment construction; California; wood utilization; plywood; structural lumber.

How much wood is used in apartment construction in California? How much wood is consumed in the structure or frame? How much in nonstructural components, such as mouldings, doors, cabinets, and shelvings? What factors help determine the choice of wood over other building materials? What factors are likely to affect the use of wood products in apartment construction in the future?

Answers to such questions would be of interest to the wood products industry, builders, developers, architects, and forest economists. The U.S. Forest Service has been studying the volume of wood in apartment construction as part of a comprehensive analysis of the timber supply and demand in the United States. Wright and Reid[1] have reported one phase of the study—the volume of wood consumed, by region, in wood-framed apartments and those made from other types of material. An apartment structure was defined as a building having three or more housekeeping units.

Regardless of the type of material used in the structure, wood products such as mouldings, doors, cabinets, and shelving are usually found in all apartment buildings. Wood siding and other types of wood products may likewise be used quite extensively, but the total volume of wood products found in apartment construction can vary considerably because of the different materials that may be used in the structural system.

This note summarizes information about the volume of wood used in apartment construction in California, factors that affect the choice of wood, and prospects for increased use of wood in the future.

METHODS

The information is based on a sample of 19 apartment structures for which plans were completed in 1969. The 19 buildings were part of a larger sample included in a national survey reported by Wright and Reid.[1]

Of the 19 buildings, 17 were wood-framed apartment buildings. The data on wood consumption for this note were derived from wood materials specified in the blueprints of the 17 wood-framed structures. Of the 17 structures, seven were in northern California—north of Fresno, and 10 were in southern California—south of Santa Barbara.

In interviews, I asked the architects of the 17 apartment buildings to identify the major reasons why they had selected the basic structural system used in their design, and to identify the major factors that influenced their choice of the materials and the products that they had specified. Additionally, each architect was asked about the prospective outlook for use of wood material in apartment construction.

WOOD MATERIALS USED IN CONSTRUCTION

Eight times as much lumber and three times as much plywood are used in wood structured apartment buildings as are used in other types. For example, the volume of lumber used nationally in wood structured apartments, averaged 5.56 board feet of lumber per square foot of floor area; the volume for other types of apartments averaged 0.70 board feet. The volume of plywood in the wood structured apartment buildings averaged 2.54 square feet (3/8 inch), as compared to 0.72 square feet (3/8 inch) for other types of apartments.[1] These figures include the quantities of wood materials used for cabinets, doors, shelving, and other millwork items as well as wood materials for such temporary needs as concrete forming and scaffolding.

Table 1—*Estimated volume of wood products in wood framed apartment structures, California, 1969*[1]

Region and wood products[2]	Volume used per . . .		
	Sq. ft. of floor area	Apt. unit	$1,000 of costs
Northern California (7):			
Lumber . . . . . bd. ft.	5.4	5,966	453
Plywood . . . . . sq. ft.[3]	2.4	2,702	205
Southern California (10):			
Lumber . . . . . bd. ft.	4.6	4,377	375
Plywood . . . . . sq. ft.[3]	1.8	1,734	149
California (17):			
Lumber . . . . . bd. ft.	4.9	4,899	403
Plywood . . . . . sq. ft.[3]	2.0	2,052	169

[1]Excluding wood mouldings, doors, cabinets, or shelving.

[2]Number of apartment structures in sample are shown in parentheses.

[3]3/8-inch basis.

Fourteen of the 17 wood structures were of two- and three-story design. Typically, floor foundations were made from concrete for economy reasons, or for compliance with California fire-codes stipulating that a non-combustible material be used to provide a fireproof barrier between garage spaces and overhead housekeeping units. Excluding such finished products as doors, cabinets, and shelving, and materials used for temporary purposes during construction, the 17 wood structures in this study averaged 4.85 board feet of lumber per square foot of floor area, or 4,889 board feet per unit. The volume of plywood specified to be used in construction averaged 2.03 square feet (3/8 inch) per square foot of floor area, or 2,052 square feet per unit *(table 1)*.

A comparison of the northern and southern California samples suggests some variation between these two sub-regions in the volumes of wood materials used in apartment construction. Differences were most noticeable in the average volumes of lumber and plywood specified for roof framing, subfloors, and underlayment, and in the volumes of the siding and sheathing materials used in exterior wall construction *(table 2)*. Style differences in the use of wood or other materials in the exterior wall systems appeared to be influenced by cost factors. Stuccoed exterior wall surfaces were, for instance, reported by a few of the architects I interviewed to be much cheaper than plywood sidings in the southern California area. The reverse situation was reported to be true for many northern California areas.

FACTORS INFLUENCING SPECIFICATIONS

Each architect was asked why he specified the structural system used in the apartment he had designed. Costs and building codes were the factors cited most often as favoring the choice of wood *(table 3)*. Whenever building codes required a minimum fire spread rate of 1 hour with a seismic stress tolerance, wood frame construction was often cited as the lowest cost.

California's building code[2] stipulates minimum requirements for new construction in the state. City and county governments may require higher standards, but not lower ones. Apartment structures of three stories or less must be "one-hour fire-resistive

Table 2–*Average volume of wood products in roofs, floors, and walls in an apartment structure in California, 1969*

Component	Northern California (7)[1]	Southern California (10)[1]
Roof (amount/M sq. ft.)		
Beams, timbers ..... bd. ft.	188	177
Decking, sheathing:	1,024	1,660
Plywood ..... sq. ft.[2]	481	582
Framing lumber ..... bd. ft.	842	1,483
Soffit, facia, trim (lumber) ..... bd. ft.	393	574
Floor (amount/M sq. ft.)		
Framing (lumber) ..... bd. ft.	1,689	1,444
Subfloor, underlaying, decking:		
Plywood ..... sq. ft.[3]	1,699	1,108
Lumber ..... bd. ft.	218	68
Exterior walls (amount/M sq. ft.)[3]		
Studs (lumber) ..... bd. ft.	512	522
Siding, sheathing (plywood) .... sq. ft.[3]	497	44
Interior walls (amount/M sq. ft.)		
Studs (lumber) ..... bd. ft.	1,252	1,177

[1]Number of apartment structures in sample are shown in parentheses.

[2]3/8-inch basis.

[3]Roof area multiplied by number of stories.

construction throughout."[2] Untreated wood may be used in construction "in conjunction with other fire-resistive and non-combustible materials."[2]

With few exceptions, apartment structures of four stories or more built in California must be of "non-combustible construction and one-hour fire-resistive throughout except that permanent nonbearing partitions may use fire-retardant treated wood within the assembly, provided fire-resistive requirements are maintained." Furthermore "walls and permanent partitions shall be of noncombustible materials."[2]

When each architect was asked about the outlook for the use of wood products during the next 5 years, many thought fire codes would become the single most important influence. And they thought that as population densities increased, fire codes could be expected to become more rigorous. Because population densities are expected to influence changes in

Table 3–*Factors cited most often that favored the specification of wood products in apartment construction, California, 1969*[1]

Factors cited	Over-all structure	Roof	Floor	Exterior walls	Interior walls
	Number of times cited[2]				
Building code	5	4	3	5	2
Appearance	2	2	0	0	0
Structural consistency[3]	0	0	0	1	2
Durability, maintenance	2	1	1	2	2
Costs	7	7	5	6	3
Availability of labor and materials	1	1	1	1	2
Personal preference	1	1	1	1	2
Other factors	4	1	2	2	2

[1]Based on responses of 19 architects.

[2]Respondents were asked to cite as many factors as they would like.

[3]Structural system using the same materials and assembly as in all other parts of the same, or other related buildings.

present building codes, many architects suggested that the outlook for wood products would probably be strongly influenced by the future availability and competitiveness of wood products treated by fire retardants.

Factors often cited as currently unfavorable towards the greater use of wood were the high cost of labor; the severe fluctuations in lumber and plywood prices; the unavailability of many mouldings and millwork lines; and the behavior of wood when it shrinks, bows, or twists. Whether more lumber and plywood will be used in the future for apartment construction may well depend on whether any of these problems are overcome.

NOTES

[1]Wright, Maurice, and William H. Reid. *Wood materials used in apartment construction, 1969.* USDA Forest Serv. Res. Paper WO-16, Forest Serv., U.S. Dep. Agric., Washington, D. C. 12 p. 1972.

[2]International Conference of Building Officials. *Uniform building code.* Vol. I. Whittier, Calif. 651 p. 1970.

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G. P. O. 794–426/3741