

TECHNICAL NOTE NUMBER 140

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

FOREST PRODUCTS LABORATORY

MADISON 5, WISCONSIN

REVISED December 1952

STRESSES IN LAMINATED WOOD CONSTRUCTION

The use of heavy and lightweight material of the same species in laminated or glued-up wood construction has less injurious effect than has been generally supposed. Laminated wood specimens under observation at the Forest Products Laboratory show little weakening or tendency to warp from this cause. Most warping and checking in laminated construction can be traced to one of two causes. The first is the use of plain-sawed and quarter-sawed lumber in the same construction, and the second is the combination of lumber of different moisture content.

Plain-sawed lumber of any species shrinks and swells in width more than quarter-sawed lumber; and when the two kinds are glued together, they pull against each other with every change in moisture content. If the block containing such a combination is kept for a long time in the same atmospheric condition, the stresses die out, because the block checks or changes shape more or less to relieve the stretched condition of its fibers. As soon as the atmospheric conditions change, new stresses will be set up. For softwood species, however, these stresses would probably not be of sufficient magnitude to be serious, particularly in members protected from the weather.

If boards of different moisture content are glued together, internal stresses will result from the unequal shrinkage of the boards as their moisture content conditions equalize through seasoning. In some blocks made at the Laboratory these stresses were large enough to rupture the wood. If the wood is not ruptured, the stresses will disappear permanently in time, but the block will have changed its shape somewhat in getting rid of them.

From these facts it becomes apparent that for laminated wood articles requiring accurate shape, it is desirable to use all plain-sawed or all quarter-sawed lumber, to have all pieces at a uniform moisture content when glued, and to prevent as far as possible subsequent moisture changes

by means of moisture-resistant coatings. For the manufacture of rougher articles in which slight changes in form are of no consequence, these precautions are of much less importance, particularly if softwoods are used.