# List of Publications on MECHANICAL PROPERTIES AND STRUCTURAL USES OF WOOD AND WOOD PRODUCTS

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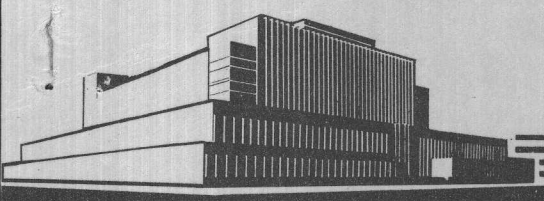

FOREST PRODUCTS LABORATORY
MADISON 5, WISCONSIN

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
In Cooperation with the University of Wisconsin

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This list, which begins on page 4, includes publications that give general information and the results of research by the U.S. Forest Service and other organizations on the strength of timber and factors affecting strength, design of wood articles, or parts where strength or reseistance to external forces is of importance.

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## INSTRUCTIONS FOR OBTAINING PUBLICATIONS

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| Title | Author | Publication and date |
|---|---|---|
| **Growth Conditions** | | |
| *How growth affects quality in hardwood lumber. | Paul, B. H. | South. Lbrmn. 201(2512):31-32, Dec. 1, 1961. |
| *Relationship of locality in rate of growth to density and strength of Douglas-fir. | Drow, J. T. | FPL Rept. 2078. 1957. |
| Relation of growing space to specific gravity and strength of second-growth redwood. | Paul, B. H., & Luxford, R. F. | West Coast Lbrmn., June 15, 1928. |
| *How growth affects quality in hickory and ash. | Paul, B. H. | Wood Working Indus., Feb. 1926. Hardwood Record, Jan. 10, 1925. |
| **Growth Features** | | |
| Structure, occurrence, and properties of compression wood. | Pillow, M. Y., & Luxford, R. F. | USDA Tech. Bull. 546. 1937. Out of Print. |
| *Compression wood cause of bowing and twisting. | Pillow, M. Y. | South. Lbrmn., Mar. 1, 1931; Wood Construc., Nov. 1, 1930; Wood Working Indus., Nov. 1930. |
| Structural timbers: Defects and their influence on strength. | Newlin, J. A., & Johnson, R. P. A. | Am. Soc. Testing Materials Proc. 1924. |

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| | **Growth Features (continued)** | |
| Effect of spiral grain on strength of wood. | Wilson, T. R. C. | Jour. For., Nov. 1921. |
| | **Loading Conditions** | |
| *Fatigue resistance of quarter-scale bridge stringers in flexure and shear. | Lewis, W. C. | FPL Rept. 2236. 1962. |
| *Creep of small wood beams under constant bending load. | Clouser, W. S. | FPL Rept. 2150. 1959. |
| *Effect of repeated loading and salt-water immersion on flexural properties of laminated white oak. | Freas, A. D., & Werren, Fred | Forest Prod. Jour. 9(2):100-103. Feb. 1959. |
| *Effect of prestressing on mechanical properties of Douglas-fir and southern yellow pine. | Wood, L. W. | FPL Rept. 2073. 1957. |
| *The influence of rate of loading on the strength of wood and wood-base material. | Markwardt, L. J., & Liska, J. A. | Reprint from Am. Soc. Testing Materials Symposium on Speed of Testing. 1956. |
| *The fatigue behavior of wood and plywood subjected to repeated and reversed bending stresses. | Kommers, W. J. | FPL Rept. 1327. 1943. Information Reviewed and Reaffirmed 1960. |

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| | Loading Conditions (continued) | |
| *Supplement: The fatigue behavior of Douglas-fir and Sitka spruce subjected to reversed stresses superimposed on steady stresses. | Kommers, W. J. | FPL Rept. 1327-A. 1944. Information Reviewed and Reaffirmed 1960. |
| *Effect of a single reversal of stress on the static and impact bending strength of Sitka spruce and Douglas-fir. | Kommers, W. J. | FPL Rept. 1325. 1943. Information Reviewed and Reaffirmed 1962. |
| *Effect of ten repetitions of stress on the bending and compressive strengths of Sitka spruce and Douglas-fir. | Kommers, W. J. | FPL Rept. 1320. 1943. Information Reviewed and Reaffirmed 1960. |
| *Effect of rapid loading on the compressive and flexural strength of wood. | Liska, J. A. | FPL Rept. 1767. 1950. Information Reviewed and Reaffirmed 1960. |
| *Effect of 5,000 cycles of repeated bending stresses on 5-ply Sitka spruce plywood. | Kommers, W. J. | FPL Rept. 1305. 1943. Information Reviewed and Reaffirmed 1960. |
| *Effects of speed of test on bending strength of insulation fiberboard. | Lewis, W. C. | Tappi 38(2):65-68, Feb. 1955. |
| *Effect of rapid loading and duration of stress on the strength properties of wood tested in compression and flexure. | Brokaw, M. P., & Foster, G. W. | FPL Rept. 1518. 1945. Information Reviewed and Reaffirmed 1958. |

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| *Relation of strength of wood to duration of load. | Wood, L. W. | FPL Rept. 1916. 1951. Information Reviewed and Reaffirmed 1960. |
| *Fatigue of wood and glued joints used in laminated construction. | Lewis, W. C. | Forest Prod. Res. Soc. Proc., 1951. |
| Speed of testing of wood: Factors in its control and its effect on strength. | Markwardt, L. J., & Liska, J. A. | Am. Soc. Testing Materials Proc., 1948. |
| Behavior of wood under continued loading. | Wood, L. W. | Eng. News-Record 139(24):108-111, Dec. 11, 1947. |
| | **Moisture** | |
| *Strength-moisture relations for wood. | Wilson, T. R. C. | USDA Tech. Bull. 282. 1932. |
| | **Preservative Treatment** | |
| *Effect of pressure treatment with coal-tar creosote on the strength of Douglas-fir structural timbers. | Luxford, R. F., & MacLean, J. D. | FPL Rept. 1798. 1951. |
| | **Seasoning** | |
| *Recommendations of the Madison conference on fundamental research in wood drying. | Youngs, R. L. | Forest Prod. Jour. 9(3):121-124, Mar. 1959. |
| *Mechanical properties of red oak related to drying. | Youngs, R. L. | Forest Prod. Jour. 7(10):315-324, Oct. 1957. |

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| | **Seasoning (continued)** | |
| *Effect of partial seasoning on the strength of wood. | Wilson, T. R. C., Carlson, T. A., & Luxford, R. F. | Am. Wood-Pres. Assn. Proc. 1930; FPL Rept. 1024. 1930. Information Reviewed and Reaffirmed 1960. |
| | **Specific Gravity** | |
| *Specific gravity-strength relations for wood. | | FPL Rept. 1303. 1956. Information Reviewed and Reaffirmed 1962. |
| *Southern pine and the density rule. | Wood, L. W. | South. Lbrmn., Dec. 1950. |
| The relation of the shrinkage and strength properties of wood to its specific gravity. | Newlin, J. A., & Wilson, T. R. C. | USDA Bull. 676. 1919. Out of Print. |
| | **Stain and Decay** | |
| *"Black streak" in western hemlock: Its characteristics and influence on strength. | Luxford, R. F., Wood, L. W., & Gerry, E. | FPL Rept. 1500. 1943. Information Reviewed and Reaffirmed 1960. |
| *The significance of the discolorations in aircraft veneers: Mahogany and khaya. | Hansbrough, J. R., & Krause, R. L. | FPL Rept. 1379. 1943. Information Reviewed and Reaffirmed 1962. |

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| | Stain and Decay (continued) | |
| *The significance of the discolorations in aircraft veneers: Yellow birch. | Hansbrough, J. R., Waterman, A. M., & Luxford, R. F. | FPL Rept. 1377. 1943. Information Reviewed and Reaffirmed 1962. |
| *The significance of the discolorations in yellow-poplar veneers. | Hepting, G. H., Roth, E. R., & Luxford, R. F. | FPL Rept. 1375. 1952. Information Reviewed and Reaffirmed 1958. |
| *The significance of the discolorations in aircraft lumber: Noble fir and western hemlock. | Englerth, G. H., & Hansbrough, J. R. | Forest Path. Spec. Rel. No. 24. 1945. |
| *The significance of black line stain in yellow birch propeller lumber. | Hansbrough, J. R. | Forest Path. Spec. Rel. No. 23. 1945. |
| *The significance of the discolorations in aircraft lumber: Sitka spruce. | Hansbrough, J. R., & Englerth, G. H. | Forest Path. Spec. Rel. No. 21. 1944. |
| *The significance of the discolorations in aircraft veneers: American beech. | Hansbrough, J. R., Waterman, A. M., & Krause, R. L. | Forest Path. Spec. Rel. No. 16. 1944. |
| *Chemical stain in noble fir as related to strength. | Luxford, R. F., & & Krone, R. H. | FPL Rept. 1329. 1943. Information Reviewed and Reaffirmed 1962. |
| *The effect of certain heart rot fungi on the specific gravity and strength of Sitka spruce and Douglas-fir. | Scheffer, T. C., Wilson, T. R. C., Luxford, R. F., & Hartley, C. | USDA Tech. Bull. 779. 1941. |

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| **Stain and Decay (continued)** | | |
| Effect of blue stain on specific gravity and strength of southern pine. | Chapman, A. D., & Scheffer, T. C. | Jour. Agr. Res., July 15, 1940. |
| *Decay and toughness losses in southern pine infected by Peniophora. | Lindgren, R. M., & Erickson, E. C. O. | Forest Prod. Jour. 6(6):201-204, June 1957. |
| **Miscellaneous** | | |
| *Effect of temperature and moisture content on internal friction and speed of sound in Douglas-fir. | James, W. L. | Forest Prod. Jour. 11(9):383-390, Sept. 1961. |
| *Effect of hydraulic-equipment oils on the bending and compressive strength of Sitka spruce. | Drow, J. T. | FPL Rept. 1520. 1945. Information Reviewed and Reaffirmed 1962. |
| *Effect of elliptic or circular holes on the stress distribution in plates of wood or plywood considered as orthotropic materials. | | FPL Rept. 1510. 1944. Information Reviewed and Reaffirmed 1962. |
| *Wood at low temperatures. | Boller, K. H. | Modern Packaging 28(1):153-157, Sept. 1954. |
| *Comparative value of timber cut from live and dead trees. | | FPL Tech. Note 101. 1958. |

## FACTORS AFFECTING STRENGTH (continued)

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| **Miscellaneous (continued)** | | |
| *Effect of extractives on the strength of wood. | Luxford, R. F. | Jour. Agr. Res., June 15, 1931. |

## JOINTS AND FASTENINGS

| Title | Author | Publication and date |
|---|---|---|
| **Bolts** | | |
| *Bolt-bearing strength of wood and modified wood: Bearing strength of commercial crossbanded compreg under aircraft bolts. | Hunt, P. J., Goodell, H. R., & Phillips, R. S. | FPL Rept. 1523-B. 1946. Information Reviewed and Reaffirmed 1962. |
| *Supplement: Bearing strength of commercial aircraft plywood under aircraft bolts. | McLeod, A. M. | FPL Rept. 1523-C. 1946. Information Reviewed and Reaffirmed 1962. |
| *Supplement: Bearing strength of wood members reinforced with plywood and crossbanded compreg under single and multiple aircraft bolts. | Sanborn, W. A., Goodell, H. R., Ely, A. W., & Phillips, R. S. | FPL Rept. 1523-D. 1946. Information Reviewed and Reaffirmed 1962. |
| *Theoretical design of a nailed or bolted joint under lateral load. | Kuenzi, E. W. | FPL Rept. 1951. 1953. Information Reviewed and Reaffirmed 1962. |

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| | **Bolts (continued)** | |
| The bearing strength of wood under bolts. | Trayer, G. W. | USDA Tech. Bull. 332. 1932. Out of Print. |
| | **Connectors** | |
| Timber connector joints: Their strength and design. | Scholten, J. A. | USDA Tech. Bull. 865. 1944. Out of Print. |
| Modern connectors in wood construction. | Scholten, J. A. | Ag. Eng., May 1938. |
| Modern connectors for timber construction. | Perkins, N. S., Landsen, P., & Trayer, G. W. | Joint publication of Natl. Comm. on Wood. Util. and Forest Prod. Lab., 1933. 20 cents. |
| | **Lag Screws** | |
| *Lag screw joints: Their behavior and design. | Newlin, J. A., & Gahagan, J. M. | USDA Tech. Bull. 597. 1938. |
| | **Nails** | |
| *Performance comparison of slender and standard spirally grooved pallet nails. | Heebink, T. B. | FPL Rept. 2238. 1962. |
| *Spacing of sixpenny and eightpenny wire nails in Douglas-fir multi-nail joints. | Ramos, A. N. | FPL Rept. 2155. 1960. |

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| | Nails (continued) | |
| *Effect of nail points on the withdrawal resistance of plain nails. | Scholten, J. A. | FPL Rept. 1226. 1940. Information Reviewed and Reaffirmed 1959. |
| *Nailing dense hardwoods. | | FPL Tech. Note 247. 1953. |
| *Nail-withdrawal resistance of American woods. | | FPL Tech. Note 236. 1958. |
| *General observations on the nailing of wood. | | FPL Tech. Note 243. 1957. |
| *Slant driving of nails! Does it pay? | Markwardt, L. J., & Gahagan, J. M. | FPL Rept. 954. 1930. Information Reviewed and Reaffirmed 1962. |
| Why nails hold. | Markwardt, L. J., & Gahagan, J. M. | Wood Prod., Sept. 1951. Pack. & Shipping, Oct. 1951. |
| *Nail-holding properties of southern hardwoods. | Scholten, J. A. | South. Lbrmn., Dec. 1950. |
| *Strength of nailed joints in frame walls. | Scholten, J. A., & Molander, E. G. | Agr. Eng., Nov. 1950. |
| Technique of house nailing. | Forest Products Laboratory | In cooperation with the Housing & Home Finance Agency, Washington, D. C., Nov. 1947. |

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| | **Nails (continued)** | |
| The grooved nail. | Markwardt, L. J., & Gahagan, J. M. | Pack. & Shipping, Apr. 1929; Barrel & Box & Pack., Aug. 1929. |
| | **Railroad Spikes** | |
| Tests of the holding force of common and screw railroad spikes in natural and treated Douglas-fir ties. | Zimmerman, C. W. | West Coast Lbrmn., Nov. 15, 1922. |
| | **Screws** | |
| *Strength of screw fastenings in plywood. | | FPL Tech. Note 149. 1958. |
| | **Miscellaneous** | |
| *Proceedings of the symposium on fastenings for wood in house construction. | | FPL Rept. 2241. 1962. |
| *Strong joints + strong materials properly used = strong buildings. | | FPL Tech. Note 262. 1962. |
| *Corrosion of metal fastenings in zinc-chloride-treated wood after 20 years. | Baechler, R. H. | Am. Wood-Pres. Proc. 1949. |

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| **Miscellaneous (continued)** | | |
| Wood fastenings in farm structures. | Scholten, J. A. | A contribution of the Com. on Commercial Bldg. Materials --Wood--of the Am. Soc. of Agr. Engrs., July 6, 1936. |
| Corrosion of metal fastenings in zinc-chloride-treated wood. | Baechler, R. H. | Indus. & Eng. Chem., Dec. 1934. |

## LAMINATED WOOD CONSTRUCTION

| Title | Author | Publication and date |
|---|---|---|
| *Stiffness and bending strength of beams laminated from two species of wood. | Ethington, R. L. | FPL Rept. 2156. 1960. |
| *Deflection characteristics of two 20-foot-diameter laminated wood rings subjected to compressive loading along a diameter. | Werren, Fred, & Ethington, R. L. | FPL Rept. 1877. 1960. |
| Development of working stresses for glued laminated lumber. | Freas, A. D. | Am. Railway Eng. Assn. Proc. 1956, Vol. 57, pp. 979-985. |

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| *Scarf joints prove feasible for large laminated members. | Werren, Fred | Wood & Wood Prod. 61(7):22, 80-81, July 1956. |
| *Factors affecting strength and design principles of glued laminated construction. | Freas, A. D. | FPL Rept. 2061. 1956. Information Reviewed and Reaffirmed 1962. |
| *Laminated, bolted, and solid keels for 50-foot Navy motor launch compared for strength. | Luxford, R. F., & Krone, R. H. | FPL Rept. 1625. 1946. Information Reviewed and Reaffirmed 1962. |
| *Laminated oak frames for a 50-foot Navy motor launch compared to steam-bent frames. | Luxford, R. F., & Krone, R. H. | FPL Rept. 1611. 1945. Information Reviewed and Reaffirmed 1962. |
| *Strength of glued laminated Sitka spruce made up of rotary-cut veneers. | Luxford, R. F. | FPL Rept. 1512. 1944. Information Reviewed and Reaffirmed 1962. |
| Fabrication and design of glued laminated wood structural members. | Freas, A. D., & Selbo, M. L. | USDA Tech. Bull. 1069. Feb. 1954. |
| *End joints of various types in Douglas-fir and white oak compared for strength. | Luxford, R. F., & Krone, R. H. | FPL Rept. 1622. 1946. Information Reviewed and Reaffirmed 1961. |
| *Stresses in laminated wood construction. | | FPL Tech. Note 140. 1952. |

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| *Hickory-ash bats get baseball trial. | McDonald, J. K. | South. Lbrmn. 183(2297):193-194. Dec. 15, 1951. |
| *Studies of the strength of glued laminated wood construction. | Freas, A. D. | ASTM Bull. No. 170. Dec. 1950. |
| The glued laminated wooden arch. | Wilson, T. R. C. | USDA Tech. Bull. 691. 1939. 20 cents. |
| Built-up wood columns conserve lumber. | Scholten, J. A. | Eng. News-Record, Aug. 27, 1931. |

## METHODS OF DETERMINING PROPERTIES

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| **Elastic and Strength Properties** | | |
| *Modulus of elasticity of wood determined by dynamic methods. | Bell, E. R., Peck, E. C., & Krueger, N. T. | FPL Rept. 1977. 1954. Information Reviewed and Reaffirmed 1959. |

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| | Elastic and Strength Properties (continued) | |
| *Tension test methods for wood, wood-base materials, and sandwich construction. | Markwardt, L. J., & Youngquist, W. G. | Reprint from Am. Soc. Testing Materials Symposium on Tension Testing of Non-Metallic Materials, Spec. Tech. Pub. No. 194. 1957. Also: FPL Rept. 2055. 1956. Information Reviewed and Reaffirmed 1962. |
| *Approximate methods of calculating the strength of plywood. | Markwardt, L. J., & Freas, A. D. | FPL Rept. 1630. Revised 1946. Information Reviewed and Reaffirmed 1962. |
| *The effect of a change in testing speed and span on the flexural strength of insulating and structural fiberboards and a proposed new method of test. | Youngquist, W. G., & Munthe, B. P. | FPL Rept. 1717. 1948. Information Reviewed and Reaffirmed 1962. |
| *The bending strength and stiffness of plywood. | Freas, A. D. | FPL Rept. 1304. Revised 1956. Information Reviewed and Reaffirmed 1962. |
| *Stress-strain relations in wood and plywood considered as orthotropic materials. | | FPL Rept. 1503. 1956. Information Reviewed and Reaffirmed 1962. |

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| **Elastic and Strength Properties (continued)** | | |
| The influence of the form of a wooden beam on its stiffness and strength-- | | |
| *I - Deflection of beams with special reference to shear deformations. (Reprint from NACA Report 180.) | Newlin, J. A., & Trayer, G. W. | FPL Rept. 1309. 1941. Information Reviewed and Reaffirmed 1956. |
| *III - Stresses in wood members and subjected to combined column and beam action. (Reprint from NACA Report 188.) | Newlin, J. A., & Trayer, G. W. | FPL Rept. 1311. 1941. Information Reviewed and Reaffirmed 1956. |
| *Form factors of beams subjected to transverse loading only. (Reprint from NACA Report 181.) | Newlin, J. A., & Trayer, G. W. | FPL Rept. 1310. 1941. Information Reviewed and Reaffirmed 1956. |
| *Strength of orthotropic materials subjected to combined stresses. | Norris, C. B. | FPL Rept. 1816. 1950. Information Reviewed and Reaffirmed 1962. |
| *Report on progress in development of testing methods for fiberboards. | Markwardt, L. J. | FPL Rept. 2105. 1958. |
| *Effect of size and shape of specimen on the tensile strength of fiberboards. | Lewis, W. C. | FPL Rept. 1716. 1948. Information Reviewed and Reaffirmed 1960. |

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| **Elastic and Strength Properties (continued)** | | |
| *Methods of calculating the strength and modulus of elasticity of plywood in compression. | Liska, J. A. | FPL Rept. 1315. Revised 1950. Information Reviewed and Reaffirmed 1960. |
| Methods for determining the elastic constants of non-metallic materials. | Kuenzi, E. W. | Am. Soc. Testing Materials Spec. Tech. Pub. No. 118, pp. 70-78. 1952. |
| A new method of calculating the ultimate strength of continuous beams. | Newlin, J. A., & Trayer, G. W. | NACA Report 347. 1930. |
| **Growth Features** | | |
| *Detection of compression failures in wood. | | FPL Rept. 1588. 1944. Information Reviewed and Reaffirmed 1961. |
| *Instrument for rapidly measuring slope of grain in lumber. | Anderson, E. A., Koehler, A., & Krone, R. H. | FPL Rept. 1592. 1945. Information Reviewed and Reaffirmed 1960. |
| *Guide to determining slope of grain in lumber and veneer. | Koehler, A. | FPL Rept. 1585. 1943. Information Reviewed and Reaffirmed 1960. |

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| **Growth Features (continued)** | | |
| *Compression wood: Importance and detection in aircraft veneer and plywood. | | FPL Rept. 1586. 1943. Information Reviewed and Reaffirmed 1959. |
| *A simple device for detecting compression wood. | | FPL Rept. 1390. 1941. Information Reviewed and Reaffirmed 1959. |
| **Specific Gravity** | | |
| *Methods of determining the specific gravity of wood. | | FPL Tech. Note B-14. 1956. |
| Methods for determining the specific gravity of wood and wood-base materials. | Markwardt, L. J., & Paul, B. H. | Am. Soc. Testing Materials Proc. 1946. |
| **Testing Procedures** | | |
| *Results of impact tests to compare the pendulum impact and toughness test methods. | Drow, J. T., Markwardt, L. J., & Youngquist, W. G. | FPL Rept. 2109. 1958. |
| *Apparatus for determination of surface profile. | Setterholm, V. C., & James, W. L. | FPL Rept. 2130. 1958. |
| *Comparison of standard block-shear test with the panel-shear test. | Norris, C. B. | Forest Prod. Jour. 7(9):299-301, Sept. 1957. |
| *Performance of bonded wire strain gages on wood. | Youngquist, W. G. | FPL Rept. 2087. 1957. |

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| | Testing Procedures (continued) | |
| *Fabrication of small clear specimens of timber for strength tests. | Bellosillo, S. B. | FPL Rept. 2074. 1957. |
| *Climbing peel test for strength of adhesive bonds. | Werren, Fred, & Eickner, H. W. | Modern Plastics 34(4):187-190, 264. Dec. 1956. |
| A strain gage for the measurement of strains in adhesive bonds. | Norris, C. B., James, W. L., & Drow, J. T. | Am. Soc. Testing Materials Bull. No. 218, pp. 40-49. Dec. 1956. |
| *Testing and evaluating procedures for building boards. | Lewis, Wayne C. | Forest Prod. Jour. 6(7):241-246. July 1956. |
| *Method for determining tensile properties of paper. | Setterholm, V. C., & Kuenzi, E. W. | FPL Rept. 2066. 1956. Information Reviewed and Reaffirmed 1962. |
| *Forest Products Laboratory's toughness testing machine. | | FPL Rept. 1308. 1941. Information Reviewed and Reaffirmed 1961. |
| Means of determining the hardness of wood and modified woods over a broad specific gravity range. | Weatherwax, R. C., Erickson, E. C. O., & Stamm, A. J. | Am. Soc. Testing Materials Bull. (153):84-89. Aug. 1948. |
| Methods of static tests of wood poles. | | Am. Soc. Testing Materials Std., D1036-52. |

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| **Testing Procedures (continued)** | | |
| Methods of evaluating the properties of wood-base fiber and particle panel materials. | | Am. Soc. Testing Materials Std. D1037-60T. |
| Methods of conducting strength tests of panels for building construction. | | Am. Soc. Testing Materials Std. E72-61. |
| Methods of testing truss assemblies. | | Am. Soc. Testing Materials Std. E73-52. |
| Standard methods of conducting static tests of timbers in structural sizes. | | Am. Soc. Testing Materials Std. D198-27. |
| Standard methods of testing small clear specimens of timber. | | Am. Soc. Testing Materials Std. D143-52. |
| Standard methods of testing plywood, veneer, and other wood and wood-base materials. | | Am. Soc. Testing Materials Std. D805-52. |
| Some applications of simulated service testing to nonmetallic materials. | Freas, A. D. | Am. Soc. Testing Materials Bull. 141:35-40. Aug. 1946. |
| Effect of specimen shape on the compressive strength properties of laterally supported plywood specimens. | Liska, J. A. | Am. Soc. Testing Materials Bull. (133):33-36. Mar. 1945. |

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| **Testing Procedures (continued)** | | |
| Load and strain measuring instruments for use in rate of loading and constant load tests. | Foster, G. W. | Instruments, Feb. 1945. |
| Spring suspended spherical bearing block for compression tests. | Markwardt, L. J., & Luxford, R. F. | Am. Soc. Testing Materials Bull. Aug. 1940. |

## MODIFIED WOODS AND PAPER LAMINATES

| Title | Author | Publication and date |
|---|---|---|
| *Modified woods. | Stamm, A. J. | FPL Rept. 2192. 1960. |
| *Influence of manufacturing variables on the impact resistance of resin-treated wood. | Millet, M. A., Seborg, R. M., & Stamm, A. J. | FPL Rept. 1386. 1943. Information Reviewed and Reaffirmed 1962. |
| *Mechanical properties of laminated modified woods. | Erickson, E. C. O. | FPL Rept. 1639. 1947. Information Reviewed and Reaffirmed 1959. |
| *Factors affecting the strength of papreg: Some strength properties at elevated and subnormal temperatures. | Meyer, H. R., & Erickson, E. C. O. | FPL Rept. 1521. 1945. Information Reviewed and Reaffirmed 1959. |

## MODIFIED WOODS AND PAPER LAMINATES (continued)

| Title | Author | Publication and date |
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| *Supplement: Effect of moisture on certain strength properties of papreg. | Meyer, H. R., & Erickson, E. C. O. | FPL Rept. 1521-B. 1945. Information Reviewed and Reaffirmed 1962. |
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| Title | Author | Publication and date |
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| Title | Author | Publication and date |
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| Title | Author | Publication and date |
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| Title | Author | Publication and date |
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| Title | Author | Publication and date |
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| Title | Author | Publication and date |
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| Title | Author | Publication and date |
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| | Other | |
| *Weights of various woods grown in the United States. | | FPL Tech. Note 218. 1958. |

## SANDWICH CONSTRUCTIONS AND MATERIALS

| Title | Author | Publication and date |
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| *Durability of resin-treated paper honeycomb core. | Boller, K. H. | FPL Rept. 2158. 1959. |
| *Design curves for the buckling of sandwich cylinders of finite length under uniform external lateral pressure. | Norris, C. B., & Zahn, J. J. | FPL Rept. 1869. 1959. |
| *Buckling of simply supported rectangular sandwich panels subjected to edgewise bending. | Jahnke, W. E., & Kuenzi, E. W. | FPL Rept. 1868. 1959. |
| *An apparatus for measuring internal friction and fatigue strength of core materials used in sandwich construction. | James, W. L., & Norris, C. B. | FPL Rept. 1866. 1958. |
| *Mechanical properties of glass-fabric honeycomb cores. | Kuenzi, E. W. | FPL Rept. 1861. 1957. |

| Title | Author | Publication and date |
|---|---|---|
| | Core Materials (continued) | |
| *Mechanical properties of aluminum multiwave cores. | Kuenzi, E. W., & Setterholm, V. C. | FPL Rept. 1855. 1956. |
| *Short-column compressive strength of sandwich constructions as affected by the size of the cells of honeycomb core materials. | Norris, C. B., & Kommers, W. J. | FPL Rept. 1817. 1956. |
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| *Effect of unbonded joints in an aluminum honeycomb-core material for sandwich constructions. | Norris, C. B. | FPL Rept. 1835. 1952. Information Reviewed and Reaffirmed 1958. |
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| Title | Author | Publication and date |
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| Investigation of mechanical properties of honeycomb structures made of resin-impregnated paper. | Norris, C. B., & Mackin, G. E. | U.S. NACA Tech. Note 1529. 1948. Washington 25, D.C. |
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| *Determination of mechanical properties of adhesives for use in the design of bonded joints. | Kuenzi, E. W. | FPL Rept. 1851. 1956. Information Reviewed and Reaffirmed 1962. |
| *Repair of aircraft sandwich constructions. | Panek, E., & Heebink, B. G. | FPL Rept. 1584. 1948. Information Reviewed and Reaffirmed 1962. |

| Title | Author | Publication and date |
|---|---|---|
| | Fabrication and Inspection (continued) | |
| *Supplement. | Mohaupt, A. A., & Heebink, B. G. | FPL Rept. 1584-A. 1956. Information Reviewed and Re-affirmed 1962. |
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| *Supplement: Derivation of differential equation and its application to rectangular panels with loads applied at corners. | Cheng, Shun | FPL Rept. 1874-A. 1960. |

| Title | Author | Publication and date |
|---|---|---|
| | Properties (continued) | |
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| *Structural sandwich design criteria. | Kuenzi, E. W. | FPL Rept. 2161. 1959. |
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| *Sandwich panels for building construction. | Wood, L. W. | FPL Rept. 2121. 1958. |
| *Compressive buckling curves for simply supported sandwich panels with glass-fabric-laminate facings and honeycomb cores. | Norris, C. B. | FPL Rept. 1867. 1958. |
| *Elastic buckling of a simply supported rectangular sandwich panel subjected to combined edgewise bending and compression. | Kimel, W. R. | FPL Rept. 1857. 1956. Information Reviewed and Reaffirmed 1962. |
| *Supplement: Results for panels with facings of either equal or unequal thickness and with orthotropic cores. | Kimel, W. R. | FPL Rept. 1857-A. 1956. Information Reviewed and Reaffirmed 1962. |

| Title | Author | Publication and date |
|---|---|---|
| | Properties (continued) | |
| *Elastic buckling of a simply supported rectangular sandwich panel subjected to combined edgewise bending, compression, and shear. | Kimel, W. R. | FPL Rept. 1859. 1956. Information Reviewed and Reaffirmed 1962. |
| Sandwich constructions. | Heebink, B. G. | Modern Plastics Ency. Issue 34(1A): 434-435. Sept. 1956. |
| Testing sandwich constructions at the Forest Products Laboratory. | Kuenzi, E. W. | Am. Soc. Testing Materials Bull. (164):21-28. Feb. 1950. |
| *Compressive buckling design curves for sandwich panels with isotropic facings and orthotropic cores. | Norris, C. B. | FPL Rept. 1854. Revised 1958. |
| *Deflection and stresses in a uniformly loaded, simply supported, rectangular sandwich plate. | Raville, M. E. | FPL Rept. 1847. 1955. Information Reviewed and Reaffirmed 1960. |
| *Supplement: Experimental verification of theory. | Lewis, W. C. | FPL Rept. 1847-A. 1956. Information Reviewed and Reaffirmed 1962. |
| *Stresses induced in a sandwich panel by load applied at an insert. | Youngquist, W. G., & Kuenzi, E. W. | FPL Rept. 1845. 1955. Information Reviewed and Reaffirmed 1960. |

| Title | Author | Publication and date |
|---|---|---|
| | Properties (continued) | |
| *Supplement. | Youngquist, W. G., & Kuenzi, E. W. | FPL Rept. 1845-A. 1955. Information Reviewed and Reaffirmed 1960. |
| *Supplement. No. 2. | Younquist, W. G., & Kuenzi, E. W. | FPL Rept. 1845-B. 1956. Information Reviewed and Reaffirmed 1962. |
| *Transfer of longitudinal load from one facing of a sandwich panel to the other by means of shear in the core. | Norris, C. B., & Boller, K. H. | FPL Rept. 1846. 1955. Information Reviewed and Reaffirmed 1960. |
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| *Basic shear strength properties of metal-bonding adhesives as determined by lap-joint stress formulas of Volkersen and Goland and Reissner. | Eickner, H. W. | FPL Rept. 1850. 1955. Information Reviewed and Reaffirmed 1960. |
| *Supplement: Analysis of long cylinders of sandwich construction under uniform external lateral pressure: Facings of moderate and unequal thickness. | Raville, M. E. | FPL Rept. 1844-A. 1955. Information Reviewed and Reaffirmed 1960. |
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| Title | Author | Publication and date |
|---|---|---|
| | Properties (continued) | |
| *Design criteria for long curved panels of sandwich construction in axial compression. | Kuenzi, E. W. | FPL Rept. 1558. 1946. Information Reviewed and Reaffirmed 1959. |
| *Buckling loads of flat sandwich panels in compression: Various types of edge conditions. | March, H. W., & Smith, C. B. | FPL Rept. 1525. 1945. Information Reviewed and Reaffirmed 1962. |
| *Supplement: The buckling of flat sandwich panels with edges simply supported (end-grained balsa cores and facings of aluminum and glass-cloth laminate). | Boller, K. H. | FPL Rept. 1525-A. 1947. Information Reviewed and Reaffirmed 1960. |
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| *Supplement: The buckling of flat sandwich panels with either all edges simply supported or all edges clamped (cores of paper honeycomb and facings of glass-cloth laminate). | Boller, K. H. | FPL Rept. 1525-E. 1948. Information Reviewed and Reaffirmed 1962. |

| Title | Author | Publication and date |
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| | Properties (continued) | |
| *Stability of a few curved panels subjected to shear. | Kuenzi, E. W. | FPL Rept. 1571. 1947. Information Reviewed and Reaffirmed 1959. |
| *Effect of shear strength on maximum loads of sandwich columns. | Boller, K. H., & Norris, C. B. | FPL Rept. 1815. 1950. Information Reviewed and Reaffirmed 1960. |
| *Elastic stability of the facings of flat sandwich panels when subjected to combined edgewise stresses. | Boller, K. H., & Norris, C. B. | FPL Rept. 1802. 1949. Information Reviewed and Reaffirmed 1960. |
| *Strength of aluminum lap joints at elevated temperatures (tests conducted immediately after the temperature was reached). | Kuenzi, E. W. | FPL Rept. 1808. 1949. Information Reviewed and Reaffirmed 1962. |
| *Wrinkling of the facings of sandwich construction subjected to edgewise compression. | Norris, C. B., Ericksen, W. S., March, H. W., Smith, C. B., & Boller, K. H. | FPL Rept. 1810. 1949. Information Reviewed and Reaffirmed 1961. |
| *Supplement: Sandwich constructions having honeycomb cores. | Norris, C. B., Boller, K. H., & Voss, A. W. | FPL Rept. 1810-A. 1953. Information Reviewed and Reaffirmed 1962. |
| *Flexural rigidity of a rectangular strip of sandwich construction. | March, H. W., & Smith, C. B. | FPL Rept. 1505. Revised 1955. Information Reviewed and Reaffirmed 1960. |

| Title | Author | Publication and date |
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| | Properties (continued) | |
| *Supplement: Supplementary mathematical analysis and comparison with the results of tests. | Norris, C. B., Ericksen, W. S., & Kommers, W. J. | FPL Rept. 1505-A. Revised 1952. Information Reviewed and Reaffirmed 1962. |
| *The bending of a circular sandwich plate under normal load. | Ericksen, W. S. | FPL Rept. 1828. 1953. Information Reviewed and Reaffirmed 1960. |
| *Stresses within a rectangular, flat sandwich panel subjected to a uniformly distributed normal load and edgewise, direct, and shear loads. | Norris, C. B., & Kommers, W. J. | FPL Rept. 1838. 1953. Information Reviewed and Reaffirmed 1962. |
| *Buckling of sandwich cylinders in torsion. | March, H. W., & Kuenzi, E. W. | FPL Rept. 1840. Revised 1958. |
| *Developments and trends in lightweight composite construction. | Markwardt, L. J. | Am. Soc. Testing Materials Spec. Tech. Pub. No. 118, pp. 3-31. 1952. |
| *Behavior of a rectangular sandwich panel under a uniform lateral load and compressive edge loads. | March, H. W. | FPL Rept. 1834. 1952. Information Reviewed and Reaffirmed 1958. |
| *Shear-fatigue properties of various sandwich constructions. | Werren, F. | FPL Rept. 1837. 1952. Information Reviewed and Reaffirmed 1958. |

| Title | Author | Publication and date |
|---|---|---|
| | Properties (continued) | |
| *Critical loads of a rectangular flat sandwich panel subjected to two direct loads combined with a shear load. | Norris, C. B., & Kommers, W. J. | FPL Rept. 1833. 1952. Information Reviewed and Reaffirmed 1958. |
| *Buckling of cylinders of sandwich construction in axial compression. | March, H. W., & Kuenzi, E. W. | FPL Rept. 1830. Revised 1957. |
| Strength of sandwich construction. | Norris, C. B. | Am. Soc. Testing Materials Spec. Tech. Pub. No. 118, pp. 46-53. 1952. Philadelphia, Pa. |
| Sandwich construction in the elastic range. | March, H. W. | Am. Soc. Testing Materials Spec. Tech. Pub. No. 118, pp. 32-45. 1952. |
| *Edgewise compressive strength of panels and flatwise flexural strength of strips of sandwich constructions. | Kuenzi, E. W. | FPL Rept. 1827. 1950. Information Reviwed and Reaffirmed 1958. |
| *Effects of shear deformation in the core of a flat rectangular sandwich panel:<br>1. Buckling under compressive end load.<br>2. Deflection under uniform transverse load. | March, H. W. | FPL Rept. 1583. 1948. Information Reviewed and Reaffirmed 1960. |

| Title | Author | Publication and date |
|---|---|---|
| | Properties (continued) | |
| *Supplement: Stiffness of flat panels of sandwich construction subjected to uniformly distributed loads normal to their surfaces--simply supported edges. | Kommers, W. J., & Norris, C. B. | FPL Rept. 1583-A. 1948. Information Reviewed and Reaffirmed 1962. |
| *Supplement: Compressive buckling of sandwich panels having facings of unequal thickness. | Ericksen, W. S., & March, H. W. | FPL Rept. 1583-B. Revised 1958. |
| *Supplement: Deflection under uniform load of sandwich panels having facings of unequal thickness. | Ericksen, W. S. | FPL Rept. 1583-C. 1950. Information Reviewed and Reaffirmed 1962. |
| *Supplement: Deflection under uniform load of sandwich panels having facings of moderate thickness. | Ericksen, W. S. | FPL Rept. 1583-D. 1951. Information Reviewed and Reaffirmed 1958. |
| *Effect of defects on strength of aircraft type sandwich panels. | Mohaupt, A. A., & Heebink, B. G. | FPL Rept. 1809. 1949. Information Reviewed and Reaffirmed 1962. |
| *Supplement. | Mohaupt, A. A., & Heebink, B. G. | FPL Rept. 1809-A. 1949. Information Reviewed and Reaffirmed 1958. |

## SPECIES

### *American Woods

Alder, red
Baldcypress
Beech, American
Buckeye
Butternut
Cedar, Alaska
" , incense-
" , eastern red-
" , northern white-
" , Port Orford white-
Cherry, black
Chestnut
Douglas-fir
Fir, balsam
" , noble
" , white
Hackberry
Hemlock, eastern
" western
Holly, American
Larch, western
Locust, black
Maple
Oaks
Osage-orange
Pecan
Persimmon
Pine, eastern white
" , jack
" , ponderosa
" , red
Pine, southern
" sugar
" western white
Poplar, balsam
Redwood
Spruce, Sitka
Sweetgum
Sycamore, American
Tamarack
Tupelo
Walnut, black
Willow, black
Yellow poplar

| Species | Title | Author | Publication and date |
|---|---|---|---|
| | **American Woods (continued)** | | |
| Aspen | Mechanical properties of aspen. | Johnson, R. P. A. | Lake States (University Farm, St. Paul 1, Minn.) Aspen Rept. No. 7, July 1947. |
| Elm | *Southern hard elm strength properties compare favorably with rock elm. | Dohr, A. W. | South. Lbrmn. 187(2345):187-188, Dec. 15, 1953. |
| | *Southern hard elms as substitutes for rock elm. | Baudendistel, M.E. & Paul, P. H. | South. Lbrmn. 169(2129):211-215, Dec. 15, 1944. |

| Species | Title | Author | Publication and date |
|---|---|---|---|
| | **American Woods (continued)** | | |
| Fir | *Some physical and mechanical properties of noble fir. | Paul, B. H., Dohr, A. W., & Drow, J. T. | FPL Rept. 2168. 1959. |
| | *California red fir compares favorably with other western species. | Drow, J. T., & Ericksen, L. N. | Calif. Lumber Merchant, Dec. 1, 1947. |
| | Properties of white fir and their relation to the manufacture and uses of wood. | Johnson, R. P. A., & Brundage, M. R. | USDA Tech. Bull. 408. 1934. Out of Print. |
| Hawaiian | *Physical, mechanical, and other properties of five Hawaiian woods. | Youngs, R. L. | FPL Rept. 2191. 1960. |
| Hemlock | *Properties of western hemlock and their relation to uses of the wood. | Johnson, R. P. A., & Gibbons, W. H. | USDA Tech. Bull. 139. 1929. |
| Hickory | *A tone test for hickory. | Heck, G. E. | South. Lbrmn. 179(2249):268, 270, Dec. 15, 1949. |
| | *The quality of Appalachian hickory. | Paul, B. H. | South. Lbrmn., Apr. 6, 1929. |
| Larch | Strength of western larch and its suitability for poles. | Drow, J. T. | Timberman 50(9): 94, 96, July 1949. |
| | Properties of western larch and their relation to uses of the wood. | Johnson, R. P. A., & Bradner, M. I. | USDA Tech. Bull. 285. 1932. Out of Print. |

| Species | Title | Author | Publication and date |
|---|---|---|---|
| | American Woods (continued) | | |
| Oak | *Some properties of California white oak and Oregon white oak. | Paul, B. H., Dohr, A. W., & Drow, J. T. | FPL Rept. 2135. 1958. |
| Pine | *Mechanical properties of Coulter pine from California. | Dohr, A. W. | FPL Rept. 2102. 1958. |
| | *Mechanical properties of ponderosa pine from the Black Hills. | Drow, J. T., Dohr, A. W., & Bellosillo, S. | FPL Rept. 2090. 1957. |
| | *Strength of Virginia pine established. | Dohr, A. W. | South. Lbrmn. 181(2273):225-226, Dec. 15, 1950. |
| | *The white pine group. | | FPL Tech. Note 215. 1957. |
| Redwood | *The strength and related properties of redwood. | Luxford, R. F., & Markwardt, L. J. | USDA Tech. Bull. 305. 1932. |
| Spruce | *Mechanical properties of Engelmann spruce. | Drow, J. T. | FPL Rept. 1944-4. Revised 1960. |
| Tanoak | *Specific gravity, shrinkage, and strength of tanoak. | Paul, B. H., Dohr, A. W., & Drow, J. T. | FPL Rept. 2041. 1955. Information Reviewed and Reaffirmed 1960. |
| Yellow poplar | *Survey of strength and related properties of yellow-poplar. | Luxford, R. F., & Wood, L. W. | FPL Rept. 1516. Revised 1953. Information Reviewed and Reaffirmed 1959. |

| Species | Title | Author | Publication and date |
|---|---|---|---|
| | **American Woods (continued)** | | |
| General | *"Virgin growth" and "second growth." | | FPL Tech. Note 153. 1957. |
| | *Differences between heartwood and sapwood. | | FPL Tech. Note 189. Reissued 1962. |
| | **Foreign Woods** | | |

Leaflets on the following foreign woods are issued by the Forest Service, U.S. Department of Agriculture:

| | | | | |
|---|---|---|---|---|
| *Balsa | *Greenheart | *Khaya | *Lignumvitae | *Teak |
| *Braxilian araucaria | *Iroko | *Lauans | *Mahogany | |

Other general reports on foreign woods issued by the Forest Products Laboratory are named in the list of publications on the structure and identification of wood described on page 79.

| Species | Title | Author | Publication and date |
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| | **Foreign Woods** | | |
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## OTHER PUBLICATION LISTS ISSUED BY

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The following lists of publications which deal with the other investigative projects of the Forest Products Laboratory are obtainable upon request:

Boxing and Crating--Strength and serviceability of shipping containers, methods of packing.

Building Construction Subjects--Partial list of Government publications of interest to architects, builders, engineers, and retail lumbermen.

Chemistry of Wood and Derived Products--Chemical properties and uses of wood products, such as turpentine, alcohol, and acetic acid.

Fire Protection--Fire test methods, fire retarding chemicals and treatments, and fire behavior of treated and untreated wood, wood products, and wood structures.

Fungus Defects in Forest Products--Decay, stains, and molds in timber, buildings, and various wood products; antiseptic properties of protective materials.

Furniture Manufacturers, Woodworkers, and Teachers of Wood Shop Practice--Partial list of Government publications on growth, structure, and identification of wood; moisture content, physical properties, air seasoning, and kiln drying; grading, manufacturing, and waste utilization; strength and related properties and joints and fastenings; glues and gluing, veneer and plywood fabrication; box and crate construction.

Glue and Plywood--Development of waterproof glues, preparation and application of various glues, plywood manufacturing problems.

Growth, Structure, and Identification of Wood--Structure and identification of wood; the effect of cellular structure of wood on its strength, shrinkage, permeability, and other properties; the influence of environmental factors, such as light, soil, moisture, and fire, on the quality of wood produced; and secretions of economic value produced by trees and their exploitation.

## OTHER PUBLICATION LISTS ISSUED BY

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Pulp and Paper--Suitability of various woods for pulp and paper, fundamental principles underlying the pulping and bleaching processes; methods of technical control of these processes; relation of the chemical and physical properties of pulps and the relation of these properties to the papermaking qualities of the pulps; waste in the industry, for example, decay in wood and pulp, utilization of bark, white water losses, etc.

Seasoning of Wood--Experimental and applied kiln drying, physical properties, air drying, steam bending.

Structural Sandwich, Plastic Laminates, and Wood-Base Aircraft Components--Strength, selection, and character of aircraft wood, plywood, and wood and composite laminated and sandwich materials; fabrication and assembly problems; methods of calculating the strength.

Thermal Properties of Wood--General information and the results of research on how wood is affected by and transmits heat.

Wood Finishing Subjects--Effect of coatings in preventing moisture absorption; painting characteristics of different woods, and weathering of wood.

Wood Preservation--Preservative materials and methods of application; durability and service records of treated and untreated wood in various forms.

Note: Since Forest Products Laboratory publications are so varied in subject matter, no single big list is issued. Instead, a list is made up for each Laboratory division. Twice a year, December 31 and June 30, a list is made up showing new reports for the previous 6 months. This is the only item sent regularly to the Laboratory's mailing list. Anyone who has asked for and received the proper subject lists and who has had his name placed on the mailing list can keep up to date on Forest Products Laboratory publications. Each subject list carries descriptions of all other subject lists.

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