

**List of Publications on
GLUE, GLUED PRODUCTS, AND VENEER**

May 1951



No. R513

**UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
FOREST PRODUCTS LABORATORY
Madison 5, Wisconsin
In Cooperation with the University of Wisconsin**

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This list includes publications that present the results of research by the Forest Products Laboratory on the development of waterproof glues, preparation and application of various glues, plywood manufacturing problems, etc.

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INSTRUCTIONS FOR OBTAINING PUBLICATIONS

Publications available for distribution at this Laboratory are marked with an asterisk (*).

Single technical notes, reprints, and processed reports may be obtained free upon request from the Director, Forest Products Laboratory, Madison 5, Wisconsin.

Federal Government bulletins, circulars, and leaflets, if not available for free distribution at this Laboratory, may be purchased at the price indicated from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Send money order, draft, or cash; stamps or personal checks are not accepted.

Trade journals containing articles herein listed may often be purchased from the publishers or may be consulted in various libraries.

The Forest Products Laboratory reserves the right to furnish only those publications which in its judgment will give the information requested. Blanket requests or requests for a large number of copies of any individual article will not be filled except in unusual cases.

TYPES OF GLUES AND THEIR CHARACTERISTICS

Technical Notes

- *F-2 Strength of commercial liquid glues.
- *F-4 Water-resistant glues.
- *104 Overheating reduces strength of animal glue.
- *146 Occurrence and removal of glue stains.
- *170 Copper salts improve casein glue.
- *202 Water-resistant cold press blood albumin glue.
- *207 Glues for use with wood.
- *223 A factory method for testing hardness of glue joints.

Processed Reports

- *R30 Vegetable glue. Revised May 1950.
- *D280 Casein glues: their manufacture, testing, and preparation. Revised May 1950.
- *R281-2 Blood albumin glues: their manufacture, preparation, and application. Revised July 1938.
- *D492 Animal glues: their manufacture, testing, and preparation. Revised December 1948.
- *1333 Analysis for filler content of urea-formaldehyde glues. Sept. 1944.
- *1336 Synthetic-resin glues. Revised January 1948.
- *1337 Glues for use in aircraft. October 1941.
- *1350 Tests to determine the slipping properties of bag-molding glues in fluid stage. May 1943.
- *1352 Determination of degree of cure of low-temperature phenolic-resin glues by solubility methods. September 1943.
- *1532 Stability of low-temperature-setting phenol, resorcinol, and melamine resin adhesives stored at 80° F. Revised January 1947.
- *R1691 Polyvinyl-resin emulsion woodworking glues: a study of some of their properties, October 1947.

Articles in Trade and Technical Press

Glues for use in building construction, by Don Brouse. Presented at the Second Annual School for Building Inspectors, Chicago, Ill., April 25-29, 1948.

*Polyvinyl-resin emulsion woodworking glues: a study of some of their properties, by W. Z. Olson and H. D. Bruce. Southern Lumberman, Oct. 1, 1947. Report No. R1691.

*Water-resistant animal glue, by F. L. Browne and C. E. Hrubesky. Indus. & Eng. Chem., Feb. 1927. Same: Report R40, revised 1933.

Technologically useful properties of casein, by F. L. Browne. Colloid Chemistry (edited by Alexander, V. 4, pp. 399-441), 1932.

Consistency of animal glue, by Don Brouse. Indus. & Eng. Chem., Mar. 1929.

*The significance of mechanical wood joint tests for the selection of wood-working glues, by T. R. Truax, F. L. Browne, and Don Brouse. Indus. & Eng. Chem., Jan. 1929. Report R1111.

Casein glue, by F. L. Browne. In Casein & Its Industrial Applications, by Edwin Sutermeister, pp. 169-219, 1927.

Which glue will give me the least knife trouble; a question answered by this factor method of measuring the hardness of glue joints, by Don Brouse. Wood Working Indus., Mar. 1926.

Hard water and glue mixtures, by F. L. Browne. Veneers, January 1925.

Glues for manual training work, by T. R. Truax. Indus. Education Magazine, March 1924.

What makes glue stick, by Eloise Gerry and T. R. Truax. Scientific American, Aug. 1923.

Same: Effect of wood structure on glue penetration. Furn. Mfr. & Artisan, April 1922.

Hydroscopicity of hide glues and the relation of tensile strength of glue to its moisture content, by E. Bateman and G. G. Town. Indus. & Engr. Chem., April 1923.

GLUING OF WOOD

Technical Notes

- *193 Starved glue joints.
- *211 Strong and weak glue joints.
- *236 Glues for wood in archery.
- *227 Tooth-planing or sanding not necessary to effect strong glued wood joints.
- *232 Chemical treatment of surfaces improves glue joints in certain woods.

Processed Reports

- *D475 Drying and conditioning of glued joints. Revised August 1948.
- *R869 Important factors in gluing with animal glue.
- *1340 Control of conditions in gluing. Revised April 1950.
- *1342 The gluing characteristics of 15 species of wood with cold-setting urea-resin glues. 1950.
- *1351 Preliminary experiments to improve the gluing characteristics of refractory plywood surfaces by sanding. June 1943.
- *R1422 Rate of setting of cold-setting urea resin glue joints. 1950.
- *R1427 Effect of fire-retardant chemicals on glues used in plywood manufacture. March 1943.
- *R1484 Experiments on the gluing of wood treated with oil solutions of chlorophenols. May 1945.
- *1531 Gluing with low-temperature-setting phenol, resorcinol, and melamine glues; Development of joint strength in birch plywood cured at several temperatures for various periods of time. With appendix on additional resin glues. Revised April 1946.
- *1534 Effect of moisture content of wood on joint strength in gluing birch veneer and maple lumber with room-temperature-setting and intermediate-temperature-setting phenol, resorcinol, and melamine glues. May 1945.
- *1541 Bleed-through of glue in aircraft plywood. November 1944.
- *1542 Strength of joints in hard maple blocks, glued with certain resin glues, after various open and closed assembly periods. May 1946.
- *1546 Variation in maximum allowable assembly time with age in the pot at time of spreading for four resin glues. September 1946.

Processed Reports (Cont'd)

- *1547 Rate of development of joint strength by four resin glues on eight species of wood. September 1946.
- *R1629 Curing of resorcinol-resin glues at temperatures from 40° to 80° F. September 1946.
- *R1670 Effect of clamp spacing on the quality of glue bonds in laminated white oak timbers glued with an intermediate-temperature-setting, phenol-resin glue. July 1947.

Articles in Trade and Technical Press

- Some tests on the gluing characteristics of four California species: chinquapin, tanoak, laurel, and madrone, by W. Z. Olson. Calif. Lbr. Merchant, July 1949.
- The gluing of wood, by Don Brouse. U.S.D.A. Yearbook of Agriculture 1949: p. 636-639.
- *Gluing of plywood to concealed framing members with high-frequency, stray-field heating, by E. R. Bell and M. E. Dunlap. Prefabricated Homes, 8(2):15-17, 28-29, Mar.-Apr. 1947. R1694.
- Moisture content and gluing: the effect of moisture content of wood on joint strength in gluing birch veneer and maple lumber with room-temperature-setting and intermediate-temperature-setting phenol, resorcinol, and melamine glues, by W. Z. Olson. South. Lbrmn., Feb. 1, 1947.
- *Glues and gluing in prefabricated house construction, by G. N. Arneson. Miss. Valley Lbrman., May 10, 17, 1946; Cosgrove's Mag., May-June 1946.
- Development of wood adhesives and gluing technic, by T. R. Truax. In Amer. Soc. Mech. Engr., Wood Indus. Div., Trans., 54(4):1-4, 1932.
- Adhesion in the painting and in the gluing of wood, by F. L. Browne. Indus. & Eng. Chem., Mar. 1931.
- *Removing "weak link" in millwork: When properly made, glue joints can be made as strong as wood itself in most respects, by T. R. Truax. Wood Working Indus., May 1930.
Same: Glue Practice. Timberman, May 1930.
- Gluing Pacific Coast woods, by T. R. Truax and C. A. Harrison. West Coast Lumberman, May 15, 1928.
- Gluing wood in aircraft work, by T. R. Truax. Amer. Soc. Mech. Engr., Aeronautics Div., Transactions, pp. 61-4, 1928.
- Conditions affecting the making of glued joints, by T. R. Truax. Furn. Mfr., & Artisan, May 1924.

Additional Government Publications

Gluing wood in aircraft manufacture, by T. R. Truax. U. S. Dept. Agr. Tech. Bul. 205. 1930. 25 cents.

The gluing of wood, by T. R. Truax. U. S. Dept. Agr. Bul. 1500. 1929. 25 cents.

GLUING OF MATERIALS OTHER THAN WOOD (metals, plastics, etc.)

Processed Reports

- *1346 Gluing of thin compreg. Revised December 1946.
- *1348 The gluing of laminated paper plastic (papreg). Revised January 1944.
- *1545 Resistance to fatigue stressing of wood-to-metal joints glued with several types of adhesives. August 1946.
- *1548 Tensile strength at elevated temperature of glued joints between aluminum and end-grain balsa. September 1946.
- *1569 Investigation of methods of inspecting bonds between cores and faces of sandwich panels of the aircraft type. September 1947.
- *1574 Fabrication of lightweight sandwich panels of the aircraft type. June 1947.
- *R1768 Adhesives for bonding wood to metal, by H. W. Eickner & R. F. Blomquist. February 1951.
- *1813 A study of methods for preparing clad 24S-T3 aluminum-alloy sheet surfaces for adhesive bonding. May 1950.
- *1813-A A study of methods for preparing clad 24S-T3 aluminum-alloy sheet surfaces for adhesive bonding: Pt. 3-- Effect of cleaning method on resistance of bonded joints to salt-water spray, by H. W. Eickner. December 1950.

Articles in Trade and Technical Press

Evaluation of several adhesives and processes for bonding sandwich constructions of aluminum facings on paper honeycomb core, by H. W. Eickner. National Advisory Committee for Aeronautics Technical Note 2106. May 1950.

DURABILITY OF GLUES

Processed Reports

- *Z1294 Effect of extending hot-press, urea-resin glue with rye flour on strength and durability of the glue joints. April 1942.
- *1332 Increasing the durability of casein glue joints with preservatives. October 1943.
- *1339 Effects of elevated curing temperatures on the strength and durability of yellow birch plywood joints made with room-temperature-setting urea glues. November 1945.
- *1345 Effect of high and low temperatures on resin glue joints in birch plywood. Revised January 1944.
- *1355 A comparison of the durability of 23 urea resins in glue joints exposed to nearly saturated air at 75° C. (167° F.). Sept. 1946.
- *R1447 Experiments with preservatives for soybean glue and soybean-glued plywood. March 1944.
- *1530 Summary of information on the durability of woodworking glues. Revised December 1946.
- *1533 Experiments to develop a rapid durability test for urea-resin glues. February 1945.
- *1537 Durability of room-temperature-setting and intermediate-setting resin glues cured to different degrees in yellow birch plywood. Revised December 1947.
- *1538 Durability of papreg-to-papreg and papreg-to-birch glued joints. Revised August 1950.
- *1539 Resistance of several types of glue in wood joints to fatigue stressing. March 1946.
- *1549 Effect of boiling for various periods of time on the strength of joints in birch plywood bonded with urea glue fortified with varying amounts of melamine and resorcinol. December 1946.
- *1566 Durability of glued joints between aluminum and end-grain balsa. 1950.
- *1568 Durability of plywood joints made with one melamine, one urea, and five resorcinol resin glues. October 1947.

Processed Reports (Cont'd.)

- *1570 Durability of glued wood-to-metal joints -- 1st progress report. June 1947.
- *1573 Durability of low-density core materials and sandwich panels of the aircraft type as determined by laboratory tests and by exposure to the weather. May 1947.
- *1573-A Same title, Pt. 2, July 1949.
- *1573-B Same title, Pt. 3, July 1950.
- *R1616 Effect of thickness of glue line on strength and durability of glued wood joints. September 1946.
- *D1729 Results of accelerated tests and long-term exposures on glue joints in laminated beams. October 1948.
- *R1748 Effect of alkalinity of phenol- and resorcinol-resin glues on durability of joints in plywood, by R. F. Blomquist. Aug. 1949.
- *R1789 Summary of information on gluing of treated wood. December 1950.

Articles in Trade and Technical Press

- *Durability of woodworking glues for dwellings, by M. L. Selbo. Forest Products Research Society Proceedings, 1949.
- Tests on the durability of woodworking glues, by F. F. Wangaard. Southern Lumberman, 174(2184):63-64, 66, 68, 70, 74, April 1, 1947.
- *Procedures for measuring the mold resistance of protein glues, by F. H. Kaufert and C. A. Richards. Wood Products, Oct. 1943. FPL Report 1344, 1950.
- The effects of treatments with wood preservatives and fire-retarding chemicals on the glue joints in birch plywood, by J. O. Elew. AWPA Proc. 1946.
- Controlled exposure tests on birch plywood indicate durability of water resistant glue joints, by Don Brouse. Mech. Eng., November 1938.
- *Serviceability of glue joints, by Don Brouse. Mech. Eng., April 1938. FPL Report No. R1172.
- Behavior of casein and blood glue joints under different conditions of exposure, by Don Brouse. Furn. Mfr., Sept. 1934; Wood Products, Oct. 1934.
- Increasing the durability of plywood, by Don Brouse. Mech. Engineering, Sept. 1931.
- Same: Tests made to increase durability of plywood. Furn. Mfr., June 1932.
- Methods of increasing durability of plywood. Wood Working Indus., Feb. 1932.

Articles in Trade and Technical Press (Cont'd.)

- *Age and strength of glue joints, by Don Brouse. Furn. Mfr., July 1931; Wood Working Indus., June 1931; Hardwood Record, Aug. 1931; Wood Products, Aug. 1931.

PLYWOOD AND VENEERED PANELS

Technical Notes

- *131 Properties of ordinary wood compared with plywood.
- *149 Strength of screw fastenings in plywood.
- *197 Veneered and solid furniture.

Processed Reports

- *R543 Notes on the manufacture of flat plywood. Revised May 1950.
- *R1299 The rate of temperature change in wood panels heated between hot plates. August 1942.
- *R1406 Methods of computing the rate of temperature change in wood and plywood panels when the two opposite surfaces are maintained at different temperatures. January 1943.
- *1589 Estimating the specific gravity of plywood. June 1944.
- *1590 A specific gravity chart for large-sized thin plywood panels. June 1944.
- *R1615 Some causes of variability in the results of plywood shear tests. June 1946.
- *R1624 Fluid pressure molding of plywood. July 1946.
- *R1630 Approximate methods of calculating the strength of plywood. Revised August 1950.
- *1785 Comparison of redwood and flat-grained yellow-poplar for cores in furniture panels, by E. C. Peck and M. L. Selbo. December 1950.
- *R1788 Mandrel bending tests for aircraft veneer, by M. Y. Pillow. December 1950.
- *R1822 Moisture-excluding effectiveness of edge seals for aircraft sandwich panels, by B. G. Heebink. December 1950.

Articles in Trade and Technical Press

- Effect of plywood glue lines on the accuracy of moisture-meter indications, by E. R. Bell and N. T. Krueger. Forest Products Research Society Proc., 1949.
- *Fire tests show resistance of plywood wall units, by G. C. McNaughton and C. A. Harrison. Wood Construction, April 15, 1941; Amer. Bldr. & Bldg. Age, June 1941. FPL Report R1257.
- *Some causes of warping in plywood and veneered products, by Don Brouse. Wood Products, Oct. 1940. FPL Report R1252.
- Plywood in relation to the veneer package industry, by C. V. Sweet. Wood Products, December 1939.
- Resin-treated plywood, by A. J. Stamm and R. M. Seborg. Indus. & Eng. Chem., July 1939.
- Developments in plywood, by C. P. Winslow. Timberman, November 1938.
- Plywood progress at the Forest Products Laboratory, by F. J. Champion. Amer. Bldr. & Bldg. Age, November 1938.
- *Fabricated wall panels with plywood coverings, by R. F. Luxford. Timberman, February 1936. FPL Report No. R1099.
- *Plywood as a structural covering for frame walls and wall units, by G. W. Trayer. Eng. News-Record, August 1934; FPL Report No. R1025.
- *Floor panels with stressed plywood coverings, by G. W. Trayer. Eng. News-Record, August 1934. FPL Report R1026.
- *Twisted plywood panels, by T. R. Truax and Don Brouse. Wood Working Indus., June 1931; Furn. Mfr., June 1931; Wood Products, June 1931; Hardwood Record, July 1931.
- Why modern furniture is veneered, by T. R. Truax. Good Housekeeping, March 1929.
- Western woods for cores in veneered panels, by T. R. Truax. Furn. Mfr. & Artisan, November 1923; Timberman, November 1923.

LAMINATED WOOD AND GLUED ASSEMBLIES

Technical Notes

- *140 Stresses in laminated wood construction.
- *244 How to make a laminated diving board.

Processed Reports

- *R1232 Durability of glued laminated barn rafters. Revised April 1945.
- *1434 Rate of temperature change in laminated timbers heated in air under controlled relative humidity conditions. September 1943.
- *R1485 Some methods of gluing light laminated or plywood curved shapes from veneer. June 1945.
- *R1611 Laminated oak frames for a 50-foot Navy motor launch compared to steam-bent frames. October 1946.
- *R1622 End joints of various types in Douglas-fir and white oak compared for strength. August 1946.

Processed Reports (Cont'd)

- *D1635 Manual on the laminating of structural wood products by gluing.
Revised October 1948.

- *R1686 Shear strength and accelerated durability tests on glue joints in laminated red oak beams applicable to such uses as truck bodies, wagons, and implement parts. October 1947.

- *R1687 Tests of glued laminated wood beams and columns and development of principles of design. November 1947.

- *R1713 Effect of width and thickness of laminations in laminated white oak beams upon the strength and durability of the glue bond. June 1948.

- *R1714 Durability of resorcinol glue bonds in gusset-type assembly joints similar to those used in wood boats. May 1948.

- *R1718 Effect of mixing flat and vertical grain in laminated white oak beams. June 1948.

- *D1729 Results of accelerated tests and long-term exposures on glue joints in laminated beams. October 1948.

- *R1749 Summary -- Studies of the strength of glued laminated wood construction. August 1949.

Articles in Trade and Technical Press

Glue joints durable in beams laminated of common lumber, by M. L. Selbo.
South. Lbrman. 179(2244):60, 62, Oct. 1, 1949.

Laminating lumber for extreme service conditions, by C. D. Dosker and A. C. Knauss. Mech. Engrs., December 1944.

*Laminating structural timbers: Some words of caution, by G. M. Hunt.
South. Lbrman., April 1, 1944. Report R1449.

Additional Government Publications

The glued laminated wooden arch, by T. R. C. Wilson. U. S. Dept. Agr.
Tech. Bull. 691. 1939. 20¢.

VENEER

Processed Reports

- *1397 A rapid method of determining the specific gravity of veneer. May 1943.
- *R1666-4 Reduction of waste in the veneer and plywood industry. June 1947.

Veneer cutting and drying properties:

- *Water oak. FPL Report No. D1766-1, May 1950.
- *Red alder. FPL Report No. D1766-2, May 1950.
- *Cottonwood. FPL Report No. D1766-3, December 1950.
- *Western larch. FPL Report No. D1766-4, April 1951.

Articles in Trade and Technical Press

- *The suitability of second-growth Douglas-fir logs for veneer, by H. O. Fleischer. Jour. Forestry 47(7):533-37, July 1949.
- Experiments in rotary veneer cutting, by H. O. Fleischer. Forest Products Research Society Proc. 1949. Wood 4(9):22-24, 57, September 1949, 4(10):20-22, October 1949.
- *Heating veneer logs, by H. O. Fleischer. Wood. March 1948.
- *Design of heating equipment for veneer logs. H. O. Fleischer. South. Lbrman. 177(2225):324-26, 328, 330. December 15, 1948.
- *Reeling veneer to increase efficiency and reduce waste, by H. O. Fleischer, South. Lumberman 175(2201):301-302, 304, illus., December 15, 1947.
- *Utilization of water oak for veneer, by H. O. Fleischer. South. Lbrman., December 15, 1946.
- Veneer clipper safety guard, by L. A. Mueller. Timberman, October 1945; Wood Products, October 1945.
- *Waste in veneer manufacture, by E. M. Davis. Furn. Mfr., May 1945; Timberman, March 1945; Timber Topics, March-April 1945. FPL Report No. R1493.
- *Short assembly periods reduce veneer expansion, by Don Brouse. Wood Working Indus., June 1931; Wood Products, July 1931; Furn. Mfr., Aug. 1931.
- *Manufacture of veneer, by T. R. Truax. Hardwood Record, April 10, 1924. FPL Report R285, revised May 1950.

RELATED PUBLICATIONS

Technical Notes

- *240 A hundred definitions pertaining to wood and other forest products

Processed Reports

- *R399 Some books on wood (a list). Revised May 1950.
- *1343-A Summary of a study of temperatures attained in a dummy aircraft wing during the summer at Madison, Wis. January 1943.

Processed Reports (Cont'd)

- *1343-B A study of temperatures attained in a dummy aircraft wing during the summer at Madison, Wis. January 1943.
- *1398 A rapid method of estimating the approximate specific gravity of wood. Revised July 1946.
- *R1465 Wood in the national economy. November 1944.
- *R1479 Some reference books on domestic and foreign woods. 1950.
- *1569 Investigation of methods of inspecting bonds between cores and faces of sandwich panels of the aircraft type. September 1947.
- *1584 Repair of aircraft sandwich constructions. May 1948.
- *1584-A Supplement to repair of aircraft sandwich constructions, by A. A. Mohaupt and B. G. Heebink. May 1950.
- *1585 Guide to determining slope of grain in lumber and veneer. Sept. 1943.
- *1592 Instruments for rapidly measuring slope of grain in lumber. June 1945.
- *1597 Study of temperature and moisture content in wood aircraft wings in different climates. February 1944.
- *R1667 Lumber waste and furniture manufacturing. February 1947.

Articles in Trade and Technical Press

- The prefabricated house, by R. F. Luxford and F. A. Strenge. U.S.D.A. Yearbook of Agriculture 1949, p. 633-636.
- Opportunities of forest products research on glues, gluing, and glued wood products, by G. N. Arneson. Natl. Farm Chemurgic Council (Columbus, Ohio) Paper 510, 3 p., 1946.
- Temperatures obtained in timbers when the surface temperature is changed after various periods of heating, by J. D. MacLean. AWPA Proc. 42-87-139, 1946.
- *Wood research pays high dividends, by C. P. Winslow. Timberman, February 1945; West Coast Lbrman., February 1945. FPL Report R1492.
- *Possible uses of improved woods and wood-base plastics in the furniture industry, by A. J. Stamm. Wood Products, January 1945; Furn. Mfr., February 1945; Retailing Home Furnishings, December 18, 1944. FPL Report R1482.
- Resin-treated, laminated, compressed wood, by A. J. Stamm and R. M. Seborg. Amer. Institute of Chem. Engrs. Jour., June 25, 1941.
- Recent developments in timber construction and use, by L. J. Markwardt. Eng. Soc. of Wisconsin Proc., 1940.

Articles in Trade and Technical Press

The antishrink treatment of wood with synthetic resin-forming materials and its application in making superior plywood, by A. J. Stamm and R. M. Seborg. South. Lbrman., December 15, 1938.

*Chestnut as a core wood, by G. C. Morbeck. Furn. Mfr., October 1930.
Same: Chestnut highly suitable as core stock wood. Wood Working Indus. October 1930.
Wood Construction, October 15, 1930.
Millwork, October 1930.

Precautions against wood staining, by F. L. Browne. Veneers, April-May 1928.

Methods for cutting and differential staining of microscopic sections of hardwood glue joints, by A. L. Weinstein. Natl. Symposium on Colloid Chemistry, Colloid Symposium Monograph, V. 4, pp. 270-89. 1926.

The place of adhesion in the gluing of wood, by F. L. Browne and T. R. Truax. Natl. Symposium on Colloid Chemistry, Colloid Symposium Monograph, V. 4, pp. 258-69, 1926.

Additional Government Publications

Manual on Wood Construction for Prefabricated Houses. Prepared by Forest Products Laboratory. December 1947. Available from Superintendent of Documents, Washington 25, D. C. \$1.50.

Wood: A Manual for Its Use in Wooden Vessels. Prepared by Forest Products Laboratory. July 1945. Available from Superintendent of Documents, Washington 25, D. C., \$1.50.

Wood Handbook (basic information on wood as a material of construction with data for its use in design and specifications), by the Forest Products Laboratory -- includes a chapter on glued wood construction. U. S. Dept. Agr. unnumbered publication. 1935. Slightly revised edition 1940. 75 cents.

The Forest Products Laboratory, a brief account of its work and aims. U. S. Dept. Agr. Misc. Circ. 306. 1938. 15 cents.

*The Forest Products Laboratory. A 16-page pictorial outline of the activities of this research institution.

ANC-19 "Wood Aircraft Inspection and Fabrication," prepared by the Forest Products Laboratory. \$1.00. 1944.

OTHER PUBLICATION LISTS ISSUED BY THE
FOREST PRODUCTS LABORATORY

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, retail lumbermen, and engineers.

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

Fungus Defects in Forest Products (Pathology in cooperation with the Bureau of Plant Industry, Soils, and Agricultural Engineering) -- Heart rots of trees; decay, molds, and stains in timber, in buildings, and in wood products; antiseptic properties of wood preservatives.

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.

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.

Logging, Manufacture, and Utilization of Timber, Lumber, and Other Wood Products -- Methods and practices in the lumber-producing and wood-consuming industries; standard lumber grades, sizes, and nomenclature; production and use of small dimension stock; specifications for small wooden products; uses for little-used species and commercial woods, and low-grade and wood-waste surveys.

Mechanical Properties of Timber -- Strength of timber and factors affecting strength; design of wooden articles or parts where strength or resistance to external forces is of importance.

OTHER PUBLICATION LISTS ISSUED BY THE
FOREST PRODUCTS LABORATORY (continued)

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 paper making 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.

Use of Wood in Aircraft Construction -- Strength, selection, and character of aircraft wood and plywood; fabrication and assembly problems; methods of calculating the strength of wooden parts; structure of wood in relation to its properties and identification.

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

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