A WOOD-SENSING ELEMENT FOR TENSION-TYPE HYGROSTATS USED IN NEAR-SATURATION HUMIDITIES

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A WOOD-SENSING ELEMENT FOR TENSION-TYPE HYGROSTATS USED IN NEAR-SATURATION HUMIDITIES

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The Forest Products Laboratory operates a number of rooms in which temperature and relative humidity are controlled for the purpose of conditioning wood and wood-product test specimens to selected moisture content values. Since these specimens are used in controlled experiments, it is important that their moisture content be brought to the selected values. This requires that the temperature and relative humidity of the rooms be reliably maintained at near-constant levels.

In order to accomplish this objective, the rooms are equipped with humidity-control systems using compressed air for operation of the control valves. Dimensional change of the sensing elements in the hygrostats regulates air-leakage ports or nozzles that correspondingly operate air valves controlling diaphragm valves on the water spray lines.

Various sensing elements, including hair, animal skin, tubular wood, and horn, have been used with success in lower humidities, but with only moderate success in relative humidities of 90 percent and above. Of these types, the horn element has proved the most generally satisfactory. However, it is fragile and easily broken, and in high humidities it is short-lived and requires frequent adjustments.

The need for a more reliable sensing element for very humid conditions led to trials of a hygroscopic wood element that proved to be very durable and sensitive to moisture changes under these conditions, and which can be used in the tension type of hygrostat. This new element, shown

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[1] Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

in figure 1, is similar to several types described previously in Forest Products Laboratory Reports R1140 and R1602, but of much thinner cross section. It consists of a piece of dense maple sapwood, free of defects, 1/32 inch thick by 5/8 inch wide by 2-1/2 inches long. The element is cut across the grain from a flat-sawn board in which the annual growth rings, viewed at the end of the board, are as straight and as nearly parallel with the longitudinal dimension of the element as possible. This grain orientation provides the maximum longitudinal dimensional change for a given change in humidity. The ends may be bound with copper or stainless steel clips fastened to the element with waterproof glue. The tension wires should be of stainless steel to prevent corrosion in the high humidities.

Growth of molds on the element can be prevented by immersing it in a 5 percent pentachlorophenol solution and drying it before it is installed. When a new element is installed, the adjusting time will be reduced if it has been previously conditioned in a room maintained at the conditions under which the element will be operating.

Relative humidities in excess of 90 percent tend to cause molding of the element. This has not been observed to affect its operation; nevertheless, avoidance of it probably is desirable.

The element described above has been used in the Laboratory 90 and 97 percent relative humidity rooms for the past 15 months. In both rooms accurate and steady conditions have been maintained within ± 1-1/2 percent of the prescribed humidity, with only occasional adjustments required during the entire period to compensate for dimensional changes occurring in the element. A typical 7-day chart is shown in figure 2. This type of element has also been in use for 9 months in the 65 percent relative humidity room, where it has performed equally well.

To summarize the advantages of the wood-element type of sensing element: (1) It is rugged, and only ordinary precautions are required in handling it or installing it in the controller; (2) it has a very long service life and operates dependably, with only occasional adjustment to compensate for drift; (3) its sensitivity is adequate for many of the Laboratory requirements in medium and low relative humdities, and it is particularly good in high relative humidities controlling within ± 1-1/2 percent; and (4) its initial cost is negligible.

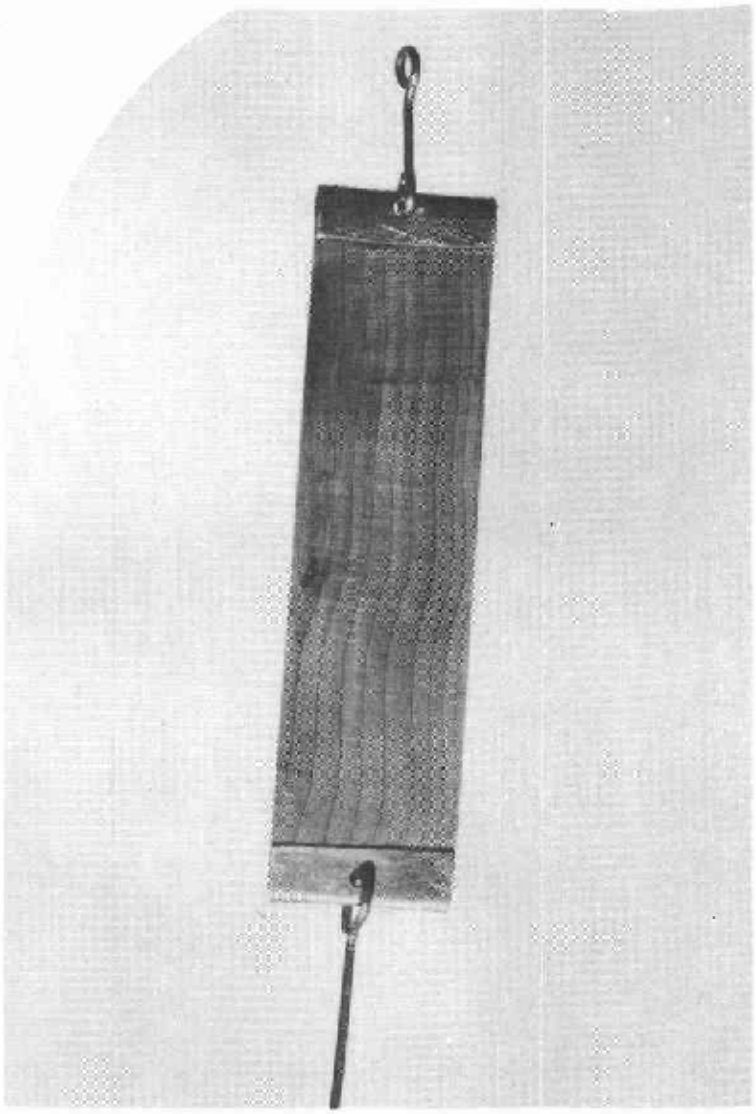

Figure 1.--Hygroscopic wood element used to control valves on water spray lines of Forest Products Laboratory humidity rooms.

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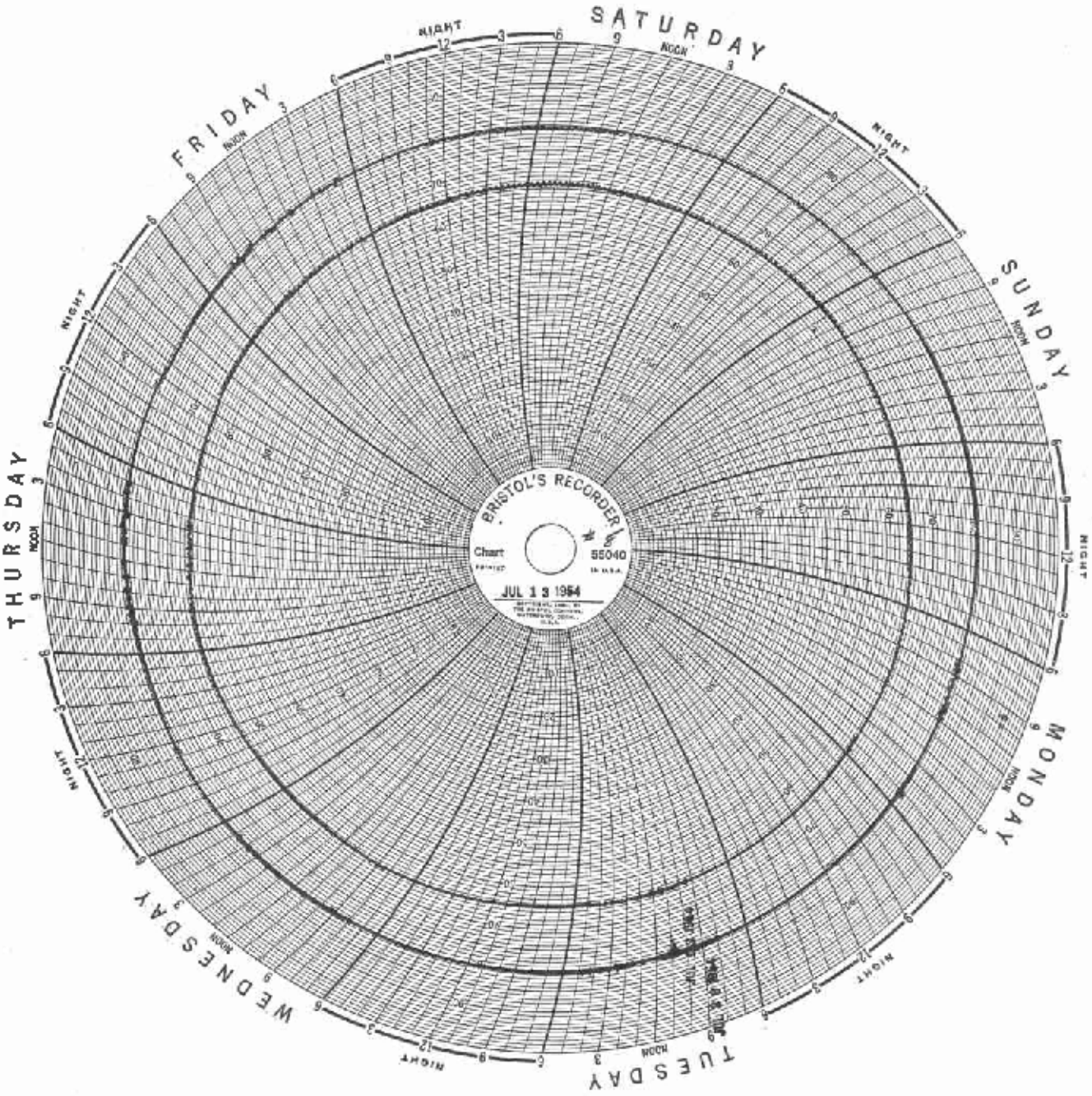

Figure 2.--Typical 7-day chart used to record relative humidity.

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PUBLICATION LISTS ISSUED BY THE FOREST PRODUCTS LABORATORY

The following lists of publications based on research at the Forest Products Laboratory (Madison 5, Wis.) are obtainable on request:

Boxing and Crating

Building Construction Subjects

Chemistry of Wood and Derived Products

Fungus Defects in Forest Products

Furniture Manufacturers, Woodworkers, and Teachers of Wood Shop Practice

Glue and Plywood

Logging, Manufacture, and Utilization of Timber, Lumber, and Other Wood Products

Mechanical Properties and Structural Uses of Wood and Wood Products

Pulp and Paper

Seasoning of Wood

Structure and Identification of Wood

Wood Finishing Subjects

Wood Preservation

Since Forest Products Laboratory publications are so varied in subject no single big list is issued. Instead a list is made up for each Laboratory division as shown above. Twice a year, 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. There is no charge for single copies of any of the reports.

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