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## VOLUME DETERMINATION OF GREEN WOOD SPECIMENS

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During the process of making specific gravity measurements on aspen wood in connection with research studies on the purchase of pulpwood on a weight basis, it was found that erroneous specific gravity values resulted when green aspen discs were not soaked prior to volume determinations. Specific gravity determinations of wood specimens are based on the oven-dry weight, divided by volume. Volume determinations can be made when specimens are oven-dry, green, or at any moisture content, depending upon the base desired. For the purpose of this paper it will be assumed that volume determinations of specimens in the green condition are desired.

If the wood specimen is perfectly regular in shape, linear measurements may be made and cubic volume computed from these, with the volume being equal to the product of the length and cross sectional area.

Volumes of all wood specimens, regular or irregular in shape may be determined by immersion in water, with volume being determined by the weight of the water displaced. TAPPI Standards, specify that green test specimens should be submerged in water at room temperature for at least one hour prior to the volume determination.<sup>2/</sup> Many laboratory procedures do not mention the need for pre-soaking, but specify that the weight of the displaced water should be obtained as quickly as possible after immersion of the green specimen. Wood specimens in the green condition are not fully saturated and there is a tendency for water to be absorbed even if the immersion time period is of short duration. This absorption will not affect the dimensions of the specimens since all of the wood is above the fiber saturation point.

Even though the following study was made on green aspen discs, it is equally as critical in any investigation involving the specific gravity determinations of wood where the green volume base is desired.

### Testing procedure:

Three volume determinations were made on each of ten one-inch thick aspen discs. Each disc was cut from the center of a freshly-cut 100-inch pulpwood stick. The three volume determinations were as follows:

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<sup>2/</sup> TAPPI Standards, T18m-53. Technical Association of the Pulp and Paper Industry, New York, New York.

1. Fresh-cut without pre-soaking, volume determinations being made as quickly as possible after immersion of the discs in water.
2. Pre-soaked in water for a time period of four hours prior to immersion for volume determinations.
3. Air dried for a two-day period prior to immersion for volume determinations, without pre-soaking.

By determining volumes on each of the ten discs by means of water displacement for each of the three test methods, the following volumes were obtained:

Condition of Discs	Volume (cubic centimeters)										Ave.
	Disc number										
	1	2	3	4	5	6	7	8	9	10	
Fresh-cut without pre-soak	570.5	468.7	319.5	428.7	433.3	289.2	327.6	616.1	949.8	1,301.2	571.5
Fresh-cut with pre-soak	582.8	480.5	328.0	433.1	444.9	305.5	332.6	634.9	975.5	1,339.4	585.7
Air dried without pre-soak	545.3	440.5	297.5	399.8	405.7	273.3	312.7	603.8	926.5	1,283.8	548.9

After volume determinations were completed on each of the ten sample discs, they were oven-dried at 105°C to constant weight. Then, using the oven-dry weights with each of the three determined volumes on each of the ten discs, specific gravities could be computed. Results are as follows:

Conditions of Discs	Specific Gravities										Ave.
	Disc number										
	1	2	3	4	5	6	7	8	9	10	
Fresh cut without pre-soak	.376	.362	.319	.420	.411	.359	.398	.379	.388	.428	.383
Fresh cut with pre-soak	.368	.353	.311	.416	.400	.339	.392	.358	.378	.415	.373
Air dried without pre-soak	.393	.385	.343	.450	.439	.379	.417	.377	.398	.433	.401

Specific gravities obtained when discs were pre-soaked average 2.7% and 7.6% less than specific gravities obtained when the discs were fresh cut without pre-soak and air dried without pre-soak, respectively. Volumes obtained by the three described methods show consistently that fresh-cut with pre-soaking gives the highest value, while air dried without pre-soaking, the lowest.

A conclusion which can be drawn from this test is that failure to pre-soak the disc specimens prior to immersion for volume determinations has the definite effect of decreasing the resultant volumes because water is absorbed during the time of immersion for volume determinations. The absorbed water is not recorded as displaced water and as a result the recorded volume is less than the true volume. Calculations of specific gravity will therefore be in error to the extent that the observed volume deviated from the true green volume of the specimen.