

THE EFFECT OF MOISTURE CONTENT  
ON THE BURSTING STRENGTH OF FIBERBOARD<sup>1</sup>

The bursting strength of fiberboard is influenced by the moisture content of the board which in turn varies with changes in the relative humidity of the surrounding air. The equilibrium moisture content of any one board at a given relative humidity depends on its previous drying or conditioning history. For example, air-dry kraft and jute fiberboards which were dampened and then allowed to desorb moisture to equilibrium at 50 percent relative humidity contained 9 percent moisture. When other samples of the material were oven dried and then allowed to absorb moisture to equilibrium at 50 percent relative humidity, the moisture content was 7.5 percent. This difference between desorption and absorption equilibrium moisture contents is the hysteresis phenomenon common to cellulosic materials.

When the kraft and jute fiberboards were subjected to a complete sorption cycle over the relative humidity range of 0 to 97 percent, it was found that moisture contents upon absorption were 80 to 85 percent of those upon desorption. Under these conditions, between 0 and 97 percent relative humidity, the maximum hysteresis, about 4 percent moisture content, occurred in the relative humidity range of 75 to 80 percent. This difference decreased as the range of the relative humidities of the conditioning cycle decreased.

The bursting strength of the kraft and jute fiberboards, when conditioned at several successive relative humidities ranging from 0 to 97 percent, increased with increasing moisture content up to approximately 7 percent

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<sup>1</sup>Boards laminated with waterproof adhesives or chemically treated to increase wet strength are not considered in this note.

moisture content which occurred at 40 percent relative humidity. At higher relative humidities, especially above 65 percent, the strength decreased until, at 97 percent relative humidity, the boards retained only 40 percent of the strength they had at 40 percent relative humidity. At 5 or 8 percent moisture content the bursting strength was about 95 percent of the maximum value. Similar results were observed in the case of straw corrugating board and kraft and jute laminated solid fiberboard.

Although maxima of bursting strengths of the kraft and jute fiberboard occurred at about 7 percent moisture content, upon either absorption or desorption, the magnitude of these values was affected by the previous conditioning history of the boards. This fact is illustrated by the following data for a conditioning sequence on a 16 point jute board:

Conditioning treatment:	Bursting Strength	
	(Mullen Value)	
	<u>Lb. per sq. in.</u>	
Fiberboard first dried to 3 percent moisture content...	84	
Then oven dried .....	75	
Then conditioned to 7 percent moisture content .....	90	
Then conditioned to 27 percent moisture content .....	45	
Then conditioned to 7 percent moisture content .....	96	
Then oven dried .....	79	
Then conditioned to 7 percent moisture content .....	100	

It must be emphasized that the foregoing information applies only to fiberboards that have not been treated, as for example, with synthetic resins to increase strength in the wet condition. Data on the relation of strength properties to moisture content of treated boards are not available.

The experimental work shows that when fiberboards are bought and sold on strength specifications, it is important that both the moisture content at which the boards are to be tested and the direction of approach to equilibrium moisture content be stated.