

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

EFFECT OF WAX TREATMENT ON THE COMPRESSION STRENGTH OF  
TELESCOPIC BOXES AT 50% R.H. AND 73°F.

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Progress Report Four

to

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## EFFECT OF WAX TREATMENT ON THE COMPRESSION STRENGTH OF TELESCOPIC BOXES AT 50% R.H. AND 73°F.

The effect of wax impregnation on box compression at standard testing conditions was evaluated using six combinations of board. They were as follows:

1. 69-33-42
2. 69-26-42
3. 47-33-47
4. 47-26-47
5. 42-33-42
6. 42-26-42

The above combinations were fabricated with water-resistant adhesives and were impregnated with from about 25 to 28% wax.

In general, it was found that the above level of wax treatment resulted in increase in box compression of 19 to 30% as compared to the untreated boxes. Deflections at peak load were also greater for the treated boxes.

## INTRODUCTION

The environmental conditions--low temperature, high humidity and, most important, liquid water--associated with the storage and shipment of wet-packed poultry, impose severe requirements on the shipping

container. For this reason, the process of treating corrugated board with relatively large amounts of wax or other similar substances has received favorable attention for this application. Several past studies have been concerned with the development of a suitable process for treating the board and the performance of boxes made therefrom. Because these studies have been concerned with the use of such board in the wet-pack poultry trade, attention has been centered on evaluating performance under conditions simulating those existing in the shipment of wet-pack poultry.

If wax-treated board were to be commercially used in the shipment of poultry or other commodities, information regarding box performance under standard conditions could be desirable. For that purpose, treated and untreated boxes, from several combinations of board, were evaluated for box compression at 50% relative humidity and 73°F.

#### MATERIALS

The board combinations used in this study are tabulated below in Table I.

TABLE I

NOMINAL WEIGHT, LB./1000 FT.<sup>2</sup>

| Run | Double-Face | Corrugating Medium | Single-Face |
|-----|-------------|--------------------|-------------|
| 1   | 69          | 33                 | 42          |
| 2   | 69          | 26                 | 42          |
| 3   | 47          | 33                 | 47          |
| 4   | 47          | 26                 | 47          |
| 5   | 42          | 33                 | 42          |
| 6   | 42          | 26                 | 42          |

The above combinations were fabricated at the Menasha Wooden Ware Corporation on February 20 using a resorcinol adhesive on the single-facer and a Ketac adhesive on the double-facer.

#### BOX CONSTRUCTION

The six combinations noted above were scored and slotted to give full telescope boxes with dimensions of 22 x 16 x 8 inches. The flutes in the body section were parallel to the 22-inch dimension and, in the cover, parallel to the 16-inch dimension. The laps were placed on the sides in the body and on the ends in the cover. The body sections were deep-slotted ( $3/8$  inch below male) and rectangular drain holes were cut in both cover and body in the same locations as in the Ice-o-box. In the cover, the drain hole was centrally located and was  $1-1/2$  x  $1/4$ -inch in size. In the body section the three drain holes were each  $1-1/2$  x  $1/2$ -inch in size. Five treated and five untreated boxes were fabricated from each sample. A photograph of a typical box is shown in Figure 1.

#### WAX IMPREGNATION PROCEDURE

After scoring, each blank was waxed on a roll coater using a wax temperature of  $140^{\circ}\text{F}$ . to give a wax pickup of from 25 to 28% based on the oven-dry weight. The blanks were then cured in an oven at from 185 to  $200^{\circ}\text{F}$ . for from 12 to 24 hours. At the end of the curing period, the blanks were allowed to cool in an atmosphere of high humidity and then slotted and stitched.

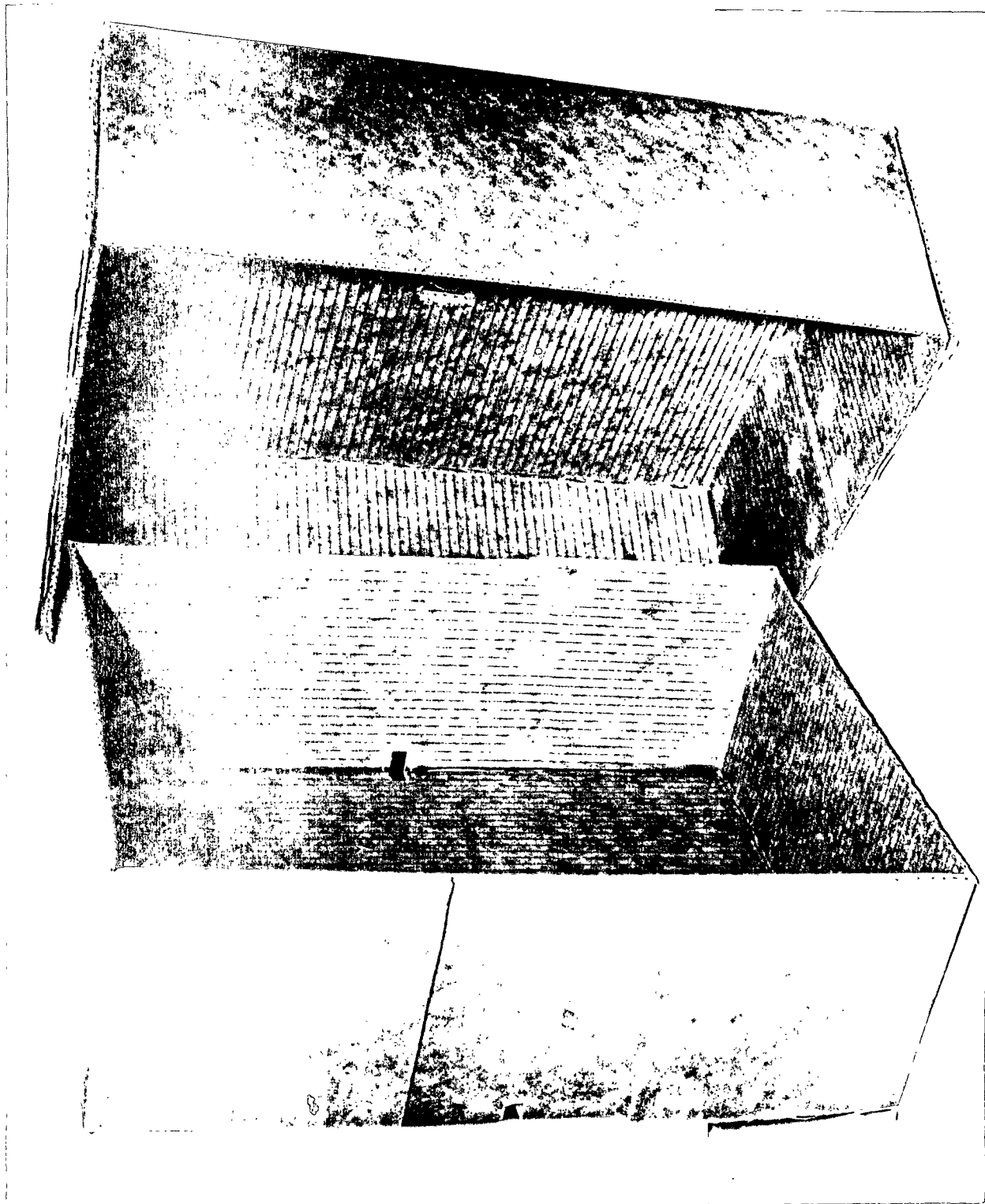


Figure 1

A Photograph of a Typical Box

## CONDITIONING AND TESTING

After preconditioning for at least 24 hours at less than 35% relative humidity and 73°F., the boxes were conditioned at  $50 \pm 2\%$  relative humidity and  $73 \pm 3.5^\circ\text{F.}$  for at least 48 hours prior to test. All boxes were tested on the Baldwin-Southwark universal tester.

## DISCUSSION OF RESULTS

The results obtained are summarized in Table I. Referring to the table, it may be noted that the addition of wax resulted in an increase in peak load of from 19 to 30%. In general, the results were dependent on the combination weight in the expected manner, although the effect of changing from 26 to 33-lb. medium was not marked at either the 42-42 lb. or the 69-42 lb. liner levels. Referring to the deflection results, it may be noted that the wax-treated boxes appeared to reach their peak load at somewhat greater deflections than the untreated boxes.

TABLE I  
EFFECT OF WAX TREATMENT ON BOX COMPRESSION  
(50% R.H. and 73°F.)

| Combination | Max. Load, (0-1.0 in.), lb. |         |                     | Deflection, in. |         |                     |
|-------------|-----------------------------|---------|---------------------|-----------------|---------|---------------------|
|             | Untreated                   | Treated | Differ-<br>ence, %* | Untreated       | Treated | Differ-<br>ence, %* |
| 69-33-42    | 3185                        | 4000    | +25.6               | 0.47            | 0.61    | +29.8               |
| 69-26-42    | 3205                        | 3980    | +24.2               | 0.51            | 0.51    | + 0.0               |
| 47-33-47    | 3405                        | 4415    | +29.7               | 0.49            | 0.59    | +20.4               |
| 47-26-47    | 2810                        | 3740    | +33.1               | 0.46            | 0.57    | +23.9               |
| 42-33-42    | 2970                        | 3540    | +19.2               | 0.47            | 0.52    | +10.6               |
| 42-26-42    | 2770                        | 3600    | +30.0               | 0.49            | 0.50    | + 2.0               |


\* Based on untreated results as reference.

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