



Harvesting and Handling Section  
CITRUS EXPERIMENT STATION  
P A C K I N G H O U S E   N E W S L E T T E R

No. 5

POST OFFICE BOX 108  
LAKE ALFRED, FLORIDA 33850  
July 1966

PALLET BOX DEGREENING ROOMS

Work on a new version of the degreening bulletin progresses slowly and an increasing number of inquiries are being received on pallet box degreening. It, therefore, seems wise to give an interim report on our latest findings and recommendations.

Excellent degreening can be obtained in pallet boxes, but not by simply putting them in degreening rooms that have very likely been of only marginal efficiency for field boxes and in which lift truck operation is cramped, slow, and uneconomic.

A new approach has been developed in cooperation with two packing-houses and several commercial companies. Principles involved are given briefly below. The double ceiling, center unit, downthrow design now in common use for pallet box degreening rooms goes back to an Experiment Station design of nearly 10 years ago (Fla. Agric. Expt. Sta. Ann. Rept. p. 208. 1957 and p. 219. 1958.<sup>1</sup>). Not only has the use of pallet boxes developed within this time, but considerable research on degreening has been done. A quite new design is now advised. Refinements are still being

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<sup>1</sup>Attention is drawn to the fact that single copies of the current Annual Report of the Florida Agricultural Experiment Stations can be obtained by writing to Mailing Office, Florida Agricultural Experiment Stations, Rolfs Hall, University of Florida, Gainesville, Florida, 32601. This 400 page volume presents each year an extremely condensed report of all research carried out for the year in the entire Experiment Station system.

made and research carried out, but the current version is now well enough tested to be no longer experimental. A schematic diagram of one successful version is shown in Figure 1. This is a ground level, high-stack type room in a building designed for this use. Figure 2 shows an experimental version adapting the same principles to a modification of an existing field box degreening room in a platform height packinghouse.

### Air Circulation

Instead of trying to force air through the pallet boxes, it is circulated between them (using the pallets as ducts) and relying on induced air movement to penetrate the fruit within the boxes. This air circulation pattern provides approximately equal air movement for each box, avoiding the considerable (e.g., 100:1) differences between air supply to the center and corner boxes in the center duct system. A double ceiling is still used to carry the air in the opposite direction. One advantage of this design is that long narrow rooms are particularly easy to run. Note that the inner curtain is dropped only as far as the top of the load. This prevents "short circuiting" and makes it possible to work with loads of different heights.

### Humidity Control

Humidity control is essential in large pallet box degreening rooms and should aim at maintaining as high a level of humidity as is possible without precipitation. Since revision of FCC Regulation 105-1.13, 17 May 1965, it is legal to add "live steam" even when room temperature is above 85° F. Two makes of humidistat have been tested and found suitable. These should be placed in return air controlling a solenoid-operated steam jet. Such equipment corrects the severe drying effect of the radiator-fan unit. Such a drying effect is related to the balance between fan and radiator capacities. A big volume of air with a small temperature rise

across the radiator has a far less drying effect than does a small volume with a big temperature rise, see Table 1.

Table 1

Example	Air Conditions Across Radiator						Steam needed per hour/ 1,000 CFM to maintain humidity.
	Temperature ° F			% Relative Humidity			
	In	Out	Rise	In	Out	Drop	
A	75°	95°	20°	98%	52%	46%	61.5 lbs
B	83°	88°	5°	98%	83%	15%	15.7 lbs

In order to take advantage of this relationship, the experimental room (Figure 2) has been designed with 2 CFM per BTU per minute rather than the 0.8 CFM per BTU per minute ratio which is typical of the package units in current use. (Please note that this room is not yet in operation.)

#### Air Volume

This recommendation still stands at 10 CFM per box (or 100 CFM per pallet box).

#### Ventilation

Ventilation should be continuous. At present, we are still recommending use of an adjustable air intake on the vacuum side of the fan. Experiments continue with a fan-driven ventilator system. Opening and shutting the room should not be necessary and is highly undesirable as it causes alternate condensation of moisture followed by drying conditions. This invites troubles from peel injury.

#### Ethylene

Using the conditions described above, one part per million of ethylene has been quite adequate for optimum degreening. The usual needle valves are hard to control at the necessary delivery rate. We are currently using a micrometer type valve that costs about \$9.00 and is proving an

excellent investment. (A simple, reliable ethylene analyzer is now available for less than \$100.00.)

#### Lift Truck Convenience

To pay for themselves, fork lift trucks must be able to work fast and anything breakable should be kept out of their way. Note that with this design the pallet boxes are stacked in straight rows with no complications and all services are overhead.

#### ACKNOWLEDGEMENTS

The advances in degreening room design discussed in this Newsletter have been greatly expedited by the cooperation of the following companies or organizations: Lake Wales CGA; Alcoma Packing Company, Lake Wales; Petersen Industrial Machines, Lake Wales; C. D. Jacobs Company, Largo; Food Industries Research and Engineering, Harrisburg, Pa.; and Industrial Products Group, Honeywell Corporation, Orlando.

#### SOMETHING TO THINK ABOUT

The next logical move is to parallel developments in refrigeration by disregarding the tradition of having individual degreening rooms and using a large single room, moving batches in and out just as is done in cold storage. This would be cheaper to construct and simpler to operate and could be expected to be fully as efficient. Moreover, it is perfectly feasible to have a dual purpose room, used for degreening in the fall and precooling and cold storage at other seasons.

All we need is a cooperator. A very sensible and economical start would be to have someone with a sizable cold room of modern design who would be willing to make the necessary modifications. Big room degreening anyone?

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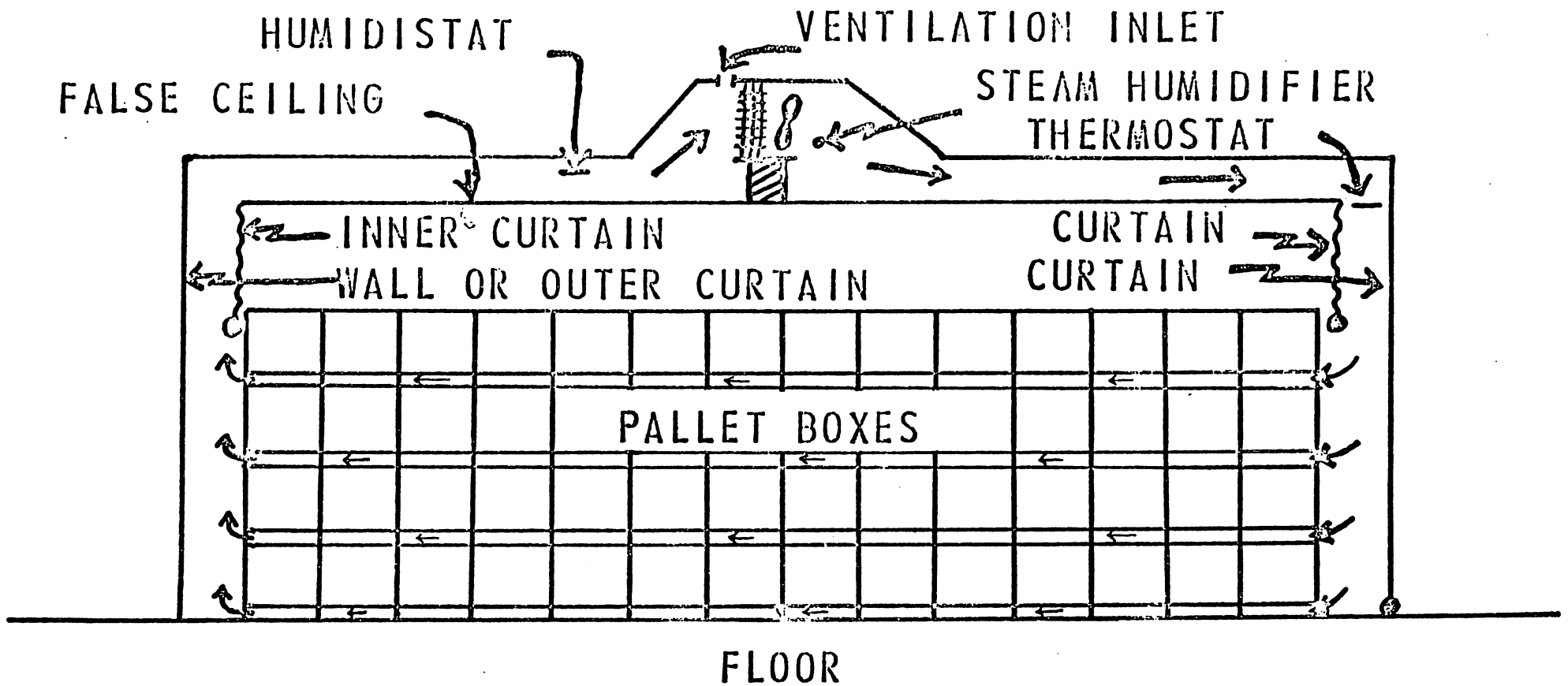
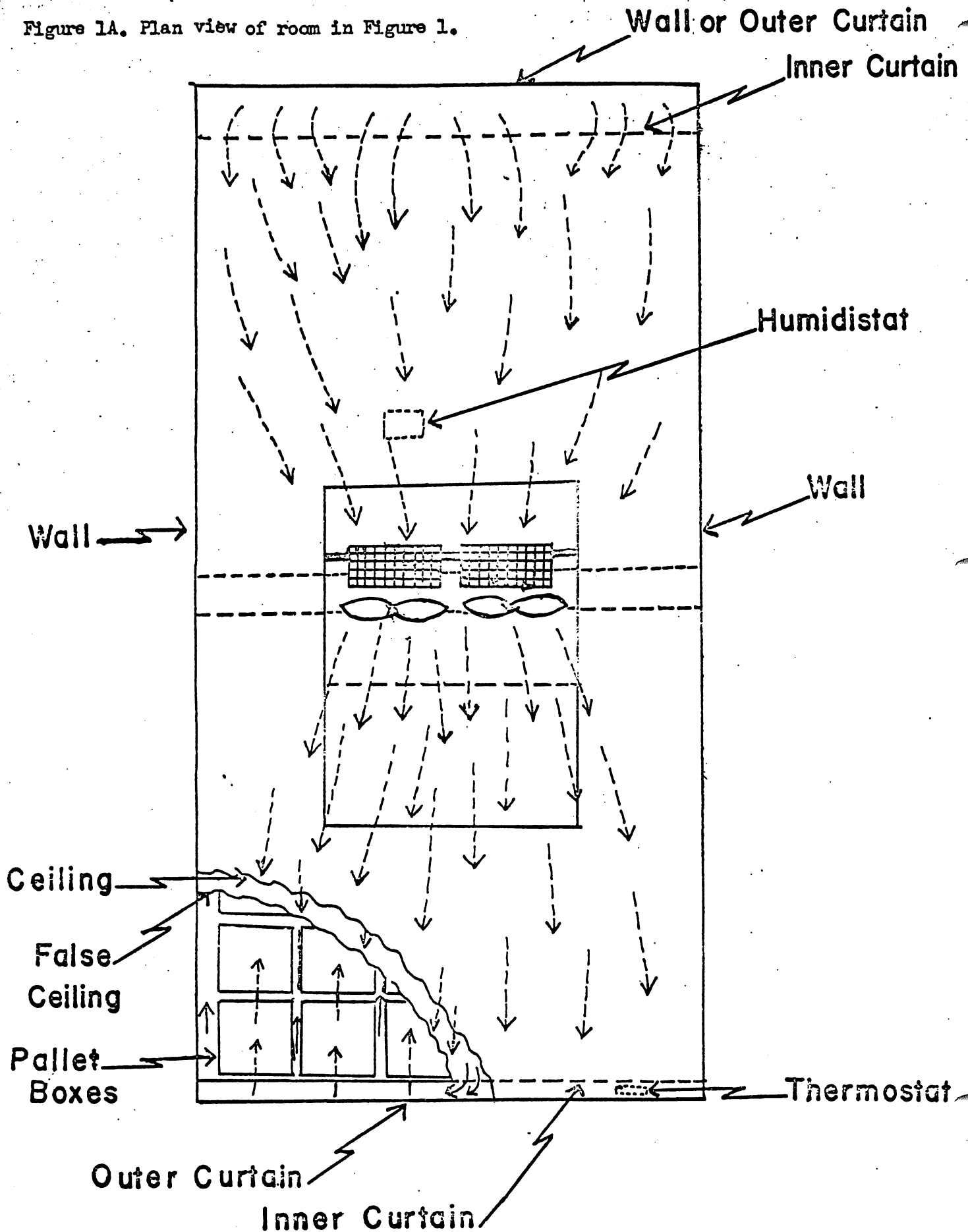


Figure 1. Diagrammatic presentation of the new pallet box design. Note that the double curtains prevent "short-circuiting" of the air over the fruit and provide plenum and vacuum areas at each end of the room, thereby inducing a strong air movement through the channels provided by the pallets. Both humidity and temperature are automatically controlled. Note the position of the humidistat and thermostat sensing units.

Figure 1A. Plan view of room in Figure 1.



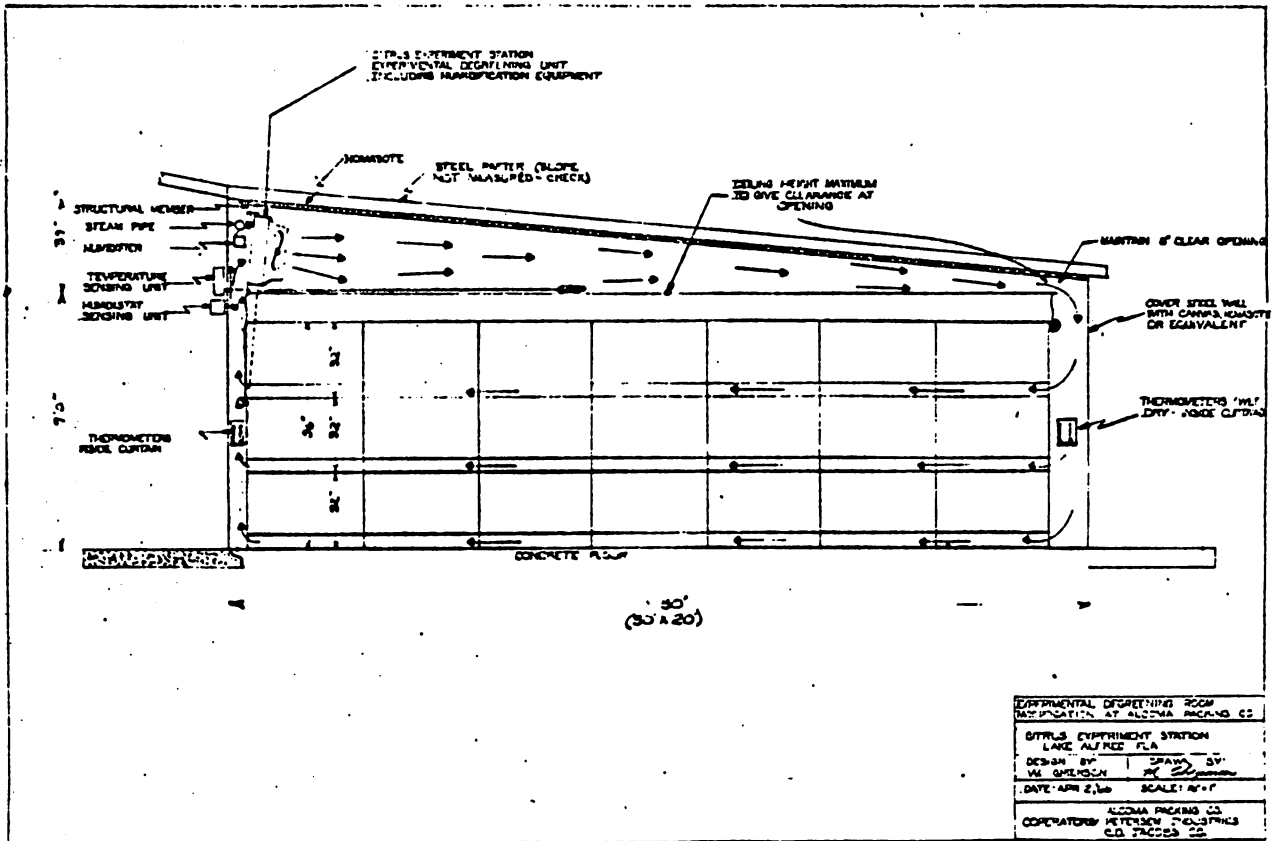


Figure 2: The experimental degreening room in which the design shown in Figure 1 is adapted for trial as a three-high pallet box room by rebuilding an existing field box degreening room.