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# A REVIEW OF EFFORTS BY THE FOOD INDUSTRY TO STANDARDIZE PALLETS

by  
D. R. Hammons  
Agricultural Research Service  
College Station, Texas  
and  
M. E. Anderson  
Agricultural Research Service  
Columbia, Missouri

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The authors present a review and recommendation for a standardization program for pallets in the food industry.

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Efficiency in the food distribution system would be significantly increased if standardization of pallets should become a reality. The great variety of pallet sizes and types of construction is a result of many different handling, storing, and transporting requirements that have been thrust upon an industry which has had no incentive to standardize. However, evidence of the need for a standard pallet was apparent when the problem of pallet exchange arose as a major deterrent to efficiency. Since most consumers are vitally interested in lower food prices, and farmers and distributors are interested in increasing their profits, standardization of pallets as a means of holding costs to a minimum has become an issue of great debate and interest in the food industry. The responsibility for implementing a standardization program lies with the distributors and the food industry in general should be carried out on a voluntary basis.

This paper presents a review of efforts by the food industry to standardize pallet sizes and types of construction. It (1) presents the current status of pallet standardization, (2)

defines the major problems the industry faces in implementing standardization, and (3) presents recommendations for alternative actions by industry. The scope of standardization includes nomenclature for and the types, sizes, materials, and components of pallets, as well as inspection, testing, and sampling.

## CURRENT STATUS OF STANDARDIZATION

An understanding of the status and problems of palletization, requires that a pallet be defined. The MHI Committee of the American National Standards Institute (ANSI) defines a pallet as "a horizontal platform device used as a base for assembling, storing, handling, and transporting material and products in a unit load." In addition the Institute defines and classifies four types of pallets, as follows: Captive, a pallet whose use cycle remains within a single enterprise (private, corporate, or Government); noncaptive, a pallet whose use cycle extends through more than one enterprise (private, corporate, or Government); expendable (single trip pallet), a pallet intended to be discarded after a single cycle; and reusable (multiple trip pallet), a pallet intended for multiple cycles. For other pallet component definitions and

terminology, the reader is referred to American National Standard "Pallet Definitions and Terminology," ANSI MH 1.1.2-1972 (2).

The two most common sizes of wooden pallets are 48- by 40-inches and 42- by 35-inches. The food industry is divided between the processed-packaged foodstuffs group, represented by the Grocery Pallet Council (GPC); and the fresh fruit and vegetable group, represented by the United Fresh Fruit and Vegetable Association and the Western Growers Association. The GPC is an organization of foodstuff manufacturers that have a pallet-pool arrangement. The GPC has issued three interchangeable standards, Recommended Hardwood Pallet Specifications for the Grocery Industry, (9), Recommended West Coast Wood Pallet Specifications for the Grocery Industry (11), and Recommended Southern Pine Specifications for the Grocery Industry (10), for the portion of the industry it represents and has strongly endorsed the 48- by 40-inch pallet. The goal of the Palletization and Productivity Committee of the United Fresh Fruit and Vegetable Association is one single-size pallet (48- by 40-inch) and 100-percent palletization (15). The Western Grocers Association favors the 42- by 35-inch pallet because it more effectively utilizes space in rail cars. That size pallet is also preferred by the railroad industry. According to R. A. Jurczak, Chief Engineer of the Freight Claim and Damage Prevention Division of the Association of American Railroads (7), shippers using the 42- by 35-inch pallet point out that that size is advantageous because their products spend more time in transportation vehicles than in their warehouses or in their customers' warehousing facilities. Freight rates have a profound impact on shipments of some food products. For example, the freight rate per carton of citrus fruit is considerably less in fully loaded rail cars

than in trucks for the trip from California to the east coast. Pallet size is important because the rail car must be completely full to get the reduced rate (12).

Other pallet sizes<sup>a</sup> established by the MHI Committee of the American National Standards Institute are as follows:

<u>Inches</u>	<u>Nominal Millimeter Size</u>
32 x 24	800 x 600
42 x 36	1050 x 900
48 x 36	1200 x 900
56 x 44	1400 x 1100
60 x 48	1500 x 1200
36 x 36	900 x 900
42 x 42	1050 x 1050
48 x 48	1200 x 1200
40 x 32	1000 x 800 <sup>b</sup>
48 x 32	1200 x 800 <sup>b</sup>
48 x 40 <sup>c</sup>	1200 x 1000 <sup>b</sup>
72 x 48	1800 x 1200 <sup>b</sup>

<sup>a</sup> The first dimension is the length; the second, the width.

<sup>b</sup> Size recommended for international trade by the International Organization for Standardization.

<sup>c</sup> Standard size recommended by the Grocery Manufacturers of America and the Grocery Pallet Council.

The issue of pallet exchange is a natural outgrowth of pallet standardization. Two major concepts have been suggested as solutions to the exchange problem. In one concept, empty pallets would be shipped in a mass movement from certain collection points to pallet

pools. In the other concept, all segments of the industry would return pallets to the sender as soon as they are unloaded, creating what might be referred to as a "floating pallet pool."

Some reasons for the diversity of pallet base sizes currently used by the food industry can best be explained by categorization of foodstuffs into:

1. Grocery items, called "hardware" items, that need no refrigeration.
2. Such products as potatoes and onions that are shipped in bags, but require refrigeration.
3. Highly perishable items that are bulge filled or overfilled and those that are packed properly for shipment.

In a discussion of the diversity in the industry, consideration must be given to the impact of the international situation. Don Stokes (USDA, retired), who attended a meeting of experts on packaging and palletization of fresh fruits and vegetables (13), observed from statements made by the representatives of various countries and individual responses to a palletization survey that most countries lean toward the 1200- by 1000-mm (48- by 40-inch) pallet. About 1 billion are presently in use. Some countries use the 1200- by 800-mm pallet for local distribution and selective-size pallets to meet the demand of importers (5). The International Organization for Standardization (ISO), in Standard No. ISO/R-198-1961, recommends three pallet sizes: 1000- by 800-mm, 1200- by 800-mm, and 1000- by 1200-mm. They increased this number by one size, 1800- by 1200-mm, in standard No. ISO/R-329-1963.

The utilization of cross-sectional space in transportation vehicles by the

48- by 40-inch and 42- by 35-inch pallets is given in Table 1. The mean cross-sectional space utilization for a railroad car in which the 48- by 40-inch pallet is used is 88.1 percent and for a railroad car in which the 42- by 35-inch pallet is used, 96.3 percent. The highway trailer gives a 93.4 percent utilization for the 42- by 35-inch pallet, but only 88.9 percent for the 48- by 40-inch pallet. Consequently, the railroads utilize the 42- by 35-inch pallets more advantageously than does the trailer (96.3 vs. 93.4 percent). However, when only the refrigerated vehicles are considered, the 42- by 35-inch pallet gives the highway trailer an efficiency of 95.5 percent, as compared to the railroad car's 97.2 percent. For the 48- by 40-inch pallet, the reverse is true; 90.9 percent for the highway trailer and 88.9 percent for the railroad car.

#### MAJOR PROBLEMS FACED BY INDUSTRY

The sizes of the two most commonly used pallets, 48- by 40-inches and 42- by 35-inches, inhibit the versatility of the mode of transportation used. The variation in width of transport vehicles presents a problem for standardization. For closed highway vans or trailers, the average internal width is 92 inches. Refrigerated and insulated vehicles have an even narrower width (generally 88 inches). Lengths up to 40 feet are common, and some states now permit 45 feet.(3).

The common internal width of a refrigerated rail car is 108 inches (5). Approximately one-half of the refrigerated rail cars in use are that size. The other half of the rail cars vary from 98 to 111 inches in width (17).

The use of different vehicle loading patterns may increase the percentage of space utilization by these two

Table 1. Utilization of Cross-Sectional Space in Transportation Vehicle by 48- by 40-inch and 42- by 35-inch Pallets (1).

Type of Vehicle	Width of Vehicle (in.)	Utilization of Space (%), for Pallet Sizes:	
		48- by 40-inch	42- by 35-inch
<u>Railroad</u>			
Box car	110	87.3 (96)*	95.5 (105)**
Refrigerated car	108	<u>88.9</u> (96)*	<u>97.2</u> (105)**
Mean for railroad		88.1	96.3
<u>Trailer</u>			
Van	92	86.9 (80)***	91.3 (84)*
Refrigerated	88	<u>90.9</u> (80)***	<u>95.5</u> (84)*
Mean for trailer		88.9	93.4

\*Total length of two pallets used to calculate percentage of space utilization.

\*\*Total width of three pallets used to calculate percentage of space utilization.

\*\*\*Total width of two pallets used to calculate percentage of space utilization.

most common pallet sizes. Theoretically, if the width of a vehicle is 92 inches, one would align the two pallets (48- by 40-inches) such that the 48- and 40-inch dimensions would provide an effective width of 88 inches, for a space utilization of 95.6 percent. That type of load could only occur with pallets designed for four-way entry.

The pallet exchange concept is complicated by the current controversy concerning the types of wood used in pallet construction. The hardwood versus softwood comparison brings up several complicating issues. Hardwood is available primarily on the east coast, whereas softwoods are available primarily on the west coast. When hardwood pallets are shipped from the east coast to the west coast, the question arises as to whether pallets constructed of softwoods offer an equal exchange. Although independent testing has shown that softwood pallets

give service superior to that of hardwood, critics of softwood are skeptical (17).

The principal advantages of using wood pallets for unit loads in the food industry are that:

1. They are readily available.
2. Most workers are trained or can be trained to handle them.
3. Many handling and warehouse facilities have been designed for pallet handling systems.

The disadvantages of using wood pallets are that:

1. They occupy 5 to 6 cubic feet of space.

2. They are heavy (5). Each hardwood pallet weighs at least 65 pounds, and each softwood pallet weighs at least 20 pounds.

3. Reusable hardwood pallets, in many instances, must be returned to the shipping point for reuse.

4. Expendable wood pallets, if sizable quantities are used, cause a disposal problem. A United Fresh Fruit and Vegetable Association report (17) states that: "Generally speaking, the disposal pallet is designed with a minimum of material, which in turn results in a minimum of performance." It further states that, "in addition to being an extravagant use of a natural resource, the pallets present a problem in pollution since burning is practically the only way to dispose of them." For the year 1976, the pallet industry used 4.981 billion feet of lumber, 13% of the national lumber usage (8).

5. Poor quality of construction by some manufacturers often increases costs.

The problem of expendable pallets brings to the forefront the fact that consideration must be given to the use of slipsheets. A slipsheet may be defined as a thin piece of material such as corrugated fiberboard, solid fiberboard, or plastic sheeting that is used with a specially equipped fork truck to move unitized loads. The fork truck is equipped with two wide platens to carry the load and a pull-and-push-attachment to grip and move the slipsheet that holds the load. Depending on requirements, the attachment may retain the slipsheet and discharge the load, or discharge the load and slipsheet together. Slipsheet loads can be tiered on top of each other, three or four high, and be retrieved by the specially equipped forktruck. The slipsheet provides a low-cost method for loading unitized cargo into transportation

vehicles and for unloading from the vehicles. Slipsheets are basically meant to replace pallets only during the transportation portion of marketing. They are used in combination with pallets, during warehousing, both before and after transportation (6). According to Chapogas (4), the use of slipsheets in lieu of pallets results in several advantages:

1. They are low in cost.
2. They occupy less space than pallets.
3. They are readily disposable.

The principal disadvantages in their use are:

1. Paper absorbs moisture and tears easily when exposed to high humidity conditions.
2. Initially they require special, expensive attachments for handling the slipsheet, and the attachments may not be available at most locations.
3. Few produce warehouse handlers are experienced in their use. Roger Rij, Agricultural Research Service, United States Department of Agriculture, is quoted (16) as saying that, on a truckload of treefruit, a shipper can load up to 600 pounds more fruit with slipsheets than with wooden pallets. Don Stokes predicted that the future trend in unitization will be toward slipsheets (14).

#### RECOMMENDATIONS FOR INDUSTRY ACTION

A review of the literature cited in this paper indicated that the Government (14) and industry representatives have made several suggestions which seem worthy of note. These are summarized, in general, as follows:

1. Work for international acceptance of the 1200- by 1000-mm pallet and its metric equivalent, the 48- by 40-inch pallet, which is probably the one most universally used today. The 48- by 40-inch pallet does not fit the dimensions of the rail cars as well as highway trailers (see Table 1); however, approximately 75 to 80 percent of all U.S. fruits and vegetables are shipped by truck.

2. Explore unitization of more products on slipsheets.

3. Encourage receivers to upgrade their material-handling equipment to enable them to handle products shipped on slipsheets.

4. Experiment with new unitizing materials and methods.

5. Develop individual company exchange programs, particularly for shipments of less than 500 miles or for shipments in which backhaul usage of pallets can be most effective.

6. Give more study to actions that might be taken by responsible food industry officials to expedite a resolution of differing opinions concerning the merits of alternative pallet sizes.

7. Convert rapidly to the metric system in the distribution channels.

The different associations representing the food industry must be willing to sit down and seriously discuss cooperation in implementing the standardization of pallets. Consideration might be given to a system of monetary reimbursement to the segment of industry that would be "hard hit" by pallet standardization as a means of offsetting additional costs to them, and thereby, gaining their cooperation in the standardization effort.

As stated previously, efficiency in the food distribution system would benefit most all consumers by helping to hold food costs down. The goal of industry should be to provide the climate necessary for implementing procedures that will provide the needed standardization.

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