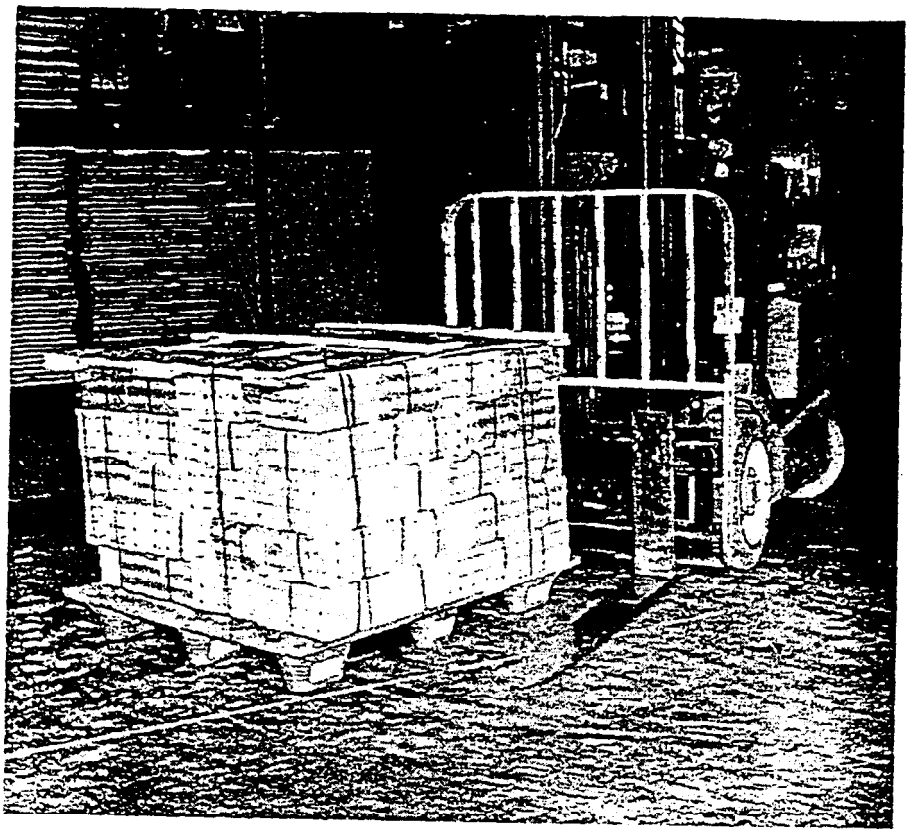
UNITED STATES POSTAL SERVICE



PALLET LIFE CYCLE TEST REPORT

OCTOBER, 1994

USPS ENGINEERING
MATERIAL HANDLING OFFICE

ENGINEERING

UNITED STATES
POSTAL SERVICE

April 21, 1995

Tom Pintar, Vice President
Sales and Marketing
TriEnda Corporation
Post Office Box 400
Portage, WI 53901-0400

Dear Tom:

The Postal Service conducted testing of several pallet types to determine what would be the life cycle of the pallets when used in our Postal environment. The testing has been completed.

Your twin sheet thermoformed plastic pallet, was one of the pallet types tested. We have enclosed a copy of the Pallet Life Cycle Test Report. The information contained in this report is not to be used for advertising or promotional purposes. If you have any questions, I can be reached on 703-280-7012.

Ralph E. Walker
Mechanical Engineer
Group Leader, Mail Transport Equipment
Material Handling

Enclosure

8403 LEE HIGHWAY
MERRIFIELD VA 22082-8101

PALLET LIFE CYCLE TEST REPORT

Test Initiated
14 February 1994

«»

Test Completed
09 May 1994

«»

Test Report Authors

Ralph Walker	USPS Engineering, Material Handling Office
Dr. S. Paul Singh	Michigan State University, School of Packaging
Harold Mesimer	New Breed Leasing Corporation
Jeff Taylor	New Breed Leasing Corporation
K. Scarborough	New Breed Leasing Corporation

«»

Test Director

Ralph Walker	USPS Engineering, Material Handling Office

«»

Test Coordinator

Harold Mesimer	New Breed Leasing Corporation

«»

Test Assistants

Jeff Taylor	New Breed Leasing Corporation
Ken Hindre	New Breed Leasing Corporation

«»

Test Consultants

Dr. S. Paul Singh	Michigan State University, School of Packaging
Ken Cook	A.D. Little Company, Inc.

«»

Test Facility

New Breed Leasing Corporation
Louis DeJoy, C.E.O.

PALLET LIFE CYCLE TEST REPORT

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

1.1 Purpose

A major United States Postal Service (USPS) pallet procurement necessitated this evaluation. Following this test, all subsequent pallet purchases will be based on reliable, comparative life cycle cost estimates and pallet performance.

This Executive Summary provides an abridged version of the results from the Pallet Life Cycle Test. These conclusions are derived completely from information found in the Pallet Life Cycle Test Report.

1.2 Methodology

The testing of different pallets under similar “real life” situations in a warehouse setting,. brought about the development of the Pallet Life Cycle Test (PLCT). This setting more closely simulates the everyday handling characteristics encountered by pallets in a postal facility. The majority of the Pallet Handling Methods (Tests) used in the Pallet Life Cycle Test came from the USPS report entitled *Pallet Handling in Postal Facilities,* dated January 17, 1994, written by Arthur D. Little, Inc. (See Appendix 6.4).

In order to determine pallet performance, 120 Transportation Routes (Trips) and 120 Pallet Handling Methods (Tests) were conducted.

The PLCT involved loading, transporting and unloading 63,360 pallet loads. The Pallet Handling Methods (Test) subjected the 4,800 pallet loads to 48,960 pallet handling movements. The stacking and unstacking of 4,800 pallet loads occurred 9,600 times.

The pallet loads were banded 2,880 times with plastic strapping and 1,920 times with steel strapping.

The data derived from 61 days of extensive actual testing is the basis for this test report.

1.3 Pallet Life Cycle

Using a set of predetermined Failure Criteria (See Appendix 6.5), a Pallet Life Cycle is the number of “Individual Test Cycles” a loaded pallet can complete prior to failure. The average pallet life cycles ranged from 7.10 for the Litco Presswood Fiber Pallets to 60.0 for the Loudon Structural Foam, the Cadillac - Retailer and Penda Twin-Sheet Thermoform Pallets.

1.4 Pallet Performance

Pallet performance was determined using the Pallet Performance Coefficient (See Section 4.3) devised to evaluate both plastic and presswood fiber pallets. The test results showed the twin-sheet thermoform pallet family offered the best pallet performance due to the following factors:

- Lightweight - approximately 19-20 pounds.
- Best Performance - averaged 55.93 Individual Test Cycles.
- Low Cost - approximately $15-$16 per pallet.
- Easily Recycled.

2.0 GENERAL

2.1 Scope

A major United States Postal Service (USPS) pallet procurement necessitated this evaluation. Following this Pallet Life Cycle Test, all subsequent pallet purchases will be-based on reliable, comparative life cycle cost estimates and pallet performance.

This Pallet Life Cycle Test Report evaluates the performance characteristics of three nestable pallet families which are, presswood fiber (PF), plastic structural foam (SF), and plastic tin-sheet thermoform (TF). These performance characteristics were developed from governing USPS pallet handling methods and those derived from Bulk Mail Center (BMC) site visits conducted by Arthur D. Little, Inc. (See Appendix 6.4)

All information contained in this report is derived from objectives established by the USPS and data obtained from procedures in accordance with the Pallet Life Cycle Test Plan.

2.2 Background

The U.S. Postal Service began using pallets to transport different classes of mail from Postal Facilities. This program called “Palletized Mail” started in 1973. The first pallets used were wooden pallets that measured 48 inches long by 40 inches wide and consisted of deck boards and stringers. These pallets were not nestable and weighed over fifty pounds. A nestable, molded presswood fiber pallet introduced in 1977 is still being used by the Postal Service. This pallet is 48 inches long by 40 inches wide and weighs approximately 42 pounds.

The Postal Service provides pallets to the Postal Customers. Postal Customers can furnish their own pallets to ship mail to Postal Facilities, provided they meet the following guidelines. A pallet must be 48 inches by 40 inches wide and have a four-way entry for a pallet jack.

The Postal Service considered using other types of light weight, nestable pallets. Plastic pallets were the only other light weight, nestable pallets available. The Postal Service was able to procure 200,000 plastic pallets in 1987. These pallets were only available from commercial sources. The Postal Service procured two light weight, nestable pallet families: a twin-sheet thermoform plastic pallet and a structural foam plastic pallet. The twin-sheet thermoform pallets weighed 22-25 pounds and the structural foam pallets weighed 25-37 pounds.

The use of these two pallet families indicated that a plastic pallet designed and fabricated for use by the Postal Service would be beneficial. The Postal Service awarded a contract that included the USPS technical requirements for 600,000 light weight, nestable thermoform pallets in 1988. There were some changes made to the pallet during the manufacturing phase of the contract.

The Postal Service, since the completion of the initial contract for the procurement of Postal plastic pallets, has been buying the presswood fiber nestable pallet as per a Postal Specification.

A request to buy additional nestable plastic pallets, initiated by the Mail Transport Equipment (MTE) function of the Postal Service, came about in late 1993. Prior to issuing a solicitation for the procurement of these pallets, a decision to select pallet types based on life cycle costs resulted. This decision assured that the pallets with the most value be purchased and that the best interest of the Postal Service be served. Researching the information collected by the Postal Service on pallet life cycle costs indicated that this data was not adequate enough to support life cycle cost evaluations.

Three companies received awards to supply plastic, nestable, twin-sheet thermoform pallets. The solicitation to procure these pallets allowed bids for either the twin-sheet thermoform or the structural foam plastic pallets. The unit price for the twin-sheet thermoform pallet being less than the structural foam was the basis for it being selected by the Postal Service.

Prior to any major procurements being made, a decision to conduct Pallet Life Cycle Tests of various pallets came about. These Pallet Life Cycle Tests and their results became available in June 1994.

2.3 Definitions

The following are definitions pertinent to the Pallet Life Cycle Test Report:

BMC: Bulk Mail Center.

Cadillac / Retailer : Cadillac Products, Inc. style of pallet.

Cadillac / USPS : Cadillac Products, Inc. USPS design pallet.

Data Collection Sheet: A form used to record the actual methods performed and condition of pallets after inspection during the Pallet Life Cycle Test.

Double stack: Two loaded pallets stacked one on top of the other.

DynaMax: The name of the software program used to process the information taken from the EDRs.

EDR: Environmental Data Recorders.

FPS: Functional Pallet Systems.

HDPE: High Density Polyethylene.

Individual Test Cycle: An Individual Test Cycle consists of movement of (1) test deck from stacking, pallet banding, loading, transporting, unloading, pallet handling methods (test) and inspection.

Inspection: An inspection consists of removing bands, unstacking books, and examining each pallet against a predetermined set of Failure Criteria.

IST: Instrumented Sensor Technology, the company that manufactured the Environmental Data Recorders.

Litco: Litco International, Inc.

Loudon: Loudon Plastics, Inc.

Menasha: Menasha Corporation.

MTE: Mail Transport Equipment.

Nestable: The ability of one pallet to uniformly stack together with another pallet.

Nestability: The ability of a pallet to be nestable.

Pallet Handling Methods (Test): A prescribed set of fork lift handling tests used in the Pallet Life Cycle Test.

Pallet Life Cycle Test Plan: A plan developed to provide guidance and instruction on how to perform the Pallet Life Cycle Test.

Pallet Type: An individual pallet style from one particular manufacturer.

Penda: Penda Corporation (Tri-Enda Corporation).

PF: Presswood Fiber Pallet.

PLCT: Pallet Life Cycle Test

Presswood Pallet: A pallet made of a wood-based composite material.

Random Selection Method: Methods used to assure that random samples were taken.

SF: Structural Foam Pallet.

Shuert: Shuert Industries.

Structural Foam Pallet: A pallet made of molded HDPE foam material.

Test Deck: Consisting of forty (40) pallets, a Test Deck includes five (5) pallets each from the eight (8) pallet manufacturers.

Top Cap: A pallet top cap in accordance with U.S. Postal Service Specification USPS-C-1264.

Transportation Route (Trip): A predetermined 82.2 mile trip over various road surfaces and conditions.

Trip: The completion of the transportation route.

Trip Marking Strip: An adhesive backed strip attached to the test pallets and used to record the date the pallet was transported on the Transportation Route.

TS: A twin-sheet, thermoform pallet made of HDPE material.

Twin-sheet Thermoform Pallet: A pallet made of HDPE material.

USPS: United States Postal Service.

2.4 Pallet Characteristics

2.4.1 USPS Pallet Specifications

The United States Postal Service has three (3) pallet specifications that cover the design, manufacture, inspection, preparation for shipment, and pallet delivery.

- USPS-P- 1017C United States Postal Service Specification, Nestable, Lightweight Pallet (See Appendix 6.1).
- USPS-P- 1108B United States Postal Service Specification, Nestable, Plastic Thermoformed Pallet (Item No. 3919B) (See Appendix 6.2).
- USPS-P-1265 United States Postal Service Specification, Nestable, Plastic, Structural Foam, Pallet (See Appendix 6.3).

2.4.2 Pallet Handling in Postal Facilities

A detailed United States Postal Service report entitled *Pallet Handling in Postal Facilities,* dated January 17, 1994, written by Arthur D. Little, Inc. Acorn Park, Cambridge, Massachusetts 02140-2390 (See Appendix 6.4).

2.4.3 USPS Pallet Failure Criteria

The Pallet Life Cycle Test Plan identifies ten forms of failure criteria that are used to determine whether the pallet can be reused for another Individual Test Cycle (See Appendix 6.5).

2.4.4 Individual Pallet Photographs

Descriptive photographs of each pallet are contained in Appendix 6.6.

3.0 TEST OBJECTIVES AND PROCEDURES

3.1 Test Objectives

- Develop a Pallet Life Cycle method that will simulate the various physical hazards a palletized load will be subjected to in the USPS distribution environment and represent an Individual Test Cycle.
- Compare three different pallet families for a maximum of sixty (60) Individual Test Cycles based on relative performance, cost, ergonomics and environmental rationale.

The above objectives were met by considering the following items:

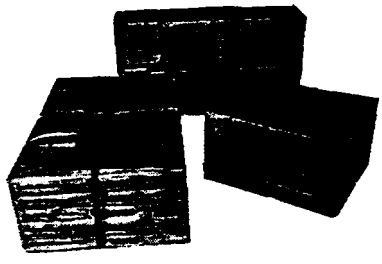
- Select eight pallet manufacturers to represent the three pallet families.
- Subject palletized loads to various handling methods that will simulate the conditions in the USPS environment.
- Establish failure criteria for damaged pallets used in the USPS environment.
- Determine maximum number of Individual Test Cycles each of the eight pallet types can endure before failure.
- Determine what part cost plays in the overall Pallet Life Cycle Test.
- Determine what part ergonomics plays in the overall Pallet Life Cycle Test.
- Determine how environmental issues affect the pallets in the Pallet Life Cycle Test.
- Determine which handling methods impart the most damage to the pallets during the handling methods portion of the Pallet Life Cycle Test.
- Determine what affects the transportation aspect of the road test has on the pallets.
- Determine what the-vibration levels are at the rear of the trailer and also on the top of the palletized load representing a double stack during road testing.
- Determine what affects steel and plastic banding have on pallet loads of mail.
- Determine which design features are desirable or detrimental to pallets used in the Pallet Life Cycle Test.
- Determine what part nestability plays in the handling and storage portion of the test.

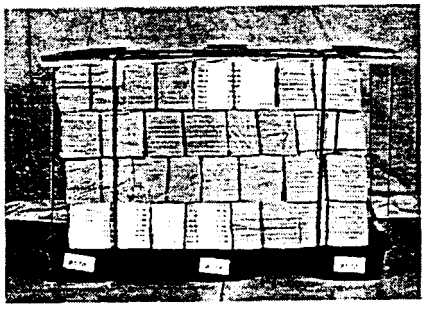
3.2 Test Procedures and Data Collection Methodology

The following paragraphs are a brief explanation regarding the sequence of events for the Pallet Life Cycle Test. The Pallet Life Cycle Test Plan provides greater detail for all procedures and governing directives referenced below.

3.2.1 Phone Book Stacking and Pallet Banding

The first activity in the Pallet Life Cycle Test sequence was the placement of a uniform load of phone books onto the pallet. Given the differing weights of the various phone books, a weight range of 1025 - 1175 pounds was used.

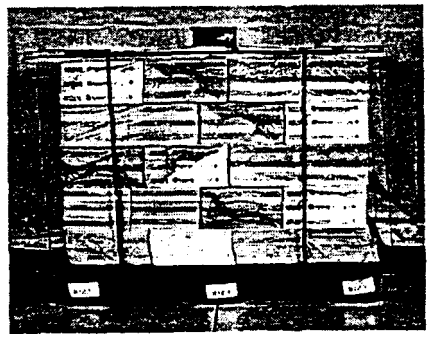




After the load was in place, a pallet top cap was added. Determined by the Random Selection Method, the top cap was secured using either plastic or steel banding.

3.2.2 Trailer Loading

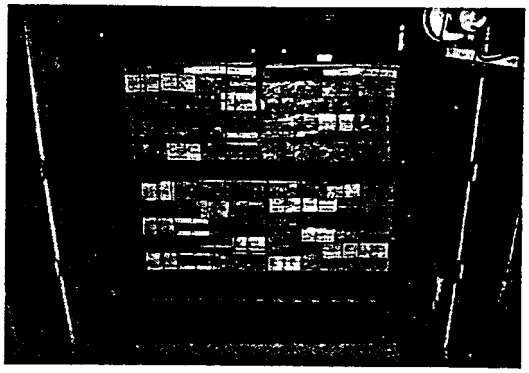
At the conclusion of all stacking and banding, the Random Selection Method was used to determine the Special Five Pallets (those pallets designated for the last five positions on the trailer). Once these pallets were located amongst the Test Deck, the last pallet to be loaded was located. On this pallet a unique top cap was required for housing one of the EDR Units. After the top cap was replaced, it was secured to the pallet using the previously designated banding material.



Once the Special Five Pallets were selected, the Random Selection Method was used to determine and mark the pallets selected for the Pallet Dump. At this point, a Data Collection Sheet was created and the proper items annotated for each pallet in the Test Deck.

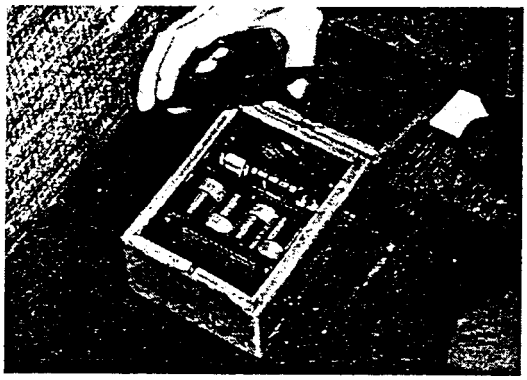
With the above items completed and using the Random Selection Method, the trailer was loaded in the proper sequence ensuring the Special Five Pallets were the last five pallets loaded. As the trailer was loaded, a trailer Loading Manifest was completed to track each pallet's location on the trailer.

The trailer loading was complete with the installation of the load bar securing the load.



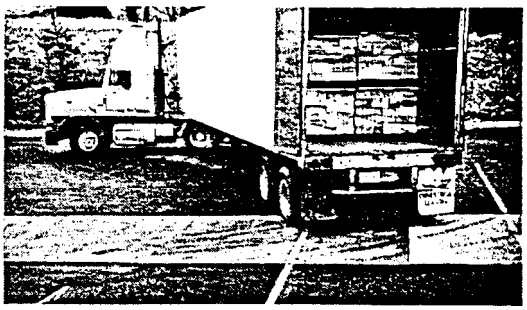
3.2.3 Environmental Data Recorder Installation

While the trailer was being loaded, the three EDR Units were programmed for the current Transportation Route (Trip). Once programmed, these units were secured in their designated protective boxes using the proper governing directives. Installation was complete once all units were activated and secured in their boxes. The Test Deck is photographed to verify proper loading and positioning of the pallets. The doors of the trailer are then locked and sealed. The loaded trailer is now ready for the Transportation Route (Trip).



3.2.4 Transportation Route (Trip)

At the conclusion of EDR installation, the trailer was readied for the Transportation Route (Trip). Photographs of the Test Deck were taken to verify proper loading and positioning of the pallets. The doors of the trailer were then locked and sealed.



The truck then began its 82.2 mile trip over various road surfaces and conditions. This trip took approximately two (2) hours and ended with the trailer returning to the Pallet Life Cycle Test Facility and docking to the warehouse. The trip was then logged in and photographed to show the positioning of the Test Deck.

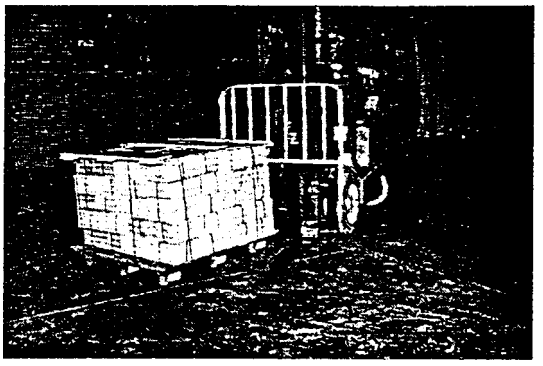
3.2.5 Environmental Data Recorder Removal

Prior to unloading the trailer, the three (3) EDR units were deactivated and placed in the Standby Mode using the proper governing directives. The units were then removed to the computer area and the information down loaded.

3.2.6 Trailer Unloading

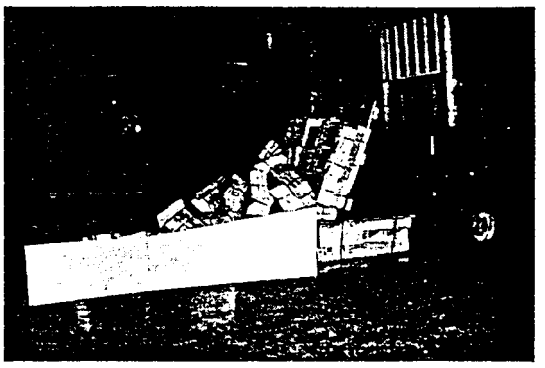
The unloading commenced once the EDR units were removed and the load bar disengaged. The pallets were unloaded while double stacked and placed into the Download Staging Area. As the pallets were placed in this staging area, the Random Selection Method was used to verify the pallet testing order and those pallets selected for the pallet dump.

3.2.7 Pallet Handling Methods (Test)



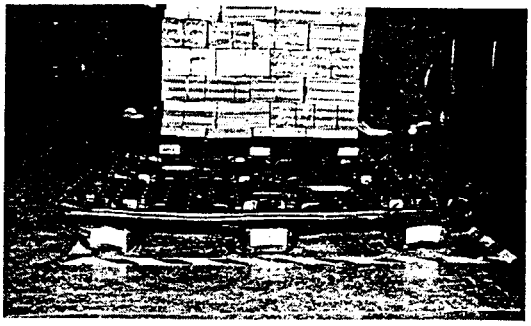
The Pallet Handling Methods (Test) began after all pallets were unloaded and the sequence verified using the Random Selection Method. Unless otherwise stated, each pallet was tested using the following Pallet Handling Methods:

1. Normal Lift
2. Comer Lift
3. Inside Leg Push
4. Edge Lift/Push
5. Leg Push
6. Angle Insertion
7. Sliding - Wear Resistance of a Pallet (1 Load)
8. Sliding - Wear Resistance of a Pallet (2 Loads)
9. Leg Push with Fork Lift Side Shifter
10. Sluing of Pallet
11. Pallet Dumping *(One of each Manufacturer's Type chosen through the Random Selection Method)*



After each pallet completed its designated series of handling methods, the pallet was transported to its proper staging position in the Inspection / Staging Area using the Random Selection Method.

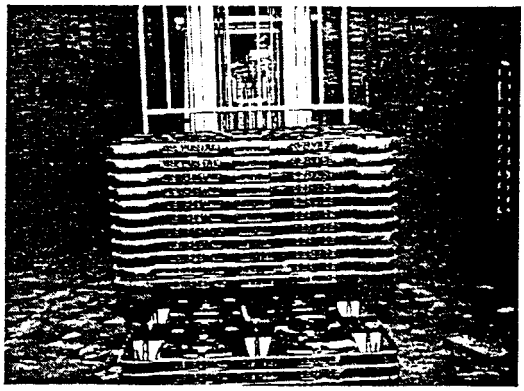
3.2.8 **Pallet Inspection**



As the pallets were positioned in the Inspection / Staging Area, each was de-banded, its phone books removed, and the pallets inspected. After a thorough inspection of the entire pallet, the Data Collection Sheet for that pallet was completed. If the pallet was condemned, a replacement pallet was introduced into the Test Deck and the condemned pallet removed. If the pallet was not condemned, the Trip Marking Strip was updated and the pallet made ready for the next Individual Test Cycle.

After all pallets from the Test Deck were inspected. the Data Collection Sheets were hand delivered to the Data Entry Station for processing.

3.2.9 Pallet Nesting and Denesting



At the completion of the 120 Individual Test Cycles, a Pallet Nesting and Denesting Test was performed on the surviving pallets from the two Test Decks, as well as the remaining sample pallets. These tests are used to determine what effect, if any, the testing of the pallets had on their ability to nest and denest. (See Section 5.0 General Observations.)

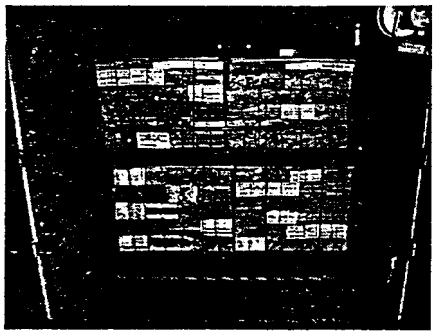
4.0 PALLET DATA ANALYSIS AND RESULTS

The pallets were subjected to various handling methods described in the "Test Procedures and Data Collection Methodology" Section 3.2. Based on the objectives of this study, an ideal pallet should possess the following characteristics:

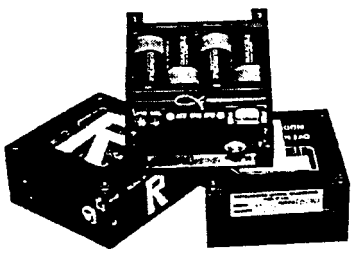
- Survive a maximum number of Individual Test Cycles without sustaining damage resulting in condemnation or an unsafe handling environment
- Lowest Cost
- Light weight for manually handling
- Easily recyclable

This section of the report provides a summary of the Pallet Life Cycle Test data and describes the results for the various pallets evaluated. Each section summarizes the various conditions evaluated.

4.1 Transportation



The vibration levels were measured at the rear of the trailer using two Environmental Data Recorders (EDRs). The levels were measured on the roadside and curbside position of the trailer using the recorder settings described in Appendices D-l and D-2 of the Pallet Life Cycle Test Plan. A total of 120 trips were monitored. Each trip represented 185 recorded events measured over the threshold level. Power Density Spectrums were developed for these trips. The Power Density Spectrums were reviewed to determine files containing a large number of events representing transient responses of the load measured by the recorder. These spectrums show higher vertical vibration acceleration levels in the frequency range of 20-250 Hz. as compared to those in the l-10 Hz. These files represent a majority of events that are the response of the palletized load resulting from trailer vibration and need to be ignored since they do not truly represent vibration input at the truck bed.



A set of files was selected and merged to represent a total of 4440 events. These were analyzed to develop composite vibration spectrums. Figures 4-l and 4-2 depict the Power Density Spectrum representing the vertical vibration levels in trailers carrying USPS shipments in the roadside and curbside locations. The maximum vibration levels are present at 4 Hz. representing the trailer suspension. Additional levels are found at 10-25 Hz. and 58 - 60 Hz. representing the structural response of the trailer. These Power Density spectrums can be used to perform simulated vibration tests on close-loop controlled electro-hydraulic vibration machines to represent these shipments.

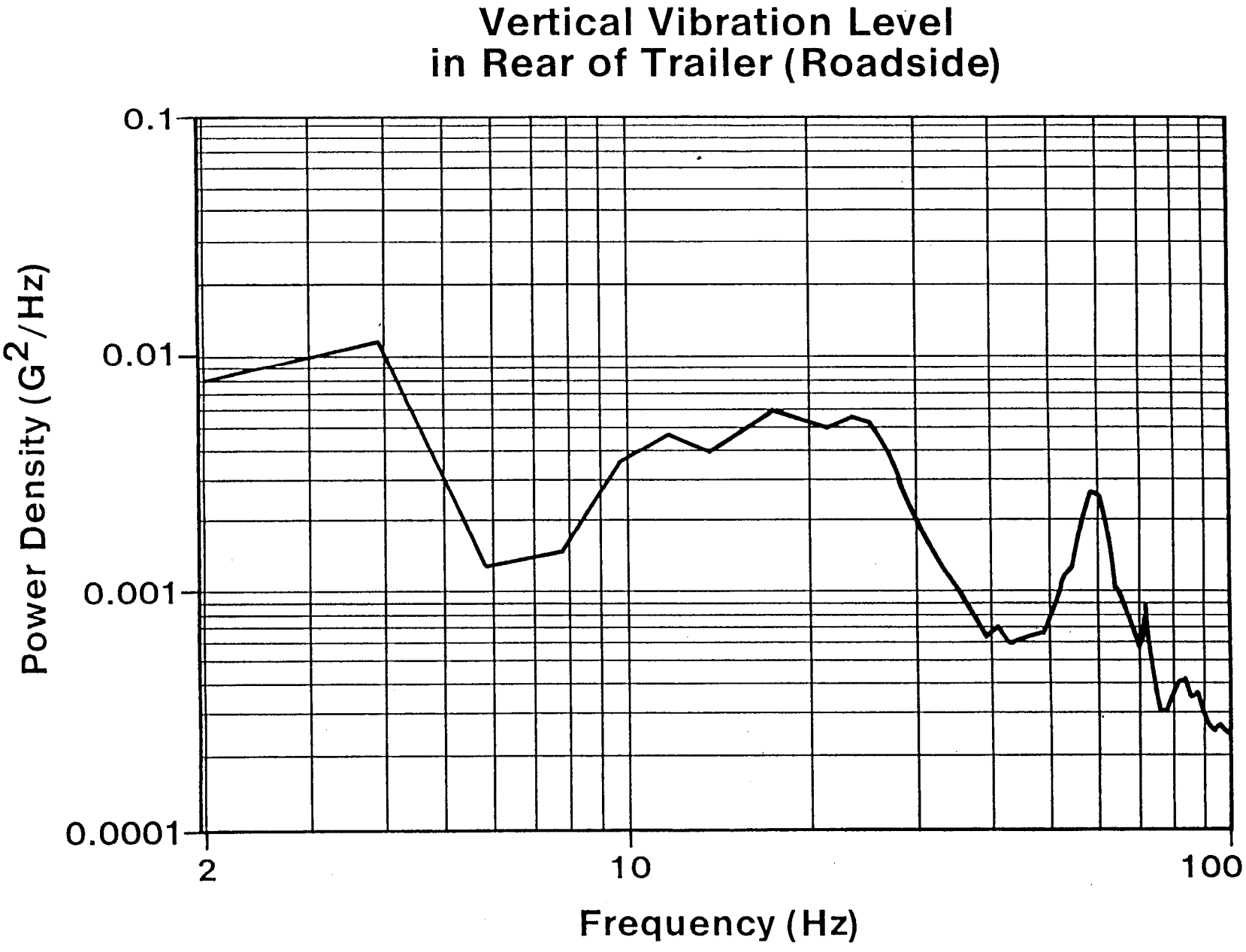

Vertical Vibration Level
in Rear of Trailer (Roadside)
0.1
0.01
0.001
0.0001
Power Density (G2/Hz)
2
10
100
Frequency (Hz)

Figure 4-1

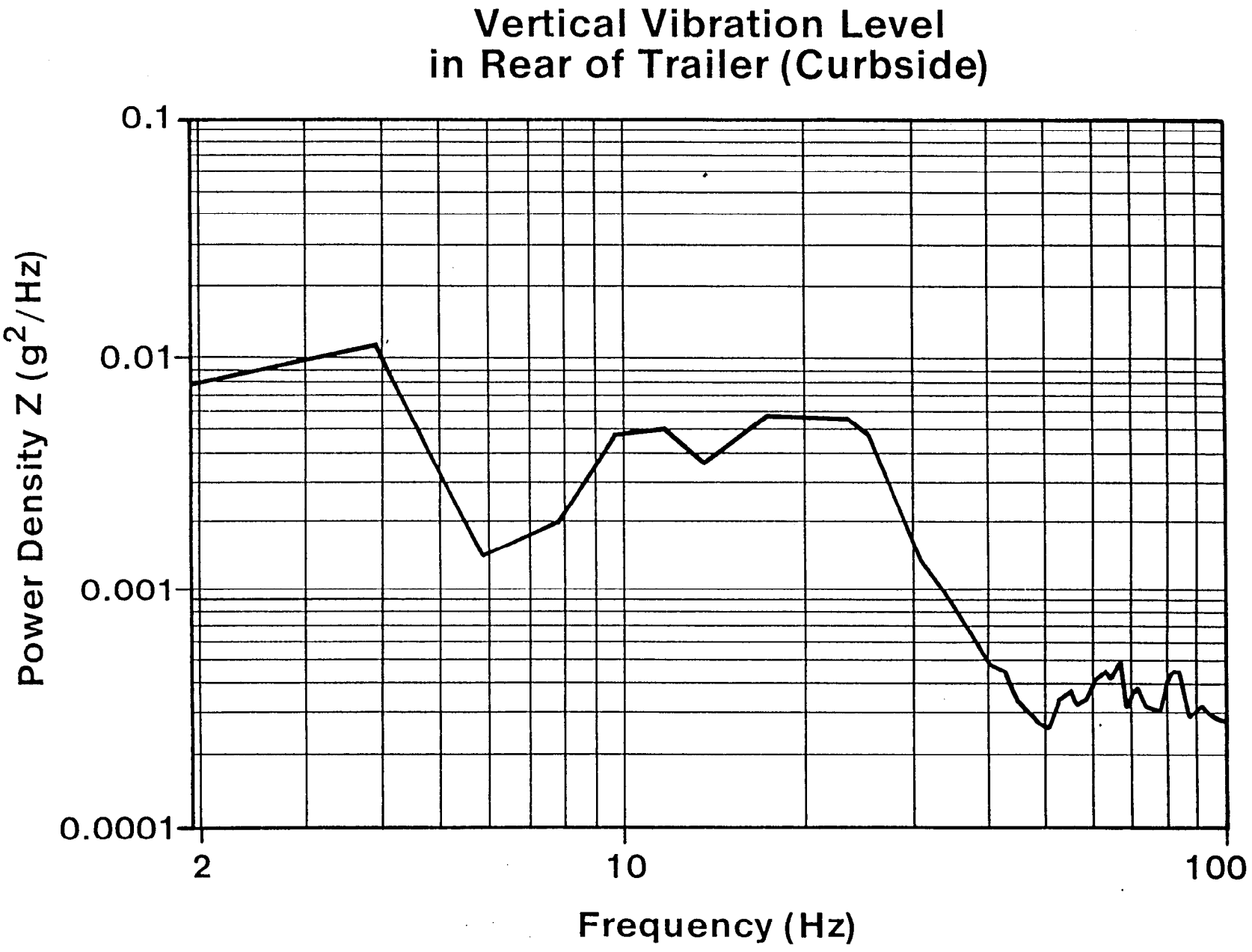

Vertical Vibration Level
in Rear of Trailer (Curbside)
0.1
0.01
0.001
0.0001
Power Density Z (g2/Hz)
2
10
100
Frequency (Hz)

Figure 4-2

A third EDR was used to measure the vibration levels on top of the palletized load representing a double stack. A set of files that represented this transmitted vibration data and contained 4440 events was merged to develop a composite spectrum. Figure 4-3 represents the Power Density Spectrum describing the transmitted vibration on top of the double-stacked palletized loads. There is significant magnification at the 4 Hz. and 23 Hz. frequencies to the palletized loads.

4.2 Pallet Damage Analysis

This section presents the data for the damage caused to the various pallets for a maximum of sixty (60) Individual Test Cycles. The Pallet Life Cycle Test Plan identifies ten forms of Pallet Failure Criteria used to determine whether the pallet can be reused for another Individual Test Cycle. These are:

A. Any comer leg broken such that the leg cannot rest on a level surface.
B. Any comer leg missing.
C. Center leg broken or missing such that leg cannot rest on a level surface.
D. Any two support legs broken such that the legs cannot rest on a level surface.
E. Any two support legs missing.
F. Over twenty-five percent (25%) of the pallet deck is deformed to the point that the deformation is greater than one-half inch (.5”) below the normal surface of the pallet.
G. Any crack ten inches (10”) or longer which extends through the center of the pallet (structural foam plastic and twin-sheet thermoform pallets only).
H. Any crack six inches (6”) or longer which extends through the center of the pallet (presswood fiber pallets only).
I. A hole in the pallet deck greater than the surface area of the opening in the pallet deck for a leg.
J. Pallet deck deformation which includes cracks and holes along pallet edges of three inches (3”) or more into a leg assembly or pallet surface.

The pallet is considered to be damaged if one or more of these types of failure are found after an Individual Test Cycle is completed. **The presence of one or more of these criteria can result in potential damage and unsafe handling of the palletized load in the USPS distribution environment.** This represents the **“Damage Criterion”** for pallets in the USPS environment.

Figure 4-4 represents the various pallet types tested and the corresponding manufacturing process. The weights were determined for each type of pallet by weighing five new sample pallets. The plus or minus (+/-) reflects the variation of weights about the average value. The Litco presswood fiber pallets show the largest variation in weight, having a plus or minus (+/-) of approximately 2 pounds. The twin-sheet thermoform and the structural foam have a more homogenous distribution of material resulting in low plus or minus (+/-) variations in weight. The figure also presents costs associated with these pallets. These costs represent an average procurement cost for ordering large quantities of these pallet types.

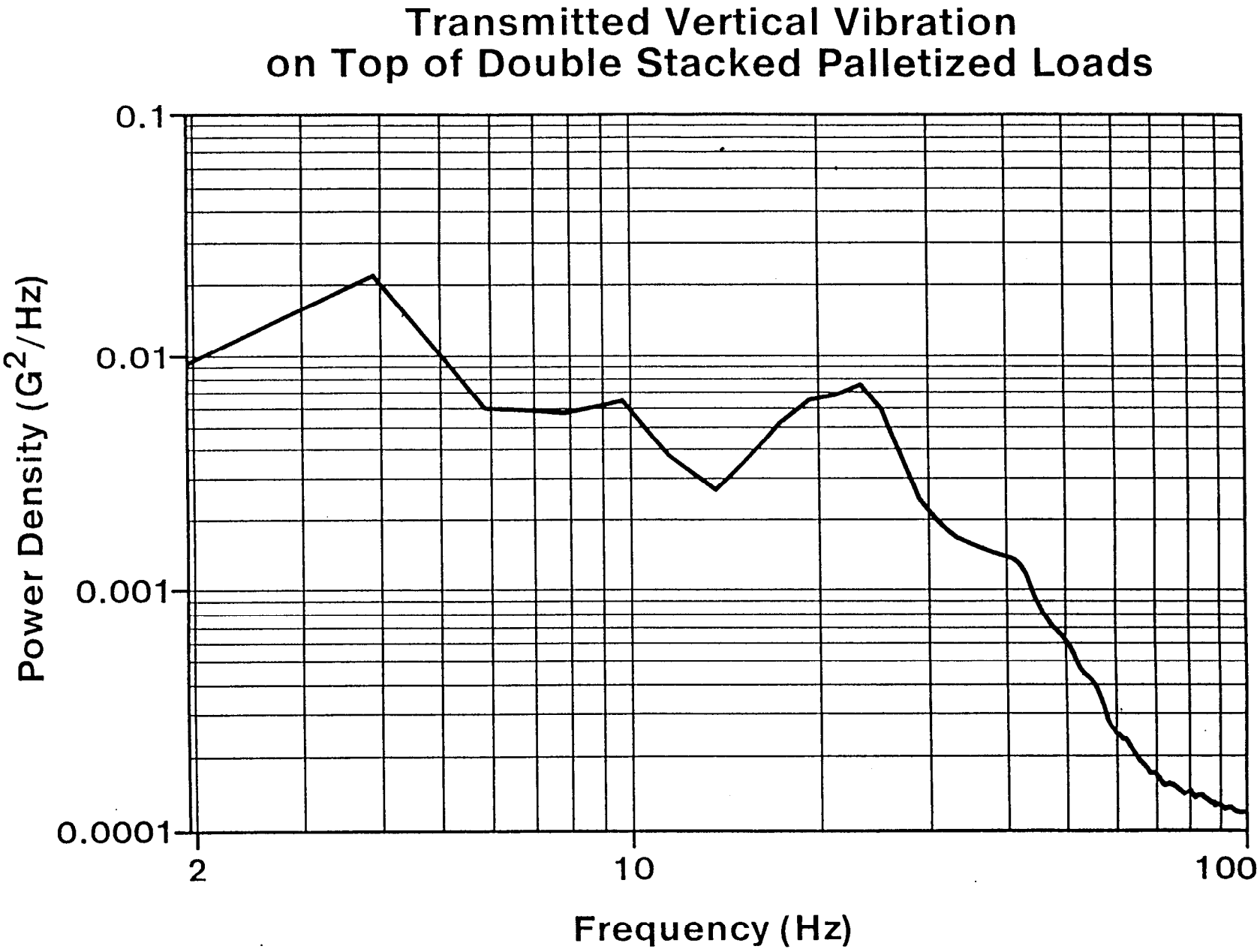
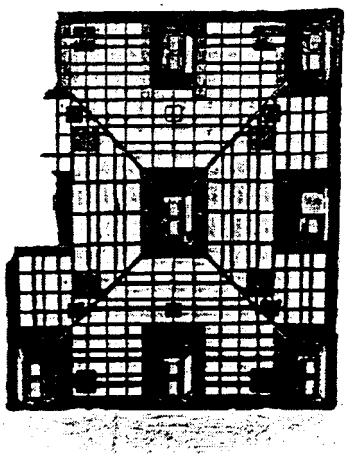

Transmitted Vertical Vibration
on Top of Double Stacked Palletized Loads
0.1
0.01
0.001
0.0001
Power Density (G2/Hz)
2
10
100
Frequency (Hz)

Figure 4-3

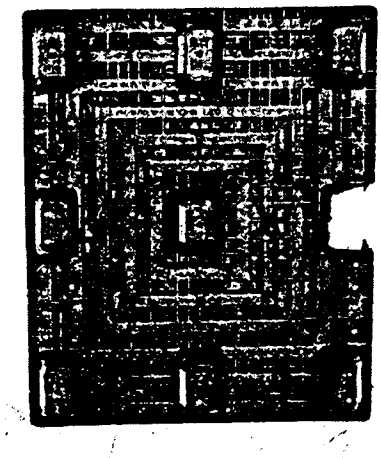
Figure 4-4 also describes the average number of Individual Test Cycles a pallet survived before failure. Obviously a pallet structure that achieves a high number of average Individual Test Cycles before failure represents a good quality, reusable pallet. It is also important to have a low plus or minus (+/-) of variation since this shows less variability in the expected Individual Test Cycles. The Litco presswood fiber pallet is a poor example of a reusable pallet for the USPS environment since it had the lowest average number of 7.10 Individual Test Cycles and a high variation of plus or minus (+/-) 5.77. The Cadillac (USPS) (HDPE twin-sheet thermoform) pallet has a low coefficient of variation which means that these pallets will fail closer to their average Individual Test Cycles determined experimentally. The Loudon Plastics (HDPE structural foam), Penda (HDPE twin-sheet thermoform) and Cadillac-Retailer (HDPE twin-sheet thermoform) all survived the maximum 60 Individual Test Cycles.

Figure 4-5 shows a comparison of the various pallets based on the average number of Individual Test Cycles survived by pallet type. Figure 4-6 shows the breakdown of all the pallets damaged in the Pallet Life Cycle Test for a total of 120 Individual Test Cycles. It is clear that the Litco presswood fiber pallet showed the highest degree of damage (68%) of all pallet types tested. The second largest damage was found in the Functional Pallet System (HDPE structural foam) pallet.

Figure 4-7 describes the various types of failures observed in all eight pallet types. The most predominant mode of failure was attributed to a missing comer leg. This was observed in the Litco presswood fiber pallets followed by FPS structural foam pallets. The second major cause of failure was the result of pallet deck deformation and the presence of cracks and holes along the pallet edges, legs or surface.



Any Corner Leg Missing



Pallet Deck Deformation - Cracks & Holes Along Pallet Edges of Three Inches or More Into a Leg Assembly or Pallet Surface

DAMAGE DATA ANALYSIS AND PALLET PERFORMANCE COEFFICIENT

Manufacturer	Manufacturing Process	Weight (lbs.)		Cost ($)	Number of Individual Test Cycles		Pallet Performance Coefficient
		Average	Variation * (+/-)		Average	Variation * (+/-)	PPC
LITCO	PRESSWOOD	41.40	1.94	6.89	7.10	5.77	2.44
FUNCTIONAL PALLET S SYSTEMS	STRUCTURAL FOAM	22.83	0.08	23.95	22.68	14.30	3.96
MENASHA CORPORATION	STRUCTURAL FOAM	28.96	0.03	23.95	39.50	17.96	6.12
SHUERT INDUSTRIES	TWIN-SHEET THERMOFORM	21.45	0.14	15.52	49.71	5.99	15.84
CADILLAC (USPS)	TWIN-SHEET THERMOFORM	19.63	0.10	15.52	54.00	2.83	18.01
LOUDON PLASTICS	STRUCTURAL FOAM	37.04	0.07	23.95	60.00	0	8.08
PENDA CORPORATION	TWIN-SHEET THERMOFORM	27.35	0.11	15.52	60.00	0	16.68
CADILLAC RETAILER	TWIN-SHEET THERMOFORM	18.99	0.13	15.52	60.00	0	20.35

* The variation represents the standard deviation for the different types. The (+/-) describes the variation regarding the average for a normal distribution.

Figure 4-4

Average Number of Individual Test Cycles Survived by Pallet Type

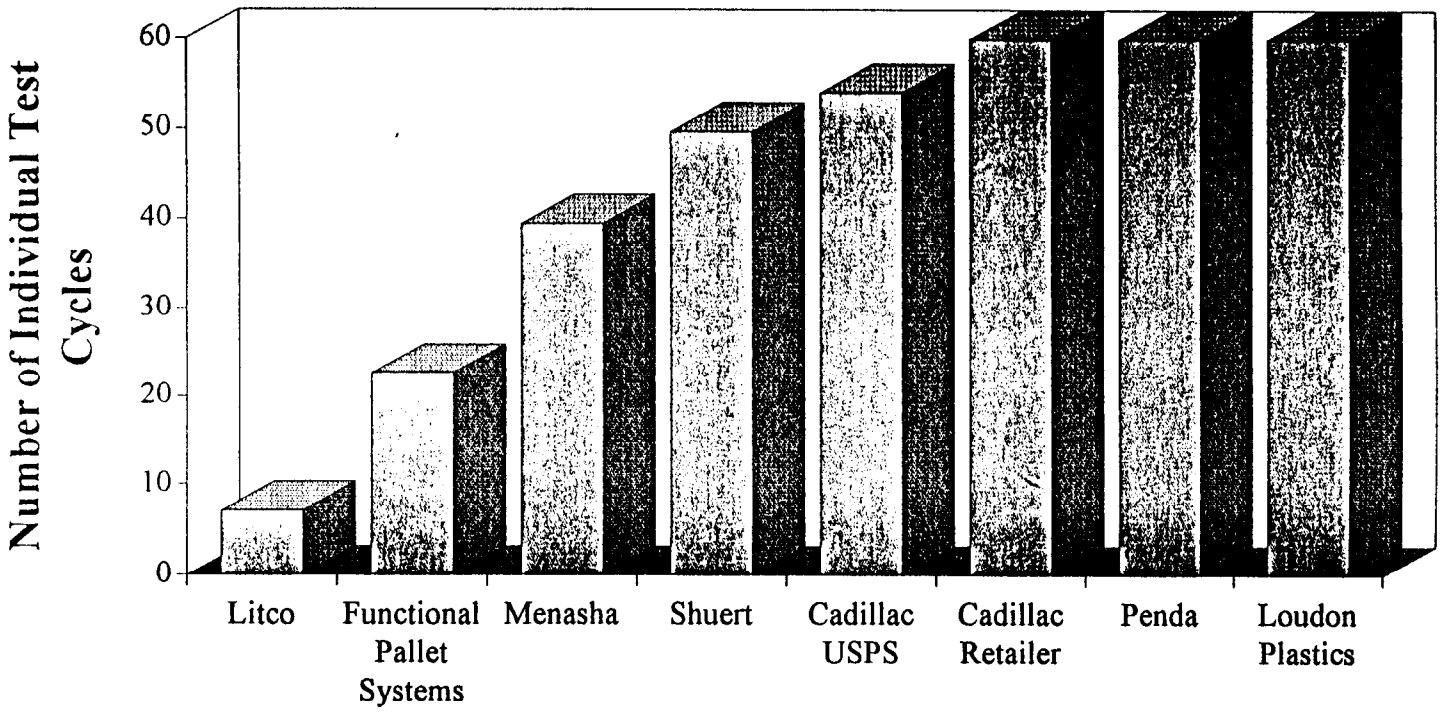


Figure 4-5

Pallets Damaged (%) in 120 Simulated Individual Test Cycles

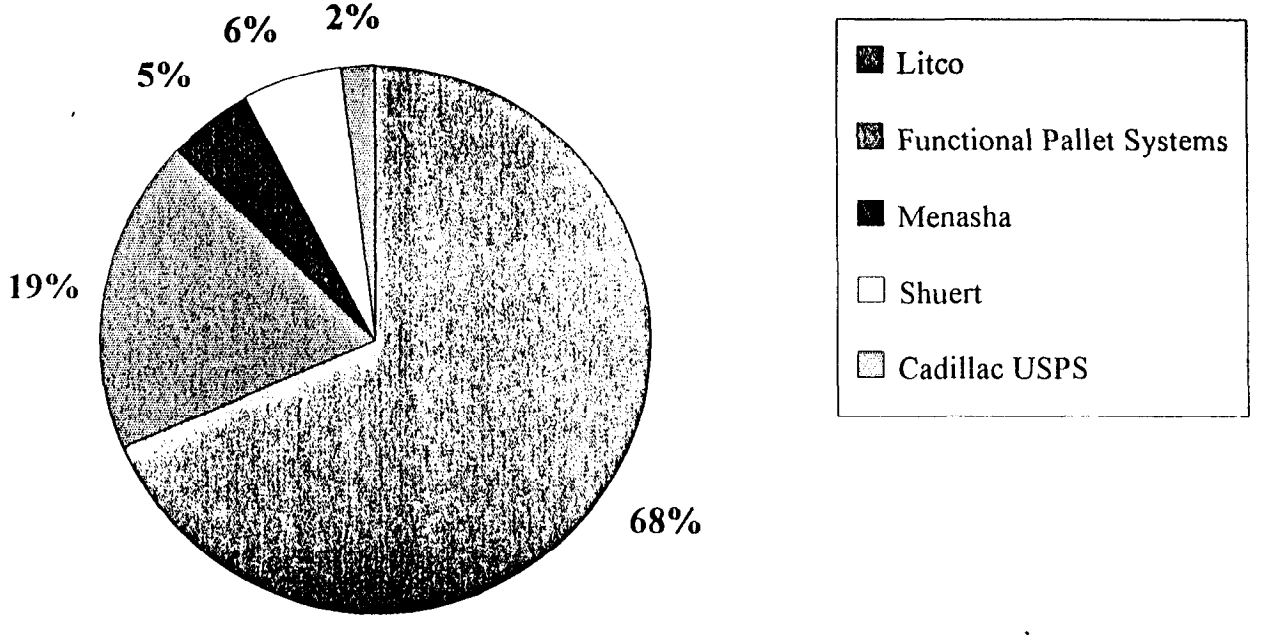


Figure 4-6

FAILURE CRITERIA ANALYSIS (SECTION 4.2)

Manufacturer	Manufacturing Process	FAILURE CRITERIA									
		A	B	C	D	E	F	G	H	I	J
LITCO	PRESSWOOD	0	64	2	3	5	0	0	2	3	9
FUNCTIONAL PALLET SYSTEMS	STRUCTURAL FOAM	1	9	0	1	1	1	2	0	3	5
MENASHA CORPORATION	STRUCTURAL FOAM	0	0	0	2	0	4	0	0	0	2
SHUERT INDUSTRIES	TWIN-SHEET THERMOFORM	0	0	2	2	0	1	0	0	0	3
CADILLAC (USPS)	TWIN-SHEET THERMOFORM	0	0	1	0	0	0	0	0	0	1
LOUDON PLASTICS	STRUCTURAL FOAM	0	0	0	0	0	0	0	0	0	0
PENDA CORPORATION	TWIN-SHEET THERMOFORM	0	0	0	0	0	0	0	0	0	0
CADILLAC RETAILER	TWIN-SHEET THERMOFORM	0	0	0	0	0	0	0	0	0	0
TOTALS		1	73	5	8	6	6	2	2	6	20

Figure 4-7

4.3 Pallet Performance Coefficient

One of the major objectives of this study was to provide a comparison of various pallets based on relative performance, cost, ergonomics and environmental rationale. The first three factors have numeric values that can represent them. The environmental factor is compared based on various factors, such as reduction in use of materials, recycling of materials and reuse of systems.

It is important that the rating of these pallets use the three factors described above to provide a uniform comparison. Since the USPS ranks each of these three factors equally, it is important that they be weighed the same in the evaluation process. The relative performance of the pallets is a function of the average number of Individual Test Cycles that a pallet type can survive without failure. A pallet that survives a large number of Individual Test Cycles before failure is a high performance pallet. The cost is directly represented by the unit dollar cost per pallet. The ergonomic factors for manually handling are attributed to the weight and size of the pallet. Since the USPS requires a standard 48 inch long and 40 inch wide pallet size, the ergonomic factor for comparing pallets is directly related to pallet weight in pounds. Additional factors, such as sharp edges and splinters, are discussed in Section 5.0.

Based on the three variables described above, a **"Pallet Performance Coefficient (PPC)"** was developed that is directly proportional to the average number of Individual Test Cycles before failure and inversely proportional to the cost and weight of a pallet. The number of Individual Test Cycles and Cost of the pallet are weighed equally in the calculation of the PPC. The average weight of pallet type is accounted for 50%, and is compared to the specified weight of the pallet as described in the USPS procurement specification for a given pallet type. **A high value of this coefficient shows a low cost, light weight pallet that survives a maximum number of Individual Test Cycles before failure.** It is evident that, since all these factors equally influence the final choice of pallet types by the USPS, this methodology is used to compare different pallet types.

This coefficient is mathematically represented by:

$$PPC = \left[\frac{N}{C W_o \left(1 + f \left[\frac{W - W_o}{W_o} \right] \right)} \right] \times 100$$

where,

N = Number of Individual Test Cycles
C = Cost ($)
W = Weight of Pallet (lbs)
W_o = Specified Weight of Pallet (lbs)
f = Weighting Factor (50% is 0.5)

Using the data in Figure 4-4, the values of PPC were determined for the various pallet types studied. The data shows that the Litco presswood fiber pallet has the lowest value of this coefficient (PPC=2.44), thereby showing a poor relative performance, based on the cost and weight of this pallet type. The twin-sheet thermoform pallets show the best relative comparison based on the three factors (PPC values between 15.84 to 20.35).

Figure 4-8 shows the values of the Pallet Performance Coefficient for all eight pallet types tested and ranks them in increasing order.

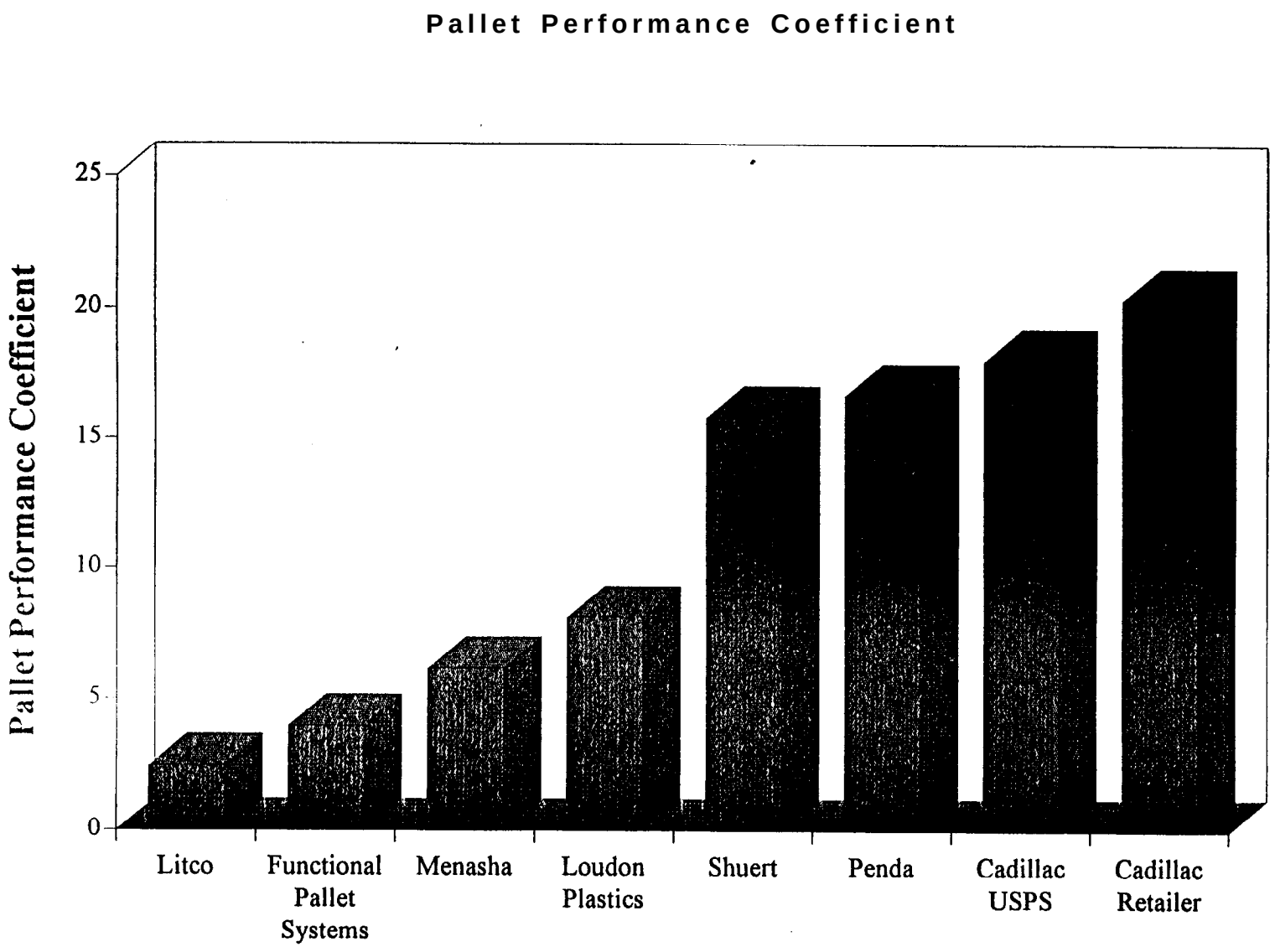

Pallet Performance Coefficient
Pallet Performance Coefficient
25
20
15
10
5
0
Litco
Functional Pallet Systems
Menasha
Loudon Plastics
Shuert
Penda
Cadillac USPS
Cadillac Retailer

Figure 4-8

Figure 4-9 shows a comparison of the averages of weight, cost and number of Individual Test Cycles for each of the three pallet families, presswood fiber, structural foam and twin-sheet thermoform.

4.4 Environmental Factors For Various Pallet Types

With increasing environmental awareness over the last decade on the use of materials and packaging systems, it is important to compare the three manufacturing process types based on various factors, such as reduction in use of materials, recycling of materials and reuse of systems. An ideal pallet system choice would be the one that possesses the following characteristics:

- Uses the least amount of materials
- Can be easily recycled
- Has a high number of uses before failure

The HDPE twin-sheet thermoform pallets are made from an extruded HDPE sheet. Any damaged pallet types can be ground into pellets which can be recycled with HDPE resin and extruded to make the sheets used to construct these pallets. The HDPE twin-sheet pallets also show the highest number of reuses before failure and use the least amount of plastic resin as compared to other plastic pallets manufactured using either injection molding or structural molding processes. They also have a residual cost of material in damaged pallets, since the average cost of recycled HDPE pellets is 21-26 cents per pound. 1

The HDPE structural foam pallets can be recycled and used with other resins to make plastic composites. However, existing technologies limit the manufacture of new HDPE structural foam pallets using significant amounts of recycled HDPE structural foam pallets that are damaged. These pallets are generally much heavier and use more resin when compared to the twin-sheet thermoform pallets.

A similar evaluation of the presswood fiber pallets shows that they use the maximum amount of material by weight for the least amount of uses (Individual Test Cycles) when compared to plastic pallets. The presswood fiber pallets are often used as a fuel source. A small amount of pallets can also be recycled into new pallets. However, the existing processes limit significant amounts of recycled content.

On a comparison basis, the HDPE twin-sheet pallets are better than the HDPE structural foam and presswood fiber pallets used for the USPS shipping and handling environment based on the various environmental factors discussed.

‘Reference from article in *Plastics News,* May 9, 1994 issue, titled “Plastics News Resin Pricing Chart”.

Comparison of Three Pallet Families

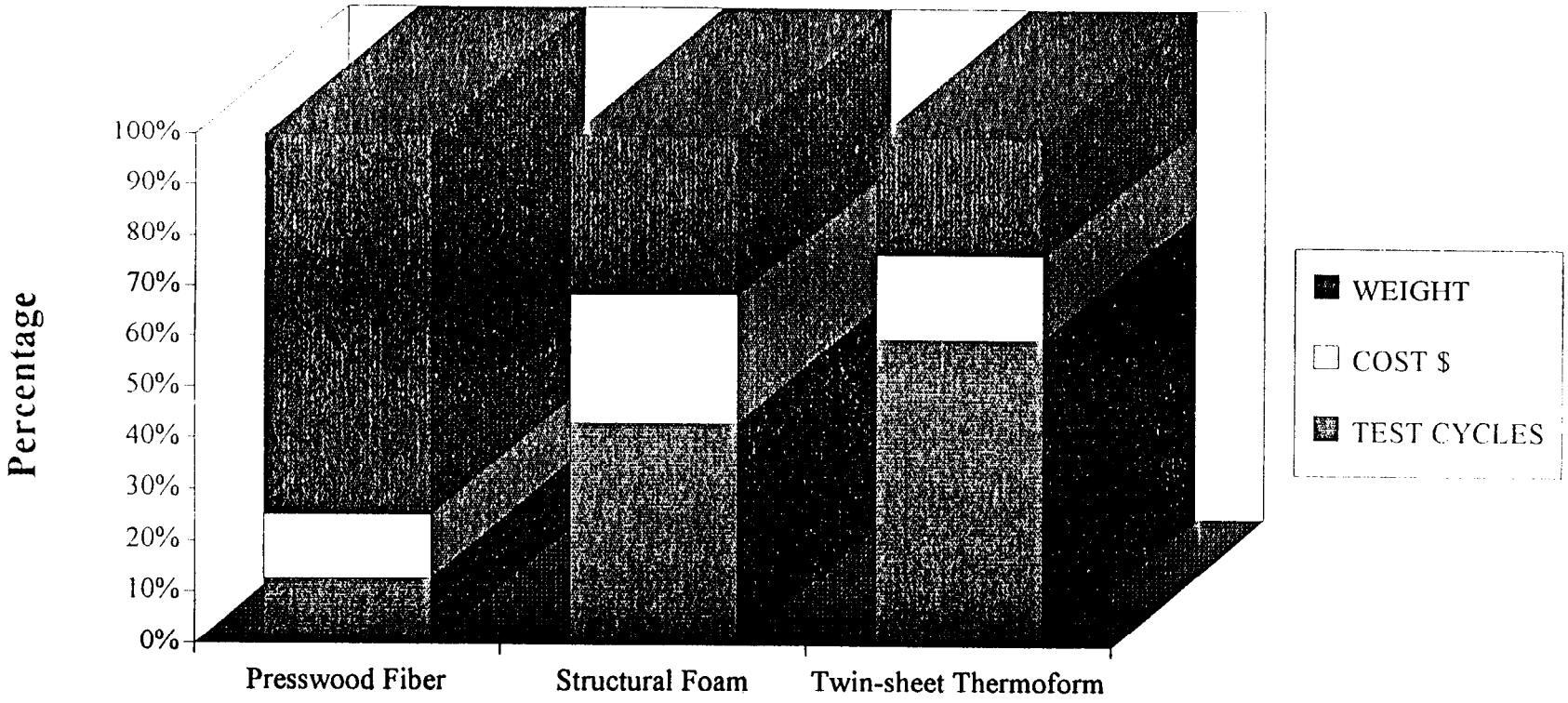


Figure 4-9

4.5 Conclusions

- Twin-sheet thermoform pallets are ranked the number one (1) pallet type of the types tested for use in the USPS Environment. They are light weight (approximately 19-20 pounds), they perform well (averaging 55.93 Individual Test Cycles) and their cost is low (approximately $15-$16).

- Structural foam pallets are ranked the number two (2) pallet type of the types tested. Their performance was only 20 - 40 test cycles, and their cost is approximately 54% higher than the twin-sheet thermoform pallets.

- The presswood fiber pallets are ranked the number three (3) pallet type. Their performance is nearly 700% below that of the lowest performing twin-sheet thermoform pallet and more than 300% below that of the lowest performing structural foam pallets. Their cost is attractive at approximately $7, compared to $15 for the twin-sheet thermoform.

4.6 Recommendations

- Make recyclability a larger factor in the specifications written for the pallets.

- Encourage the use of new materials and new designs in pallets.

5.0 GENERAL OBSERVATIONS

General Observations fall into six (6) areas:

- Banding and Stacking
- Transportation Route (Trip)
- Safety
- Pallet Handling Methods (Test)
- Design
- Nesting and Denesting

5.1 Banding and Stacking

- The actual banding process did not destroy any pallets, however, the banding did cause damage to the outside edges of the Menasha and FPS pallets.
- The FPS pallets experienced the most damage along its outside edges due to banding.
- There were no pallets condemned due to the application of banding material.
- There was no apparent difference in deformation between pallets banded with plastic material versus steel material.
- Menasha pallets would “bow” (concave) when loaded and banded.

5.2 Transportation Route (Trip)

- The Shuert pallets developed “accordion” type legs due to the pallet load and vibration during the Transportation Route (Trip).
- Temperature readings recorded during the Transportation Route (Trip) ranged from 34o to 76o for an average temperature reading of 59o

5.3 Safety

- All pallets (presswood fiber, twin-sheet thermoform, and structural foam) had a tendency to crack and break after used for a period of time, exposing sharp edges. Handling of these pallets requires the use of gloves.

5.4 Pallet Handling Methods (Test)

- The Pallet Sliding and Sluing Methods deposited a thin plastic film on the test facility floor. This film created a slick surface reducing the resistance between the pallets and the test facility floor. Due to this lack of resistance, the Sliding and Sluing Methods were altered by reducing the speed at which the forklifts could perform-these activities.
- The plastic film also reduced the amount of wear to the plastic pallets as a result of the testing.
- The rotation of forklift drivers during the Individual Test Cycles provided the opportunity for different handling speeds, styles and attitudes toward the test pallets.

5.5 Design

- The difference in design between the pallet manufacturers became more apparent as the test progressed. All test pallets had their positive and negative design features.
- The lesser amount of damage along the outside edges of the Menasha pallets was due to the design of the “cells” along the outside edge.
- For structural foam pallets, the use of a cell structure along the outside perimeter of the deck (e.g. Menasha) reduces damage due to banding.

5.6 Nesting and Denesting

- Some pallets were constructed to allow space between the pallets decks when nested. These pallets (Loudon, Litco, and Penda) were the easiest to denest and subsequently nest.

USPS-P-1017C
August 30, 1985
SUPERSEDES
USPS-P-1017B
Dated July 31, 1985

UNITED STATES POSTAL SERVICE SPECIFICATION

PALLET
NESTABLE, LIGHTWEIGHT

1.0 SCOPE AND CLASSIFICATION

1.1 Scope - This specification covers the design, manufacture, inspection, preparation for shipment, and delivery of the pallet. All pallets shall be of the type specified herein.

2.0 APPLICABLE DOCUMENTS

2.1 Government Documents - The following documents, of the issue in effect on date of invitation for bids or request for proposals, form a part of this specification to the extent specified herein:

Federal Standards

FED Test Method Std. No. 101	Test Procedure for Packaging Material
FED-STD-123	Marking for Domestic Shipment (Civil Agencies)
Fed-STD-313	Preparation and Submission of Material Safety Data Sheets

((Activities outside the Federal Government may obtain copies of Federal Specification, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402).

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington (DC), Atlanta, Chicago, Kansas City (MO), Fort Worth, Denver, San Francisco, Los Angeles, and Seattle).

(Federal Government activities may obtain copies of Federal Specification, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies).

Military Standards

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes

(Copies of military standards required by suppliers in connection with specific procurement functions should be obtained from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120).

United States Postal Service

Drawing C-258911	Lightweight Nestable Pallet Configuration Control Drawing

(A copy of the listed drawing is included in the solicitation package. Additional copies may be requested through the Contracting Officer).

3.0 REQUIREMENTS

3.1 Description - The pallet covered by this specification shall be nestable with four-way entry.

3.1.1 Size - The size shall be as specified on Drawing C-258911.

3.1.2 Height - The overall height of the pallet shall be as specified on Drawing C-258911.

3.1.3 Weight - The overall weight of the finished pallet shall be not greater than 44 pounds.

3.1.4 Nestable - Pallets shall be nestable; the height of a stack of pallets due to the addition of each subsequent pallet shall increase not more than two inches.

3.1.5 Capacity - Minimum capacity of the pallet shall be 2,500 pounds.

3.1.6 Flammability - Pallets shall preferably be fire-retardant, but shall be non-toxic when burned.

3.1.7 Physical Integrity - When exposed to the elements, that is, high and low temperatures (-40^{o} to 165^{o} F) high and low humidities, and moisture in the form of fog, rain, snow, sleet, ice, and flood waters, the pallet shall not deform, warp, and disintegrate in such a way that its intended function be impaired. Each support leg shall be self-draining.

3.1.8 Strapability - The top-deck edges of the pallet shall be capable of withstanding normal forces created by tensioning the strapping used to secure the load superimposed on the pallet. The residual deformation of the top-deck edges of the pallet shall not exceed an amount which would make the pallet to appear damaged and might cause injury.

the pallet. The residual deformation of the top-deck edges of the pallet shall not exceed an amount which would make the pallet to appear damaged and might cause injury.

3.1.9 Coefficient of Deck Friction - The coefficient of friction between the bottom surface of the pallet and a smooth steel surface or a broom-finish concrete surface shall be such that the pallet can be located on a level foundation without any danger of slipping as a result of the application of 250-pound horizontal external force with a 2500-pound load on the pallet. Furthermore, the coefficient of friction between the pallet-top surface and a corrugated board, placed between the load and the pallet top, shall be such that the load shall not slip off as a result of the application of a 250-pound external force on level ground.

3.1.10 Toxicity and Resistance to Industrial Solvents and Detergents - Harmful quantities of toxic vapors and chemicals shall not be released from the pallet as a result of exposure during storage and transportation within the temperature and humidity ranges specified. The compounds released as a result of combustion of the pallet shall not exceed the threshold-limit values for the materials involved in line with FED-STD-313. The pallet components shall not deteriorate as a result of exposure to industrial solvents and detergents potentially used for the chemical cleaning of the pallet.

3.2 Material - The material used in the manufacture of these pallets may be a suitable grade of engineering plastic or a combination of wood, fiber, and synthetic resins and shall be water-resistant and non-absorbent.

3.3 Manufacturing Method - Pallets may be manufactured by any normal fabricating methods including injection molding, compression molding, thermoforming, foam processing, stamping, etc.

3.4 First Article Approval - The supplier shall furnish, within the time frame specified (see 6.2), two pallets for examination and tests to prove, prior to starting production, that his production methods will produce pallets that comply with the requirements of this specification. Examination and tests shall be as specified in Section 4. No production units or lot samples shall be delivered prior to approval of the first article. Prefabrication of unit components prior to approval of the first article is at the supplier's risk.

3.5 Marking - Pallet shall be stencilled "U.S. MAIL" with indelible ink in letters two-inches high on opposite sides of the top surface.

3.6 Workmanship - Workmanship shall be in accordance with the best commercial practices for this type of equipment. The pallets shall be free from burrs, slivers, sharp edges, and sharp corners which might cut personnel of their clothing or damage mail. Units shall be not cracked or broken and shall be free of foreign matter (oil, grease, dirt, etc.).

3.7 Performance

3.7.1 Nesting - When pallets are tested in accordance with 4.6.2.1, the top pallet shall separate from the bottom one with a force no greater than the weight of one pallet.

3.7.2 Capacity - When tested in accordance with 4.6.2.2, the pallet shall not crack, break, splinter, delaminate, or show other signs of failure. Slight flattening at the points of impact are not considered failures.

3.7.3 Flexural Strength - When tested in accordance with 4.6.2.3, the pallet shall not crack, break, splinter, delaminate, or deform to the extent of becoming unusable.

3.7.4 Mechanical Handling - When tested in accordance with 4.6.2.5, the pallet shall not crack, break, splinter, delaminate, or show other signs of failure.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection - The contractor is responsible for the performance of all inspection requirements as specified herein in accordance with the First-Article-Approval clause in the basic contract. The contractor may utilize his own or any other inspection facilities or services. Inspection records of examinations and tests shall be maintained by the contractor and furnished to the U.S. Postal Service.

4.2 Quality Control Facilities - The contractor shall provide the U.S. Postal Service representatives with access to his plant and to all operations concerned with the manufacture and evaluation of the pallets. Equipment, working space, and physical assistance required to perform the duties of inspection evaluation shall be made available as needed.

4.3 Sampling - Each production lot of pallets shall be sampled for inspection in accordance with MIL-STD-105, Inspection Level SII, Single Sampling. For purposes of sampling, a production lot shall consist of all units presented for delivery at one time.

4.4 Acceptability

4.4.1 Acceptance - Approval of the first-article sample authorizes the commencement of production, but does not relieve the supplier of the responsibility for the compliance with all provisions of this specification of all units subsequently presented for delivery. Following acceptance by the U.S. Postal Service, the first-article sample may be delivered, after required servicing and adjustment, as the last unit of supply under the contract. Acceptance of samples shall be based on an Acceptable Quality Level (AQL) o 4.0 percent defective.

4.4.2 Rejection - Failure of any sample to pass inspection is cause for rejection of the lot it represents. When rejection occurs, the contractor may screen the entire lot and remove or replace all non-conforming units and re-submit for inspection.

4.5 Classification of Inspection - The inspections are delineated herein are classified as follows:

a. First-article sample inspection
b. Production sample inspection

4.5.1 First-Article Sample Inspection

4.5.1.1 Examination - The first-article-sample units shall be examined as specified in 4.6.1

4.5.2.2 Tests - The production-sample unit that has passed the examination of 4.5.2.1 shall be tested as specified in 4.6.2.

4.6 Procedure - Units shall be subjected to the inspection described in the following paragraphs. A checklist shall be prepared and used to indicate the compliance of each unit (including materials) with all specified requirements. The supplier shall submit certified inspection reports with the first-article sample and each lot presented for delivery. The supplier shall also submit certified inspection reports that the unit complies with paragraphs 3.1.7 and 3.1.10.

4.6.1 Examination - The unit shall be visually examined to ascertain that its condition, with respect to general configuration, fitting, markings, color, finish, fabrication techniques, workmanship, and readiness for shipment, is in accordance with the requirements of this specification and is identical to the approved first-article sample. A report of the examination containing a statement on the acceptability of each item shall be submitted.

4.6.2 Test - The units shall be completely assembled and installed on a level concrete floor at the contractor's facility as intended in an operating postal facility. All observations and measurements shall be recorded.

4.6.2.1 Nesting - Nest one pallet into the second. Place an evenly distributed load of 600 pounds on the top pallet. Pick up the pallets with a forklift truck of sufficient capacity. Run the truck at normal speed around the floor approximately 300 feet. Lower pallets to floor. Remove load. Lift top pallet from bottom one, measuring force required to so.

Reverse the pallets. Repeat the procedure.

4.6.2.2 Capacity - Place on one pallet a uniformly distributed load of 2500 pounds. Using a forklift truck of sufficient capacity, raise the pallet, whose legs on one side are resting on a l-inch thick board, a minimum of eight inches off the floor. Allow the pallet to fall freely onto the rigid impact surface. Repeat three times. Rotate the pallet 90o and repeat the drops. Remove the load from the pallet, examine the pallet (particularly the legs) for cracks, breaks, splinters, delaminations, or other signs of failure.

4.6.2.3 Flexural Strength - Place on one pallet a uniformly distributed load of 2500 pounds. Using a forklift truck of sufficient capacity, insert the forks 70 ± 2 percent under the pallet and lift the pallet from the floor (approximately 3 inches) and after a period of 30 seconds set the pallet on the floor. Repeat three (3) times. Remove the load from the pallet. Examine the pallet for cracks, breaks, splinters, delaminations or other signs of failure. Rotate the pallet 90o and repeat the above test.

4.6.2.4 Strapability - Place on one pallet a uniformly distributed load of 2500 pounds. Strap the load to the pallet with a minimum of four (4) straps on adjacent sides. The straps shall be tightened to the extent that the load cannot be moved when pushed by a human. Pick up the pallet with a forklift truck of sufficient capacity. Run the truck at normal speed around the floor approximately 300 feet. Lower pallet to floor. Remove straps and load. visually inspect the top deck edges. The deck shall not exhibit cracks, breaks, splinters, delaminations, or other signs of failure.

4.6.2.6 Mechanical Handling - With a specimen (uniformly distributed load of 2500 Ibs.), conduct a mechanical handling test in accordance with Method d5011.1 Paragraph 6.2 (Lifting and Transporting by Forklift Truck) of Federal Test Method Standard 101.

5.0 PREPARATION FOR DELIVERY

5.1 Packing - Pallets shall be packed for shipment in a manner to insure carrier acceptance and safe delivery to destination at the lowest applicable rate.

5.2 Marking - Pallets shall be marked for shipment in accordance with FED-STD-123.

6.0 NOTES

6.1 Intended Use - Pallets covered by this specification are intended for use with forklift and handlift trucks for general materials handling operations in storage and distribution systems. Pallets may be loaded wherever materials enter a supply system for storage and shipment.

USPS-P-1108B
July 5, 1989
Superseding
USPS-P-1108A (ESC)
January 24, 1989

UNITED STATES POSTAL SERVICE

P A L L E T
NESTABLE, PLASTIC, THERMOFORMED
(ITEM NO. 39198)

1.0 S C O P E

1.1 Scope - This specification covers the manufacture, inspection, preparation for shipment, and deliver of pallets of the type specified herein.

2.0 APPLICABLE DOCUMENTS

2.1 Government Documents - The following documents, of the issue in effect of date of invitation for bids or request for proposals, form a part of this specification to the extent specified herein:

STANDARDS

Federal

FED-STD-123	Marking for Domestic Shipment (Civil Agencies)
FED-STD-595	Colors

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes

DRAWINGS

U.S. Postal Service

E-1008816	Pallet Assy, Nestable

(Copies of Federal and military standards required by contractors in connection with specific procurement functions should be obtained from the Procurement and Supply Department or as directed by the Contracting Officer.)

(A copy of the listed drawing is included in the solicitation package. Additional copies may be requested through the Contracting Officer.

USPS-P-1265
October 26, 1993

UNITED STATES POSTAL SERVICE

PALLET
NESTABLE, PLASTIC, STRUCTURAL FOAM

1.0 SCOPE

1.1 Scope - This specification covers the manufacture, inspection, preparation for shipment, and deliver of pallets of the type specified herein.

2.0 APPLICABLE DOCUMENTS

2.1 Government Documents - The following documents, of the issue in effect of date of invitation for bids or request for proposal form a part of this specification to the extent specified herein:

STANDARDS

Federal

FED-STD-123	Marking for Shipment (Civil Agencies)
FED-STD-595	Colors Used in Government Procurement

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes

DRAWINGS

U.S. Postal Service

E-1008816	Pallet Assy, Nestable

(Copies of Federal standards required by contractors in connection with specific procurement functions should be obtained from the Federal Supply Service Bureau, Specification Section, 470 E. L'Enfant Plaza SW., Suite 8100, Washington, D.C. 20407.)

(Copies of Military standards required by contractors in connection with specific procurement functions should be obtained from the Defense Printing Office, Customer Service Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

(A copy of the listed USPS drawing is included in the solicitation package. Additional copies may be requested through the Contracting Officer (CO).)

2.2 Non-Government Documents - The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply

American Society for Testing and Materials (ASTM)

ASTM D 635	Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM D 638	Standard Test Method for Tensile Properties of Plastics
ASTM D 648	Standard Test Method for Deflection Temperature of Plastics Under Flexural Load
ASTM D 695	Standard Test Method for Compressive Properties of Rigid Plastics
ASTM D 790	Standard Test Method for Flexural Properties of-Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D 792	Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement

(Copies of ASTM documents may be obtained from the American Society of Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

3. REQUIREMENTS

3.1 Description - The pallet-covered by this specification shall be produced to nest with the pallet specified by USPS Drawing No. E-1008816, and shall be capable of passing the inspection and test requirements in section 4. The pallet shall be nestable with four-way entry designed for transporting mail of various types (e.g., letters, flats, packages, all classes of mail in various packaging and forms, and containers such as bundles and trays) to USPS facilities and between and within USPS facilities. Pallets, when empty of loaded, shall be able to be lifted and transported with fork lift trucks, hand pallet trucks (measuring 3 l/4-inch minimum from floor to forks), and walkie rider trucks. Each support leg and deck surface that is able to collect water shall be self-draining.

3.1.1 Color - The pallet shall be solid orange matching color No. 12473 of FED-STD-595.

3.1.2 Nesting- Pallets shall be nestable. The height of a stack of pallets, due to the addition of each subsequent pallet, shall increase not more than 2 inches.

3.1.3 Capacity - Minimum capacity of the pallet shall be uniformly distributed loads of 2,500 pounds dynamic loading and 7,600 pounds static loading.

3.1.4 Physical Integrity- When exposed to the elements (i.e., ultra violet rays; high and low temperatures (-40^{o} to 165^{o} F); high and low humidities; and moisture in the form of fog, rain, snow, sleet, ice, and flood waters), the pallet shall not deform or warp in such a way that its intended function is impaired.

3.1.5 Strapability- The top-deck edges of the pallet shall be capable of withstanding normal forces created by tensioning the strapping, used to secure the load, which is superimposed on the pallet. The residual deformation of the top-deck edges of the pallet shall not exceed an amount that would make the pallet appear damaged or might cause injury.

3.1.6 Top-Deck Texture Pattern - The top-deck surface of the pallet shall have a texture pattern for the purposes of providing a nonskid surface. The texture pattern shall be selected by the pallet manufacturer and approved by the CO.

3.1.7 Too-Deck Surface - The top-deck surface of the pallet shall have a minimum surface area of 50 percent. Holes in the top-deck surface area shall not be larger than 6 square inches, except leg pockets. The structural surface shall be selected by the pallet manufacturer and approved by the CO.

3.2 First-Article Approval- The supplier shall furnish five first-article sample pallets for approval as required by the contract schedule, made with production tools for examination and testing to prove, prior to starting production, that the production methods will produce pallets that comply with the requirements of this specification. Examination and tests shall be as specified in section 4. No production units or lot samples shall be delivered prior to approval of the first article. Fabrication of unit components prior to approval of the first article is at the risk of the supplier.

3.2.1 Notice of Approval or Disapproval of the First Article - Approval of the first-article sample authorizes the commencement of production, but does not relieve the supplier of the responsibility for the compliance, with all provisions of this specification, of all units subsequently presented for delivery. Following acceptance by the USPS, the first-article sample may be delivered after required servicing and adjustment as the last unit of supply under the contract. Acceptance of samples shall be based on an acceptable quality level (AQL) of 4.0 percent defective. A notice of disapproval shall cite reasons thereof. If the first article is disapproved by the USPS, the contractor may be required to submit an additional first article for first-article approval tests. For each notification by the USPS to submit an additional first article, the contractor shall, at no additional cost to the USPS make any necessary changes or modifications to the first article or select another first article for testing. The cost of additional first-article approval tests and all costs related to such tests shall be borne by the contractor.

3.3 Materials - The material used in the manufacture of these pallets shall be a suitable prime grade of stress-crack resistant, high density polyethylene resin molded as structural foam. The following minimum physical and mechanical properties at 73o F (except when another temperature is shown), when tested in accordance with applicable standards, is shown in Table I. The selection of the resin and its application shall be such that the pallet will pass all other tests specified herein. Thirty percent regrind of the exact same material shall be the maximum allowable when combined with virgin material.

Table I. Material Properties

Property	ASTM Test	Minimal Value
Tensile Yield Strength, psi	D-638	1310 psi
Compressive Strength (10% Deformation)	D-695	1840 psi
Deflection Temperature Under Load	D-648	oF@66psi: 129.6 oF@264psi: 93.5
Flexural Modulus	D-790	120,000 psi
Specific Gravity	D-792	0.60 Ibs/ft3
Burn Rate	D-635	Less than 4 inches/min.

3.4 Performance

3.4.1 Nesting - When two pallets are nested in accordance with 4.8.1 with the lower pallet legs resting on the floor, the lower one shall not lift off the floor when the top pallet is lifted using a fork lift or other means. The test shall be conducted with structural foam pallets and twin sheet thermoformed pallets.

3.4.2 Deflection - When tested in accordance with 4.8.2, the pallet shall deflect less than 3/4 inch.

3.4.3 Capacity - When tested in accordance with 4.8.3 and 4.8.3.1, the pallet shall not crack, break, or show other signs of failure. Slight flattening at the points of impact are not considered failures.

3.4.4 Tare Weight - Each pallet shall not exceed a tare weight of 25 pounds. The actual tare weight shall be molded in 1/2-inch vertical characters on both short sides to read “Tare Wt. XX Lbs.“.

3.4.5 Flexural Strength - When tested in accordance with 4.8.4, the pallet shall not crack, break, or deform to the extent of becoming unusable.

3.4.6 Strapability - When tested in accordance with 4.8.5, the pallet shall not crack, break, or show other signs of failure.

3.4.7 Thermal Stability- After testing in accordance with 4.8.6, the pallet shall not experience an amount of creep which prevents a gage 3 1/4-inch high from fitting in any part of the fork openings.

3.4.8 Manufacturing Method - Pallets shall be produced by molded structural foam using material as specified in paragraph 3.3.

3.5 Identification Marking - Pallets shall have the words "UNITED STATES POSTAL SERVICE" molded in l-inch high lettering on all four sides. Each pallet shall be identified on the top-deck surface with molded-in data in 0.25-inch high characters as follows:

(Contractor's Name)
(Year, month, day of manufacture)
USPS Contract No. ( )
Material ( )*
Mold Cavity Identification No. ( )

*Enter complete identification data required to specify material (e.g., manufacturer's name, brand name, type designation (number, letters, or combination) or other data as required to identify).

3.6 Workmanship - Shall be in accordance with the best commercial practices for this type of equipment. The pallets shall be free from sharp edges and sharp corners which might cut personnel or their clothing or damage mail. Units shall not be cracked or broken and shall be free of foreign matter (e.g., oil, grease, dirt, etc.).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection - The contractor may be responsible for the performance of all inspection requirements as specified herein in accordance with the First-Article approval clause in the basic contract. The CO will advise the contractor when the first-article inspection and tests are to be conducted at USPS facilities. The contractor may utilize his own or any other inspection facilities or services. Inspection records of examinations and tests shall be maintained by the contractor and furnished to the USPS.

4.2 Quality Control Procedures - The contractor shall provide the USPS representatives with access to his plant and to all operations concerned with the manufacture and evaluation of the pallets'. Equipment, working space, and physical assistance required to perform the duties of inspection evaluation shall be made available as needed.

4.3 Sampling - Each production lot of pallets shall be sampled for inspection in accordance with MIL-STD-105, Inspection Level S-2, Single Sampling. For purposes of sampling, a production lot shall consist of all units presented for delivery at one time.

4.4 Classification of Inspections - The inspection requirements specified herein are classified as follows:

a. First-Article Item Inspection (see 4.5)
b. Quality Conformance Inspection (see 4.6)

4.5 First Article Item Inspection

4.5.1 Examination - The first-article sample units shall be examined as specified in 4.7.1.

4.5.2 Tests - The first article sample units that have passed the examination of 4.5.1 shall be subjected to the tests in the order listed (see 4.8.1 through 4.8.6). Tests shall be conducted at nominal room temperature (73 F + 5 F).

4.6 Quality Conformance Inspection - The sampling and inspection procedures specified in 4.6.1 and 4.7, respectively, shall constitute the requirements for normal quality conformance inspection. The USPS reserves the right to institute either tightened or reduced inspection requirements on the basis of evaluation results, and at no additional cost or changes to the USPS. Samples shall be examined as specified in 4.7.1 and tested as specified in 4.8. Presence of one more defects or failure to pass the specified test shall be cause for rejection (see 4.9). The acceptable quality level (AQL) for lot acceptance shall be 4.0 percent major and minor defects or failed tests.

4.6.1 Sampling - For each lot of pallets ready for shipment, a random sample for inspection shall be selected in accordance with MIL-STD-105, Inspection Level S-2, Single Sampling, but increased if necessary to a multiple of seven.

4.6.2 Lot - For the purpose of this inspection, a lot shall consist of all pallets being manufactured and offered for delivery at one time.

4.7 Inspection Procedure

4.7.1 Examination Procedure - The unit shall be visually examined to ascertain that its condition, with respect to general configuration, markings, color, weight, and readiness for shipment, is in accordance with the requirements of this specification and USPS Drawing No. E-1008816 and is identical to the approved first-article sample. A report of the examination containing a statement on the approval of each item shall be submitted. Sample pallets shall be examined as specified in this paragraph and tested in accordance with 4.5.2. Any pallet that contains any defect or fails any test shall be rejected (see 4.9). The AQL for lot acceptance is 4.0 percent defective. Presence of defects in excess of the AQL shall be cause for rejection of that lot (see 4.9.2).

4.8 Test Procedure

4.8.1 Nesting - Nest one pallet into another with the lower pallet legs resting on the floor, Lift the top pallet using a fork lift truck or other means. The lower pallet shall not lift off the floor when the top pallet is lifted. Reverse the pallets and repeat the procedure. Nest pallets both ways with twin sheet thermoformed pallets.

4.8.2 Deflection - Place on one pallet a uniformly distributed load of 2,500 pounds. The load shall consist of vertical stacks of magazines, phone books, catalogs, or standard 8 1/2- by 11 -inch office paper. These shall be bundled together in stacks approximately 6 to 8 inches high using plastic banding or shrink film. Standard office paper shall be packaged approximately 500 sheets (one ream) to a package. Using a fork lift truck of sufficient capacity (with forks parallel to the 40-inch dimension of the pallet), positioned 25 ± 1 inch apart, edge to edge overall and with tips of forks flush with the 48-inch edge, raise the pallet to a height approximately 18 inches from the floor. Place a straight edge, 48 inches in length, along the underside of the deck (48-inch dimension) and measure the distance at center of front edge of pallet from bottom edge of pallet deck to the straight edge.

4.8.3 Dynamic Load Capacity - Using a uniform load of 2,500 pounds made up of bags of sand, place these on the pallet with separator sheets between layers and secure with plastic or steel strapping. Place the pallet with the legs along one 48-inch edge resting on a 1 -inch by 10-inch nominal size wood board. Raise the opposite pallet edge until the underside of the deck is at its original height plus 8 inches from the floor. Quickly remove the lifting source and allow the pallet to fall freely to the floor surface. Repeat three times; then repeat the three drops, lifting one of the 40-inch edges while the opposite feet rest on the board. Remove the load and examine the pallet for cracks, deformation, or other signs of damage.

4.8.3.1 Static Load Capacity - Static load test shall be performed using a compression test machine. Place a uniform load of 2,200 pounds minimum on the pallet loaded with the same material as in paragraph 4.8.2. Place the loaded pallet between platen and apply the compression load at a rate of approximately 1/2-inch per minute for a total load of 7,600 pounds (including initial load). Maintain this load for 72 hours. At the end of the 72 hours, remove the compression machine load and check that the vertical clearance throughout the pallet fork openings are 3 inches, using a gage block and having the dimensions 3 by 6 by 1 1/2 inches. The legs of the pallet shall not exhibit evidence of crushing, buckling, or collapsing.

4.8.4 Flexural Strength - Place on one pallet the same uniformly distributed load of 2,500 pounds, as used in paragraph 4.8.3.1. Using a fork lift truck of sufficient capacity, place a chalk mark across the forks 28 inches from the tips. Enter the pallet with the forks parallel to the 40-inch side until the rear edge of the pallet is lined up with the marks. Lift the pallet from the floor, approximately 12 inches, and after a period of approximately 30 seconds lower pallet to the floor. Repeat three times. Remove the load and examine the pallet for cracks, breaks, or other signs of failure. Move to one of the ends of the pallet and repeat the above tests with the forks parallel to the 48-inch dimension and entered a distance of 34 inches.

4.8.5 Strapability - Place on one pallet a uniformly distributed load of 2,500 pounds as used in 4.8.2 Strap the load to the pallet with a minimum of four steel straps, two each, on adjacent sides. The straps shall be tightened to the extent that the load cannot be moved when pushed by a human. Pick up the pallet with a fork lift truck of sufficient capacity. Run the truck at normal speed around the floor approximately 300 feet. Lower pallet to the floor. Remove straps and unload. Visually inspect the deck edges. The deck shall not exhibit cracks, breaks, or other signs of failure.

4.8.6 Thermal Stability - A pallet loaded with the same load used in 4.8.2 shall be held for 72 hours at a temperature of 140 F ± 5 F. At, the end of the 72 hours, check that the vertical clearance throughout the pallet fork openings are 3 1/4 inches, using a gage block and having the dimensions 3 1/4 by 6 by 1 1/2 inches.

4.9 Rejection - Failure of any sample to pass inspection is cause for rejection of the lot it represents. When rejection occurs, the contractor may screen the-entire lot and remove or replace all nonconforming units and resubmit for inspection.

4.9.1 Rejected Units - Pallets found defective in the course of inspection shall be rejected, even though the lot is accepted.

4.9.2 Rejected Lots - Lots found unacceptable in the course of inspection shall not be resubmitted for inspection unless all defective units are removed. The resubmitted lots shall be reinspected in accordance with 4.7.

5. PREPARATION FOR DELIVERY

5.1 Packing - Pallets shall be packed for shipment in a manner to ensure carrier acceptance and safe delivery to destination at the lowest applicable rate.

5.2 Marking - Pallets shall be marked for shipment in accordance with FED-STD-123.

6. NOTES

6.1 Ordering Data - Procurement documents shall specify the following:

a. Title, number, and date of specification
b. Item number of pallets to be procured
c. Time frame for furnishing a first-article sample (see 3.2)
d. Number of units to be produced and the schedule of delivery

Arthur D Little

Pallet Handling in Postal Facilities

Report to United States Postal Service

January 17, 1994

Arthur D. Little, Inc.
Acorn Park
Cambridge, Massachusetts
02140-2390

Reference 68410

Table of Contents

1. Introduction

The Postal Service requested that Arthur D. Little verify the pallet handling methods used in selected postal facilities in conjunction with the Mail Transport Equipment processing and repair project currently being conducted.

This report documents the verification of the various methods by which pallets are handled in selected Processing and Distribution Centers (P&DC) and Bulk Mail Centers (BMC). Pallet handling operations were observed in the following six postal facilities:

- D.V. Daniels P&DC, Kearny, NJ
- Chicago, IL P&DC
- Chicago, IL BMC
- Southern Maryland (Washington, DC) P&DC
- Southern Maryland (Washington, DC) BMC
- Greensboro, NC BMC

The objectives of the observations were to determine and document current pallet handling methods in the selected postal facilities. An additional objective is to ensure that these methods are properly replicated in life cycle testing of pallets. Areas observed included, but were not limited to:

- Loading to and unloading from trucks
- Movement of pallets on loading docks (including staging areas)
- Movement of pallets within the facility
- Removal of material from pallets (pallet dumping)
- Adding and securing material to pallets (pallet building)
- Stacking and storage of empty pallets

This report documents pallet handling in the selected facilities and satisfies the first objective. The second objective will be completed after test plans are reviewed and tests are observed and will be the subject of a second report.

At each facility, we met with managers to determine the best times to observe pallet handling operations. We then toured the facility, and, using the work sheet attached in the Appendix as a guide, observed operations and interviewed personnel involved in pallet handling.

2. Summary

The following table summarizes pallet handling methods observed and indicates those we recommend for inclusion in life cycle testing:

Pallet Handling Method	No. of Sites at which Observed		Include in Testing?
	BMC	P&DC	
Normal lift (side) - Forks extend through or nearly through underside of pallet bed, clear of all legs. Pallet is lifted, tilted and transported to new location where it is set down and slid 6" to 12" until striking a wall or another pallet.	3	3	Yes
Normal lift (end) - Full length of forks extend along underside of pallet bed, clear of all legs. Pallet is lifted, tilted and transported to new location where it is set down and slid 6" to 12" until striking a wall or another pallet.	3	3	Yes
Corner lift - Fork is positioned under one corner, load lifted slightly, and the pallet slid (rotated) to a new position.	3	3	Yes
Edge lift - Fork is positioned under one edge, load lifted slightly, and the pallet slid (rotated) to a new position.	3	3	Yes
Leg push - Fork is placed against one of the pallet legs and then the pallet is pushed to a new position.	3	3	Yes
Angle insertion - Fork is inserted at an angle and the fork lift moved forward until the edge of the pallet strikes the vertical support and the pallet twists into its normal position.	3	3	Yes

Pallet Handling Method	No. of Sites at which Observed		Include in Testing?
	BMC	P&DC	
Train pushing - A train of several pallets is moved to a new position by pushing with a fork lift from one end of the train.	0	1	Yes
Pallet dumping (universal unloaders) - Pallet is placed in the unloader by a fork lift. Side cam plates are positioned to hold the pallet. Entire unloader tilts until pallet contents fall into hopper.	3	0	No[1]
Pallet dumping (shingler) - Pallet is placed in the unloader by a fork lift. Unloader tilts slightly. Bottom of unloader lifts and pallet load slides off one layer at a time into hopper.	1	0	No[1]
Pallet dumping (manual) - Pallet is positioned by fork lift. Contents are removed by hand and placed on conveyor.	0	3	No[1]
Pallet dumping (fork lift) - Pallet is placed on a stack of pallets with the loaded pallet edge resting against the hopper lip. Blades are withdrawn until they are approximately 1/3 inserted. Blades are raised and moved forward simultaneously, tilting the pallet and dumping the contents into the hopper.	1	0	Yes
Pallet building (NMOs) - Pallet is positioned in the NMO sorting area and brick loaded with parcels as they arrive via conveyor. Loaded pallet is transported by fork lift to stretch wrap machine, load is stretch wrapped, then moved to staging area.	1	0	No

Pallet Handling Method	No. of Sites at which Observed		Include in Testing?
	BMC	P&DC	
Pallet building (auto loaders) - The most common method of pallet building in BMCs is the placing of a cardboard box on a pallet, positioning the box in an auto loader and filling it with parcels or sacks.	3	0	No[2]
Stacking (nesting) pallets - Pallets are nested by lifting a single pallet by hand or a stack of pallets by fork lift, placing it on top of another pallet and sliding it until the legs of the lifted pallet fall into the leg holes of the pallet at rest. The blades are then retracted.	3	3	Yes[3]
Unstacking pallets - Nested pallets can be retrieved by manually lifting the top pallet of a stack or by inserting fork lift blades under the portion of the stack to be lifted, raising the partial stack until it clears the rest of the stack and then transporting it normally.	3	3	Yes[4]
Storage - Pallets are stored in nested stacks approximately 6 to 8 feet high. All observed storage areas were inside and did not expose the pallets to the elements.	3	3	Yes[5]
Pallet jerk - Cargo strap or chain is placed around a leg of a loaded pallet and the other end attached to a pulling device such as a dock mule. The loaded pallet is then pulled up to 40 feet to a position where it can be picked up by a fork lift (usually at the tail gate of the truck).	0	0	Yes[6]
Side shift - The forks are positioned normally and the load lifted until the pallet clears the floor. Then the side shifters are used to move the pallet up to 8" to the left or right.	1	1	Yes

Notes:

1 - The universal unloader, shingler, and manual pallet unloading (dumping) methods do not place any unusual strain or stress on the pallets beyond normal lifting and setting down with a load on the pallet. Therefore, we see no need to duplicate these processes in a life cycle test.

2 - Auto loaders did not appear to cause any unusual stress or strain for pallets. However, weights supported by pallets used in autoloaders should be gathered and these data considered in determining average, maximum and minimum weights for tests.

3 - Pressed wood pallets will partially nest in thermoform plastic pallets but scrape the inside of the plastic pallet. This is a common occurrence and should be included in tests.

4 - The use of a fork lift in unstacking nested pallets should be included in the test as this is a potentially damaging operation.

5 - Although pallets were not observed in outside storage at the six facilities visited, weather damage was observed at one facility indicating outside storage at some location. Exposure to the elements should be included in the tests since it appears likely that a pallet may be exposed to weather at some point in its life by mailers if not by the Postal Service.

6 - Although the pallet jerk was not observed in any of the six facilities visited, it was reported by one dock worker to be used when “proper equipment was not available” and is a fairly common practice when fork lifts or pallet jacks cannot be used. Some form of this practice should therefore be tested.

3. General Observations

In general, all observers reported pallet handling to be very professional within the postal facilities visited. Fork lift operators were efficient, very conscious of what was occurring around them. and safe and gentle in pallet operations. Personnel were queried as to which pallets they preferred and why. Most preferred the thermoform plastic to the pressed wood because the plastic model is lighter, easier to handle (no wood splinters), and doesn’t break apart. Where plastic is not preferred, the problem is its tendency to bow under heavy loads causing mail to fall from the load.

Some pallet handling practices observed in all facilities but not normally encouraged by pallet manufacturers are:

- *The corner lift* - When minor adjustments in the position of a pallet are required. fork lift operators frequently place one blade under a comer of the pallet, lift slightly, and move forward or back to turn the pallet. This places extreme pressure on the lifted comer,

- *The edge lift* - Same as the comer lift above, but the blade is placed under an edge instead of the comer.

- *The angle insertion* - Operators frequently insert fork lift blades at an angle to the pallet edge, driving forward until the pallet edge strikes the vertical support, then continue driving forward forcing the pallet to twist into the normal position with the pallet edge perpendicular to the blades. This creates extreme horizontal pressure on one point of the pallet edge and increases the probability of a blade strike against the center legs.

- *The leg push* - In this maneuver, the pallet position is changed by placing a blade against one of the pallet legs and pushing the pallet into the new position. This may be combined with the comer lift or edge lift cited above. This creates extreme pressure on the leg.

Pallet weights were gathered from weight and acceptance offices at two facilities - the Chicago BMC and D.V. Daniels P&DC. These data are summarized below:

	Chicago BMC. November- 23-30, 1993	**D.V. Daniels P&DC- December 9-20, 1993**
Number of Pallets	115	639
Weight of Heaviest	1733 lbs	1668 lbs
Average Weight	828 lbs	702 lbs
Weight of Lightest	19 lbs	24 lbs

4. Unloading from Trucks

Load Characteristics. Pallets loaded with bulk mail or parcels arrive at the facilities in trailers. The truck loads may be homogeneous and blocked within the truck, which is frequently the case when receiving a entire truck load from a mailer. Trucks may also carry mixed loads of pallets (some with brick loaded bulk mail, some with cardboard cartons filled with sacks or loose parcels), bed loaded mail, and/or mail in rolling stock. This is usually the case when receiving mail from other postal facilities. Pallets may be set in the truck with the longer side parallel or perpendicular to the truck side wall. Some facilities alternate pallet directions giving the load a brick load effect. Pallets may be single or double stacked within the truck.

Most mailers employ stretch wrapping to secure the brick load on the pallet. Some also band the brick load to the pallet using 3/8" plastic or 5/8" steel banding. Banding may consist of two bands around the pallet and load on the 40" side or four bands with two in each direction. Top caps, usually wooden frames but sometimes cardboard and occasionally another pallet, are used by some mailers to better secure the brick loads and to provide a steadier base for stacking. Some mailers also band two pallets together in a stack.

None of the pallets observed had extremely uneven loading in tern-s of height variances or weight distribution. In general, the loading of the pallets did not appear to be a factor in pallet damage, although the narrower plastic banding did sometimes leave a permanent indentation in the edges of pressed wood pallets.

Unloading Procedures. Five of the six facilities use electric powered fork lifts to unload trucks. The forks are normally set at 24" to 26" outside to outside width. Fork lengths are 40" or 48". At the Chicago P&DC, electric pallet jacks are used to move pallets from the truck to a scissor lift (operators ride the jack by standing on the rear deck). The scissor lift is then used to lower the pallet and pallet jack to the dock level.

In the unloading process, most pallets are positioned in a manner that requires the forklift operator only to enter straight on with the forks in a lowered and level position approximately 1" above the truck bed. The blades are inserted between the legs of the pallet until the edge of the pallet is against the vertical support of the lift. The load is then lifted enough to clear the truck bed and tilted slightly toward the fork lift. The operator backs out of the truck and carries the pallet to a staging area or, in some cases, directly to the outbound trailer or pallet dumping station. There the pallet is typically lowered until it is resting on the floor and pushed the last 6" to 12" until it strikes the next pallet in the line.

repeat the above tests with the forks parallel to the 48 inch dimension and entered a distance of 34 inches.

4.7.5 Strapability - Place on one pallet a uniformly distributed load of 2,500 pounds as used in paragraph 4.7.2. Strap the load to the pallet with a minimum of four (4) steel straps, two each, on adjacent sides. The straps shall be tightened to the extent that the load cannot be moved when pushed by a human. Pick up the pallet with a forklift truck of sufficient capacity. Run the truck at normal speed around the floor approximately 300 feet. Lower pallet to floor. Remove straps and unload. Visually inspect the deck edges. The deck shall not exhibit cracks, breaks or other signs of failure.

4.7.6 Thermal Stability - A pallet loaded with the same load used in 4.7.2 shall be held for 72 hours at a temperature of 140 degrees F ± 5 degrees and the pallet fork opening clearances checked with a gage block 3-1/4 x 6 x 1-1/2 inches thick, made of ultra high molecular weight polyethylene (3-1/4 inches vertical).

4.8 Rejection

4.8.1 Rejected Units - Pallets found defective in the course of inspection shall be rejected, even though the lot is accepted.

4.8.2 Rejected Lots - Lots found unacceptable in the course of inspection shall not be resubmitted for inspection unless all defective units are removed. The resubmitted lots shall be reinspected in accordance with 4.7.

5.0 PREPARATION FOR DELIVERY

5.1 Packing - Pallets shall be packed for shipment in a manner to ensure carrier acceptance and safe delivery to destination at the lowest applicable rate.

5.2 Marking - Pallets shall be marked for shipment in accordance with FED-STD-123.

6.0 NOTES

6.1 Ordering Data - Procurement documents shall specify the following:

a. Title, number, and date of specification
b. Item number of pallets to be procured
c. Time frame for furnishing a first-article
d. The number of units to be produced and the schedule of delivery

2.2 Non-Government Documents - The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated the issue in effect on date of invitation for bids or request for proposal shall apply.

STANDARDS

American Society for Testing and Materials

ASTM D 635	Test method for rate of burn and/or extent and time of burning of self supporting plastics in a horizontal position
ASTM D 638	Test Method Tensile Properties of Plastics
ASTM D 1238	Test Method of Flow Rates of thermo plastics by extrusion plastometer.
ASTM D 1822	Test Method for Tensile Impact energy to break plastics and electrical insulation materials.
ASTM D 1693	Test method for Environmental Stress-Cracking of ethylene plastics.
ASTM D 1505	Test method for Density of plastics by the Density-Gradient technique.

(Copies of ASTM Standards may be obtained from the American Society of Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Technical Society and Technical Association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal Agencies.)

3.0 REQUIREMENTS

3.1 Description - The pallet covered by this specification shall be produced in accordance with drawing E-1008816 and shall be capable of passing the inspection and test requirements in Section 4. The pallet shall be nestable with four-way entry designed for transporting mail of various types (letters, flats, packages, all classes of mail in various packaging and forms, and containers such as bundles and trays) to U.S. Postal Service Facilities and between and within U.S. Postal Facilities. Pallets, when empty or loaded shall be able to be lifted and transported with forklift trucks, hand pallet trucks (measure 3-1/4 inches min. floor to forks) and walkie rider trucks. Each support leg and deck surface able to collect water, shall be self-draining.

3.1.1 Color - The pallet shall be black with an orange stripe matching color No. 12473 of Federal Standard 595, not less than 3 inches wide nor less than 0.008 inches thick along each 48-inch edge. Stripes shall be positioned on the pallet so as to be visible when nested and joined with the top deck in a neat, straight line along the 58-inch dimension.

3.1.2 Nesting - Pallet shall be nestable; the height of a stack of pallets due to the addition of each subsequent pallet shall increase not more than 2 inches.

3.1.3 Capacity - Minimum capacity of the pallet shall be uniformly distributed loads of 2,500 pounds dynamic loading and 7,600 pounds static loading.

3.1.4 Physical Integrity - When exposed to the elements, that is, ultra violet rays, high and low temperatures (-40o to 165o F), high and low humidities, and moisture in the form of fog, rain, snow, sleet, ice, and flood waters the pallet shall not deform or warp in such a way that its intended function is impaired.

3.1.5 Strapability - The top-deck edges of the pallet shall be capable of withstanding normal forces created by tensioning the strapping used to secure the load superimposed on the pallet. The residual deformation of the top-deck edges of the pallet shall not exceed an amount which would make the pallet appear damaged or might cause injury.

3.2 Material - The material used in the manufacture of these pallets shall be suitable prime grade of stress-crack resistant, high density polyethylene copolymer with a medium molecular weight distribution with the following nominal physical and mechanical properties at 73 degrees F. (except when another temperature is shown) when tested in accordance with applicable standards. Thirty percent regrind of the exact same material shall be the maximum allowable when combined with virgin material.

MATERIAL PROPERTIES

PROPERTY	ASTM TEST	NOM. VALUE
TENSILE YIELD STRENGTH, PSI	D-638	3700 PSI
FLOW RATE 190/21.6	D-1238	10 G./10 MIN.
TENSILE IMPACT	D-1822	125 FT LBS/IN2
ENVIRONMENTAL STRESS CRACK RESISTANCE	D-1693	450 HRS.
DENSITY	D-1505	0.950 G/CM3
BURN RATE	D-635	LESS THAN 4”/MIN.

3.2.1 Approved Sources of Resin:

A) Allied Corp.
P.O. Box 53006 P/N 5A5100
Baton Rouge, LA 70892

B) Philips 66 Co.
P.O. Box 792 P/N HMSX5100
Pasadena, TX 77501

3.3 Manufacturing Method - Pallets shall be produced by twin-sheet thermo-forming using, .135 thk. sheet material as specified in paragraph 3.2.

3.4 First Article Approval - The supplier shall furnish the first article (5 pallets) for approval as required by the contract schedule, made with production tools, for examination and testing to prove, prior to starting production, that his production methods will produce pallets that comply with the requirements of this specification. Examination and tests shall be as specified in Section 4. No production units or lot samples shall be delivered prior to approval of the first article. Fabrication of unit components prior to approval of the first article is at the risk of the supplier.

3.5 Marking - Pallets shall have the words “U.S. POSTAL SERVICE”, molded in 1.0 inch high lettering on all 4 sides.

3.5.1 Identification Marking - Each pallet shall be identified on the top deck surface with molded-in data in .25 inch high characters as follows:

(Contractor’s Name)
(Year, month, day, manufactured)
USPS Contract No. ( )
Material ( )*
Mold cavity identification no. ( )

* Enter complete identification data, required to specific material; e.g., manufacturer’s name, brand name, type designation (number, letters or combination), or other data as required to identify.

Parenthetical part of marking requires insertion of data by contractor.

3.5.1.1 Tare Weight - Each pallet shall have the information “Tare Wt. 19 Ibs.” molded in 1/2 inch vertical characters, on both short sides.

3.6 Workmanshin- Shall be in accordance with the best commercial practices for this type of equipment. The pallets shall be free from sharp edges, and sharp corners which might cut personnel or their clothing or damage mail. Units shall not be cracked or broken and shall be free of foreign matter (oil, grease, dirt, etc.).

3.7 Performance

3.7.1 Nesting - When two pallets are nested in accordance with 4.7.1 with the lower pallet legs resting on the floor, the lower one shall not lift off the floor when the top pallet is lifted using a fork lift or other means.

3.7.2 Deflection - When tested in accordance with 4.7.2 the pallet shall have a maximum deflection such that a straight line, between the two outer edges, is below the center of the pallet by less than 3/4 inch.

3.7.3 Capacity - When tested in accordance with 4.7.3 and 4.7.3.1, the pallet shall not crack, break, or show other signs of failure. Slight flattening at the points of impact are not considered failures.

3.7.4 Flexural Strength - When tested in accordance with 4.7.4, the pallet shall not crack, break, or deform to the extent of becoming unusable.

3.7.5 Strapability - When tested in accordance with 4.7.5, the pallet shall not crack, break or show other signs of failure.

3.7.6 Thermal Stability - After testing in accordance with 4.7.6 the pallet shall not experience an amount of creep which prevents a gage 3-1/4 inches high from fitting in any part of the fork openings.

4.0 QUALITY ASSURANCE PROVISION

4.1 Responsibility for Inspection - The contractor may be responsible for the performance of all inspection requirements as specified herein in accordance with the First Article Approval clause in the basic contract. The contracting officer will advise the contractor when the First Article inspection and tests are to be conducted at U.S. Postal Service facilities. The contractor may utilize his own or any other inspection facilities or services. Inspection records of examinations and tests shall be maintained by the contractor and furnished to the U.S. Postal Service.

4.2 Quality Control Facilities - The contractor shall provide the U.S. Postal Service representatives with access to his plant and to all operations concerned with the manufacture and evaluation of the pallets. Equipment, working space, and physical assistance required to perform the duties of inspection evaluation shall be made available as needed.

4.3 Sampling - Each production lot of pallets shall be sampled for inspection in accordance with MIL-STD-105, Inspection Level S-2, Single Sampling. For purposes of sampling, a production lot shall consist of all units presented for delivery at one time.

4.4 Acceptability

4.4.1 Acceptance - Approval of the First Article sample authorizes the commencement of production, but does not relieve the supplier of the responsibility for the compliance, with all provisions of this specification, of all units subsequently presented for delivery.

Following acceptance by the U.S. Postal Service, the first article sample may be delivered after required servicing and adjustment as the last unit of supply under the contract. Acceptance of samples shall be based on an Acceptable Quality Level (AQL) of 4.0 percent defective.

4.4.2 Rejection - Failure of any sample to pass inspection is cause for rejection of the lot it represents. When rejection occurs, the contractor may screen the entire lot and remove or replace all non-conforming units and resubmit for inspection.

4.5 Classification of Inspection - The inspections delineated herein are classified as follows:

a. First article sample inspection
b. Production sample inspection

4.5.1 First Article Sample Inspection

4.5.1.1 Examination - The first article sample units shall be examined as specified in 3.0.

4.5.1.2 Tests - The first article sample units that have passed the examination of 4.5.1.1 shall be subjected to the tests in the order listed, (See 4.7.1 through 4.7.6). Tests shall be conducted at nominal room temperature (73°F + 5°F).

4.5.2 Production Sample Inspection

4.5.2.1 Lot - For the purpose of this inspection, a lot shall consist of all pallets being manufactured and offered for delivery at one time.

4.5.2.1.1 Sampling - For each lot of pallets ready for shipment a random sample for inspection shall be selected in accordance with MIL-STD-105, Inspection Level S-2, single sampling, but increased if necessary to a multiple of seven.

4.5.3 Inspection - Sample pallets shall be examined as specified in 4.5.1 and tested in 4.5.1.2 Any pallet that contains any defect or fails any test (a defective) shall be rejected (see 4.8). The Acceptable Quality Level (AQL) for lot acceptance is 4.0 percent defective. Presence of defectives in excess of the AQL shall be cause for rejection of that lot (see 4.8.2).

4.6 Examination - The unit shall be visually examined to ascertain that its condition, with respect to general configuration, markings, color and stripes, weight, and readiness for shipment is in accordance with the requirements of this specification and the drawing identical to the approved first article sample. A report of the examination containing a statement on the acceptability of each item shall be submitted.
- The unit shall be visually examined to ascertain that its condition, with respect to general configuration, markings, color and-stripes, weight, and readiness for shipment is in accordance with the requirements of this specification and the drawing identical to the approved first article sample. A report of the examination containing a statement on the acceptability of each item shall be submitted.

4.7 Testing Procedures - The production sample unit that has passed the examination of 4.6 shall be tested as specified in 4.7.1 through 4.7.6.

4.7.1 Nesting - Nest one pallet into another with the lower pallet legs resting on the floor. Lift the top pallet using a forklift truck or other means. The lower pallet shall not lift off the floor when the top pallet is lifted. Reverse the pallets and repeat the procedure.

4.7.2 Deflection - Place on one pallet a uniformly distributed load of 2,500 pounds. The load shall consist of vertical stacks of magazines, phone books, catalogs, or standard 8-1/2 x 11 inch office paper. These shall be bundled together in stacks approximately 6 to 8 inches high using plastic banding or shrink film. Standard office paper shall be packaged approximately 500 sheets (one ream) to a package. Layers of these materials (magazines, catalogs, office paper) approximately 6 to 8 inches high may be separated with sheets of kraft paper, chip or kraft board in order to stabilize the load. Using a forklift truck of sufficient capacity (with forks parallel to the 40-inch dimension of the pallet), positioned 25 + 1 inch apart, edge to edge overall and with tips of forks flush with the 48-inch edge, raise the pallet to a height approximately 18 inches from the floor. Place a straight edge, 48 inches in length along the underside of the deck (48-inch dimension) and measure the distance at center of front edge of pallet from bottom edge of pallet deck to the straight edge.

4.7.3 Dynamic Load Capacity - Using a uniform load of 2,500 pounds made up of bags of sand, place these on the pallet with separator sheets between layers and secure with plastic or steel strapping. Place the pallet with the legs along one 48-inch edge resting on a 1” x 10” nom. size wood board. Raise the opposite pallet edge until the underside of the deck is at its original height plus 8 inches from the floor. Quickly remove the lifting source and allow the pallet to fall freely to the floor surface. Repeat three times, then repeat the three drops, lifting one of the 40-inch edges while the opposite feet rest on the board. Remove the load and examine the pallet for cracks, deformation or other signs of damage.

4.7.3.1 Static Load Capacity - Static load tests shall be performed using a compression test machine. Place a uniform load of approximately 2,000 pounds on the pallet consisting of either telephone books or bundled magazines approximately 6” - 8” high with kraft paper slip sheets (40” x 48” approximately) between each layer of bundled magazines or every two telephone books high. Place the loaded pallet between platens and apply the compression load at a rate of approximately 1/2 inch per minute for a total load of 7600 pounds (including books or magazines). Maintain this load for 72 hours. At the end of that time, remove the compression machine load and using a forklift truck, insert forks under the pallet. The clearance under the deck shall permit the forks to be inserted. The tests shall be made on pallets from each of the production mold-sets.

4.7.4 Flexural Strength - Place on one pallet the same uniformly distributed load of 2,500 pounds, as used in paragraph 4.7.3. Using a forklift truck of sufficient capacity, place a chalk mark across the forks 28 inches from the tips. Enter the pallet with the forks parallel to the 40 inch side until the rear edge of the pallet is lined up with the marks. Lift the pallet from the floor, approximately 12 inches, and after a period of approximately 30 seconds, lower pallet to the floor. Repeat three times. Remove the load and examine the pallet for cracks, breaks or other signs of failure. Move to one of the ends of the pallet and

Occasionally, when loads shift while in transit, it is necessary to adjust pallet positions prior to removing the pallets from the truck. This may be accomplished using fork lifts with side shifters, which allow movement of the load 6” to 8” in the directions perpendicular to the direction of the forks. Or, more frequently, the pallet is shifted by pushing on a pallet leg with a fork blade.

On rare occasions, when equipment is not available or that which is available cannot be used in the truck being unloaded, pallets are pulled from the truck using a chain or cargo strap wrapped around a pallet leg. This process was not observed but was related by a fork lift operator.

5. Loading Trucks

Truck loading is basically the reverse of unloading. The fork lift operator drives to the staging area, selects a pallet to load, positions the forks approximately 1” off the floor, and inserts the blades between the legs of the pallet - normally from the narrow, 40” side. The load is lifted. transported to the appropriate door and on to the truck. Inside the truck the load is normally lowered to the truck bed and slid the final 6” to 12” until it is flush against the pallet or container in front of it and flush against the wall. Occasionally, side shifters are used to move the pallet flush against the wail. When the fork lifts are not equipped with side shifters, the pallets are shifted by pushing with the blades against the legs.

In the Chicago P&DC, because of the difference in dock and truck height, pallets are placed on the truck bed and pushed into the truck with the next pallet, forming a train of pallets. This process is continued, alternating left and right sides. until the truck is full.

6. Movement on Loading Docks

All facilities visited, except the Chicago P&DC, have truck level loading docks with hydraulically operated dock plates. The plates are of two types: a short plate with a total length of approximately 30” and a long plate with a total length of approximately nine feet. The truck beds are normally level, nose to rear, and within 2” of dock height. No pallets were observed striking the truck beds during entrance or egress from the trucks. At the Chicago P&DC, electric pallet jacks are used to move pallets from the truck to a scissor lift (operators ride the jack by standing on the rear deck). The scissor lift is then used to lower the pallet and pallet jack to the dock level.

Palletized mail is normally staged at least twice. The first is upon unloading from the inbound truck and is normally within 50 feet of the door through which the pallet is unloaded. The pallet is transported by the unloading fork lift, frequently through congested areas. There is an obvious danger of striking objects ranging from other palletized mail to support columns in these areas, but no observers reported seeing any such accidents. Upon reaching the staging area, the operator lines up the load and sets it on the floor, usually sliding it 6" to 12" until it is flush against the pallet in front of it.

No observers noted any "train sliding" (several pallets in line pushed with a fork lift) in the staging areas. No pallets were dropped or even set down hard during our observations.

7. Movement within Facilities

Pallets are transported within the facilities by a variety of means. The most common is the fork lift. Short loads are transported with the load in front. Tall loads are carried in reverse to allow the operator to see where he/she is going. Runs of 200 to 300 feet are common. At the BMCs. pallets are sometimes placed on in-house containers (40" wide platform trucks) and transported via an automated tow-line. The Greensboro BMC is also equipped with modified manual pallet jacks which could be used to raise a pallet and transport it on the tow-line. (None were seen on the line while the observer was in the facility.) In the Chicago P&DC, pallets are "diamond loaded" on the narrower nutting trucks so that two legs (those on opposite comers) are unsupported on the narrow bed. This involves loading with a fork lift at an appropriate angle. It also exposes two comers of the pallet and load to direct strikes while being moved through the plant.

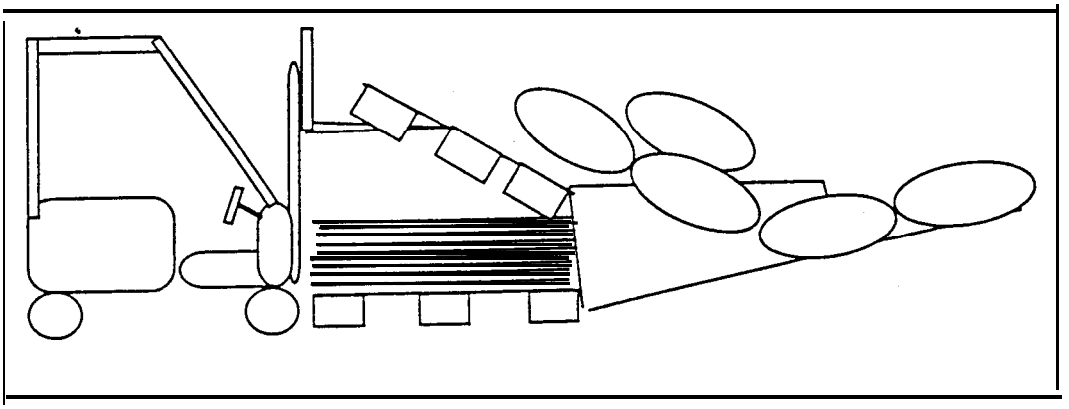
Observers walked the common transport routes in all six facilities. Although there was evidence of earlier strikes against some obstacles along the routes. no accidental contact with obstacles was observed during our periods of observation.

8. Pallet Dumping

In the P&DCs, mail is removed from the pallets manually. Normally the pallets are moved from a staging area to the unloading site and set on the floor or on a stack of empty pallets. Postal personnel then cut and remove the stretch wrap and lift the mail, one bundle at a time on to a conveyor (such as the Small Parcel and Bundle Sorter feed conveyor) or sort the mail bundles to containers in a manual sort operation.

The BMCs are equipped with unloaders which allow for the mechanical dumping of pallets. These may be universal, i.e. designed to allow dumping of all types of mail containers or specifically designed for pallet dumping. The universal dumpers typically lock the pallet in by a metal plate which rotates through a slot just above the pallet level. The entire mechanism then rotates until the mail falls away from the pallet and into the hopper feeding a take away conveyor. The shingling unloader tilts toward the hopper and then lifts the pallet and load causing the mail to fall into the hopper one layer at a time.

Another pallet dumping method was observed at the Chicago BMC. Empty pallets are stacked in front of a hopper to form a platform approximately seven inches below the lip of the hopper. A pallet loaded with canvas sacks is placed atop the stack in a position that prevents the legs from nesting. The fork lift then backs away and the stretch wrapping is cut away. Next, the fork lift blades are inserted approximately 15 inches under the pallet and the blades lifted as the fork lift moves forward. The load of sacks topples into the hopper. This procedure is actually about three times faster than the adjacent universal dumper.



Dumping Pallets from a Pallet Stack

None of the dumpers appeared to cause any damage to pallets. Surfaces were smooth and straight and the locking mechanisms did not cut or dent pallet edges. Dumping from a pallet stack, however, creates a pressure point in the center of the pallet bed as the pallet is raised and tilted. While no damage was noted during the period of observations, it is an obvious potential source of damage.

9. Pallet Building

In most postal facilities, the process of pallet building consists of setting an empty cardboard box on a pallet, positioning the box and pallet for loading, and then loading the

box with sacks or parcels. This method will increase dramatically as the cardboard Postal Paks become the normal method of inter-BMC transport in the next 12 months. A variation of this method was related by a supervisor in Chicago. Normally, a pallet/box combination is placed on an in-house container and the container pushed into the secondary loading stations. However, when no in-house containers are available, the pallet/box combination must be positioned on the loading station floor. This is complicated by a five inch high rib in the center of the loading station (normally used to lock OTR containers in position using their tow pins). To avoid the rib with the center legs of the pallet. the pallet/box combination must be end loaded and off-set approximately 6 inches to the right or left of center. The rib is then located between the pallet legs. The rib also increases the likelihood of a blade striking a pallet leg when the combination is retrieved.

The Chicago BMC also uses pallets as the sole containers from their Non-Machinable Outsides (NMO) sorting operation. Pallets are manually slid on their edge 20 to 50 feet and placed on the floor at the end of the sorting spider roller conveyors. NMOs are then brick loaded on the pallet as they come down the conveyor. When the pallet is full, approximately 3 to 4 feet high, it is transported by fork lift to a stretch machine where two layers of stretch wrap are applied to secure the load to the pallet. The loaded pallet is then transported by fork lift to an outbound staging area. When asked if he had any preference in pallets the operator of the stretch machine said the pressed wood pallets were better. He explained that the plastic pallet bed surface is too smooth. When light loads are stretch wrapped, they tend to slide on the pallet surface due to the stretch wrap tension.

10. Stacking and Storage

In ail the facilities, pallets are set aside in various places around the plant after they are emptied. They are usually found in stacks of ten to twelve like pallets. It should be noted that while each type of pallet is stackable with its own kind. they do not fit together in mixed stacks. The plastic thermoform will not fit into either the structural foam or pressed wood pallet because its legs are too fat. The pressed wood pallet will not nest in the structural foam pallet because the foam pallet has a wider lip and the center legs are smaller than the pressed wood center legs. Pressed wood pallets will partially nest in the thermoforrn plastic model, but the wooden legs scrape the inside of the outer legs of the plastic pallet causing noticeable abrasions.

Fork lift operators pick up stacks of pallets from around the plant and transport them to designated accumulation/storage areas. There they are manually sorted to cull out unusable pallets and stacked by pallet type in low stacks (12 -15 pallets).

A safety note: Leather gloves must be worn at all times when handling pallets. The pressed woodpallets are rough and tend to cut and leave splinters in unprotected hands. A fork lift is then used to merge the stacks to a height of about 6 feet. The tall stacks are loaded into vans upon call and transported to the mailers to start the cycle again.

None of the facilities visited stored pallets outside. Two facilities however, complained about mailers using outside storage. This is a particular problem with the pressed wood pallets because these pallets swell when exposed to moisture and become locked together in their stacks. This condition was observed in Chicago and mentioned in Greensboro.

Observations - Pallet Handling Survey

D.V. Daniels P&DC

Observer:

Date:

When to observe maximum pallet handling (day of week, time of day)

Pallet handling equipment

List pallet handling equipment types & characteristics:

List manager operator complaints regarding equipment:

Pallet dumping equipment

List pallet dumping equipment types & characteristics:

List manager/operator complaints regarding equipment:

Observer: Date:

Unloading from trucks

Trailer attitude (nose high, level, nose down):

Trailer condition (list characteristics which might lead to pallet damage):

Load characteristics

pallets only or mixed load:

load blocked?

load strapped?

leaning, toppled stacks?

types of pallets in load:

pallets banded?

band type (plastic, steel):

pallets shrink, stretch wrapped?

average height of each pallet load:

multi-level?

pallets in stack:

approximate stack height:

approximate stack weight:

top caps used? type?

consistency of contents:

stacking characteristics:

(heavy on light: light on heavy)

Unloading from trucks (cont)

Dock characteristics

dock levelers in use? type?

trailer/dock height difference:

length of leveling plate:

describe dock working area:

distance to induction staging area:

distance to cross-dock staging area:

adequacy of dock working area:

Unloading procedures

stacks or individual pallets unloaded?

loads adjusted with fork tines prior to insertion?

loads adjusted manually or pedally prior to insertion?

Are side shifters used?

How?

side entry (48" side) or end entry (40" side)?

loads dragged or pushed on truck bed?

loads tilted before transport?

truck sides, top, or bed struck or scraped during egress?

loads dragged or pushed on dock?

loads dropped?

loads stacked in staging area?

stack heights - # of pallets, height in feet?

stack weight?

Other comments:

Observer: Date:

Transporting within Facility

List equipment used to transport pallets-within facility:

Describe transport equipment:

Describe transport method (e.g., tug pulled dolly train: three pallet tilted stack by fork lift, load first: pallet jack via tow line)

stacks or individual pallets transported?

loads adjusted with fork tines prior to insertion?

loads adjusted manually or pedally prior to insertion?

Are side shifters used?

How?

side entry (48" side) or end entry (40" side)?

loads dragged or pushed in staging area?

loads tilted before transport?

any obstructions along transport route?

loads dropped at end of transport?

loads stacked in staging/loading/dumping area?

stack heights - # of pallets. height in feet?

stack weight?

Other comments:

lumping Procedures

List dumping equipment:

Describe dumping equipment:

Describe pallet handling prior to dumping:

Describe pallet during dumping:

Describe pallet after dumping:

Other comments:

Pallet Storage

Describe empty pallet transport:

Describe empty pallet accumulation area:

Describe empty pallet handling, stacking:

Describe any obvious signs of weather damage

Other comments:

Pallet Building Procedures

Are pallets built (mail placed on pallets) in the facility?

Describe types of mail loaded *on* pallet:

How are empty pallets positioned for loading?

How is material stacked on pallet?

How is load secured?

banded? (plastic or steel)

shrink/stretch wrapped?

top caps used?

Approximate load height/weight:

Other comments:

Loading onto trucks

Trailer attitude (nose high, level, nose down):

Trailer condition (list characteristics which might lead to pallet damage):

Dock characteristics:

Dock levelers in use? type?

trailer/dock height difference:

length of leveling plate

describe dock working area:

distance to induction staging area:

distance to cross-dock staging area:

adequacy of dock working area:

Loading procedures

stacks or individual pallets loaded?

loads adjusted with fork tines prior to insertion?

loads adjusted manually or pedally prior to insertion?

Are side shifters used?

How?

side entry (48" side) or end entry (40" side)?

loads dragged or pushed on truck bed?

loads tilted before transport?

truck sides, top, or bed struck or scrapped during entrance?

loads dragged or pushed in truck?

loads dropped?

loads stacked in truck?

stack heights - # of pallets, height in feet?

stack weight?

Loading onto trucks (cont)

Load characteristics

pallets only or mixed load:

load blocked?

load strapped?

inflatable dunnage used?

leaning, toppled stacks?

types of pallets in load:

pallets banded?

band type (plastic, steel):

Load characteristics (cont)

pallets shrink, stretch wrapped?

average height of each pallet load:

multi-level?

pallets in stack:

approximate stack height:

approximate stack weight:

top caps used? type?

consistency of contents:

stacking characteristics:

(heavy on light; light on heavy)

Other comments:

6.5 USPS Pallet Failure Criteria

The USPS Pallet Failure Criteria was developed to inspect pallets used in a USPS BMC environment and, therefore, requires a system to be employed to inspect the pallets. This criterion identifies ten forms of damage that can be applied to determine whether the pallet can be reused.

The USPS Pallet Failure Criteria are as follows:

A. Any comer leg broken such that the leg cannot rest on a level surface.

B. Any comer leg missing.

C. Center leg broken or missing such that leg cannot rest on a level surface.

D. Any two support legs broken such that the legs cannot rest on a level surface.

E. Any two support legs missing.

F. Over twenty-five percent (25%) of the pallet deck is deformed to the point that the deformation is greater than one-half inch (.5") below the normal surface of the pallet.

G. Any crack ten inches (10") or longer which extends through the center of the pallet (structural foam plastic and twin-sheet thermoform pallets only).

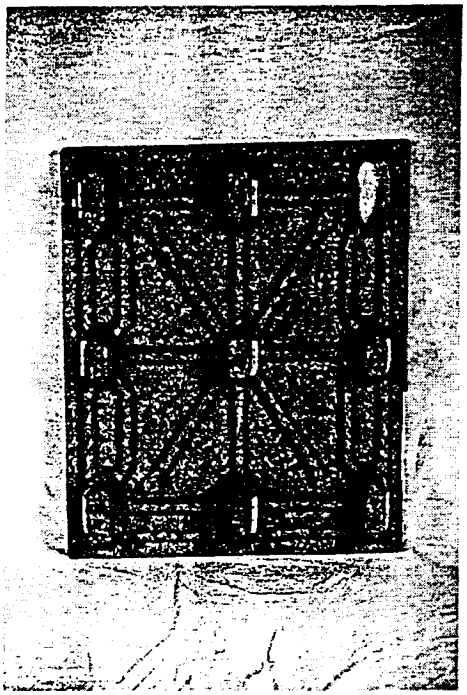
H. Any crack six inches (6") or longer which extends through the center of the pallet (presswood fiber pallets only).

I. A hole in the pallet deck greater than the surface area of the opening in the pallet deck for a leg.

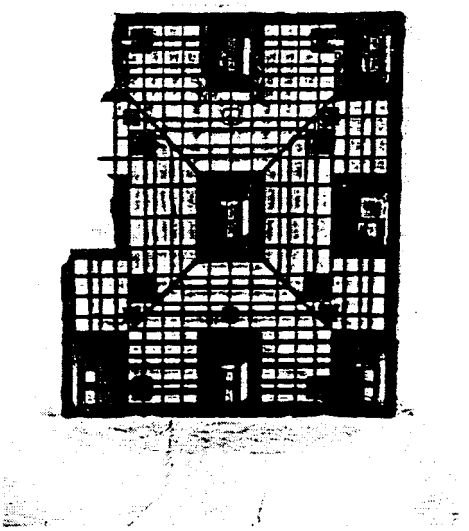
J. Pallet deck deformation which includes cracks and holes along pallet edges of three inches (3") or more into a leg assembly or pallet surface.

The pallet is considered to be damaged if one or more of these types of failures are found. The presence of one or more of these criteria can result in potential damage and unsafe handling of the palletized load in the USPS distribution environment.

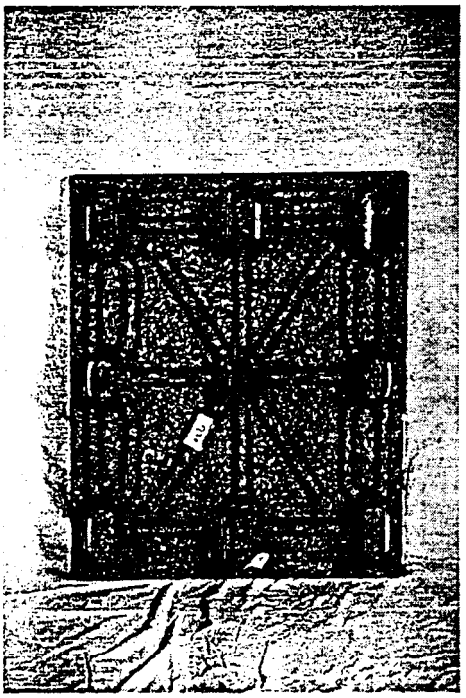
The following pages contain Failure Criteria examples as experienced during the Pallet Life Cycle Test.



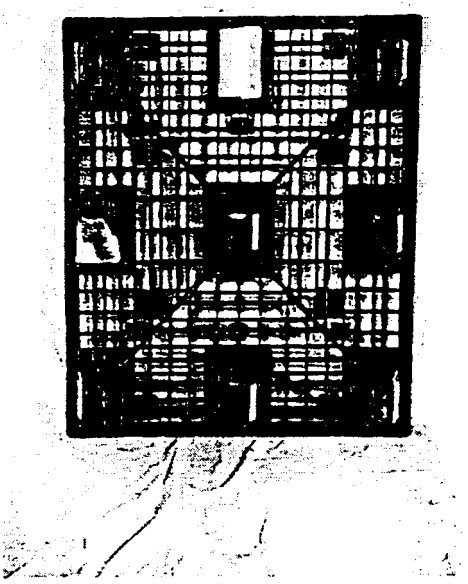
Any Corner Leg Broken Such That
The Leg Cannot Rest On A Level Surface



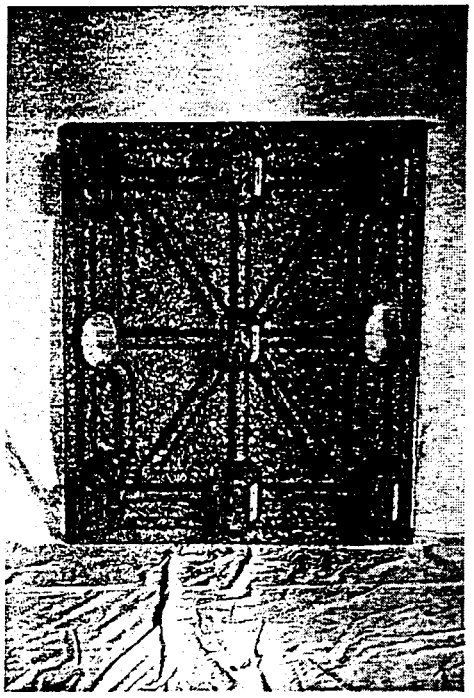
Any Comer Leg Missing



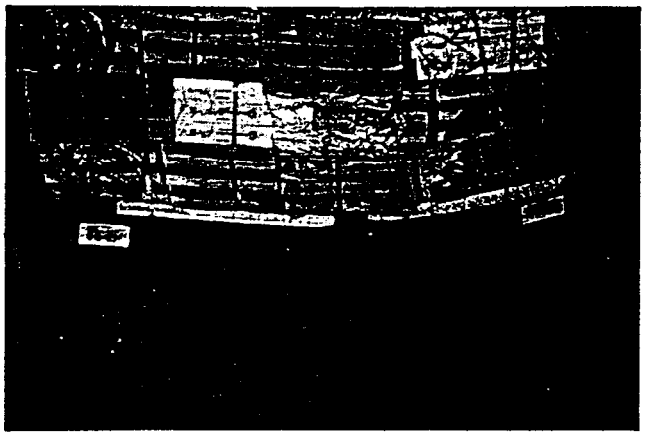
Center Leg Broken Or Missing Such That
The Legs Cannot Rest On A Level Surface



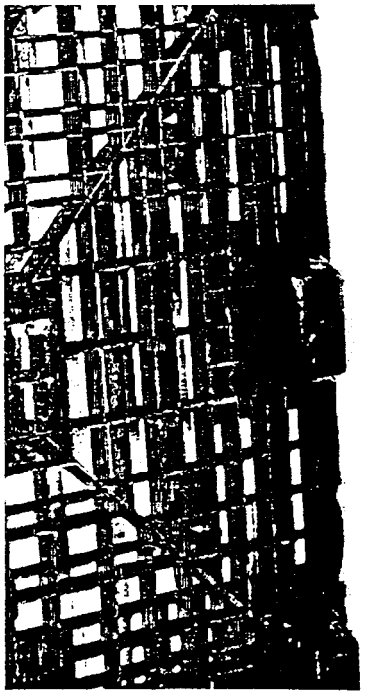
Any Two Support Legs Broken Such That
The Legs Cannot Rest On A Level Surface



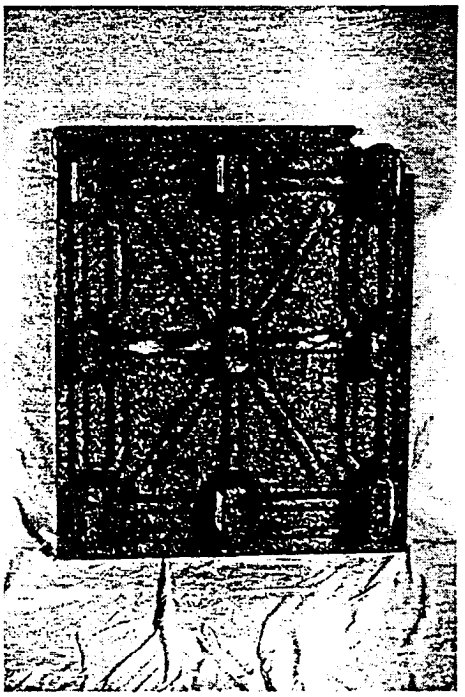
Any Two Support Leg Missing



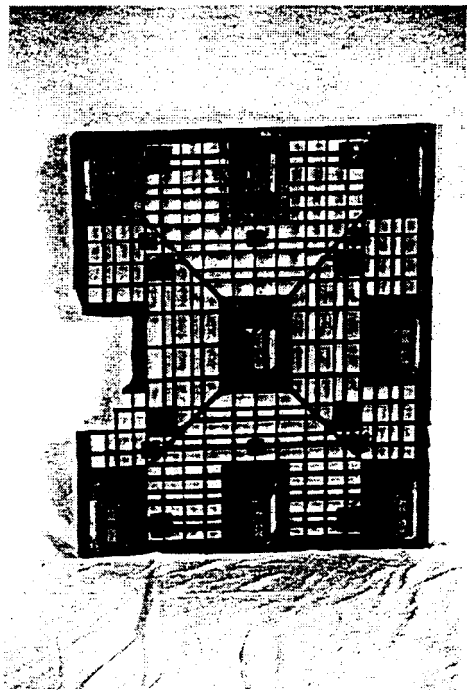
Over Twenty-Five Percent (25%) Of The Pallet Deck Is Deformed To The Point That The Deformation Is Greater Than One-Half Inch (.5") Below The Normal Surface Of The Pallet



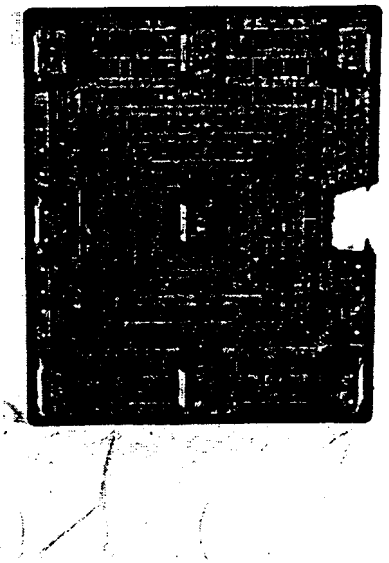
Any Crack Ten Inches (10") Or Longer Which Extends Through The Center Of The Pallet (Structural Form & Twin-Sheet Pallets Only)



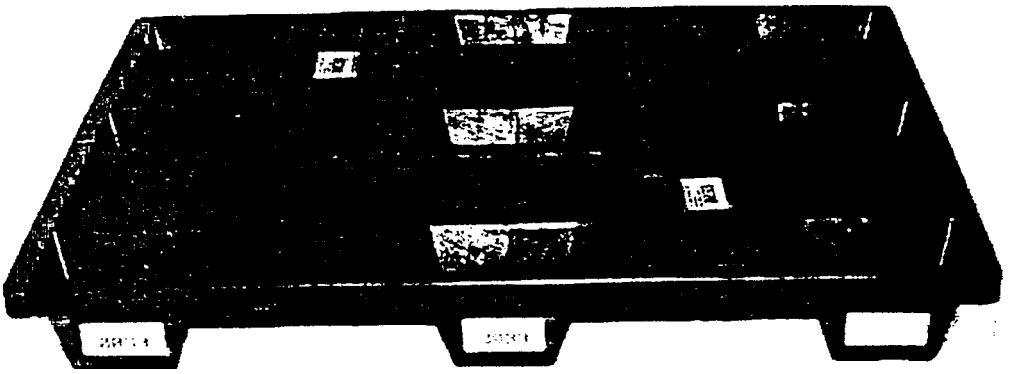
Any Crack Six Inches (6") Or Longer Which Extends Through The Center Of The Pallet (Presswood Fiber Pallets Only)



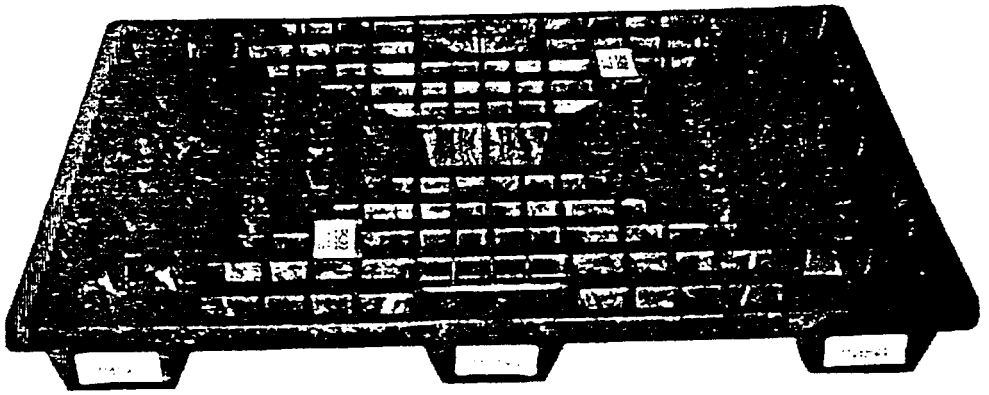
A hole in the pallet deck greater than the surface area of the opening in the pallet deck for a leg



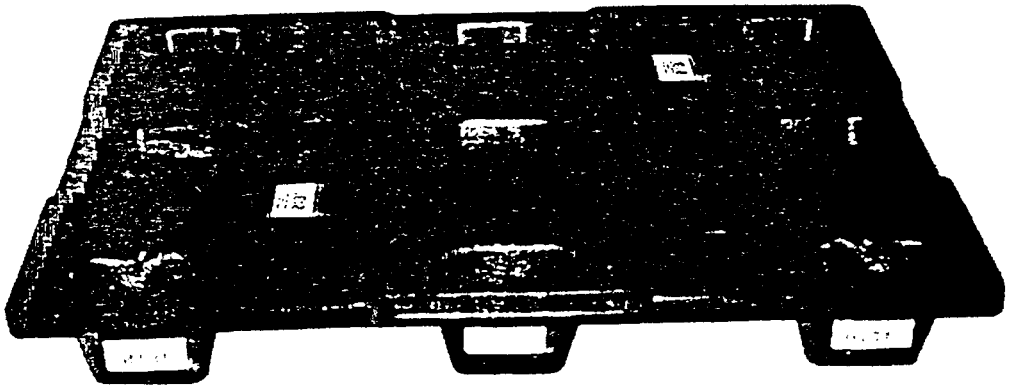
Pallet deck deformation which includes cracks and holes along the pallet edges of three inches (3”) or more into a leg assembly or pallet surface



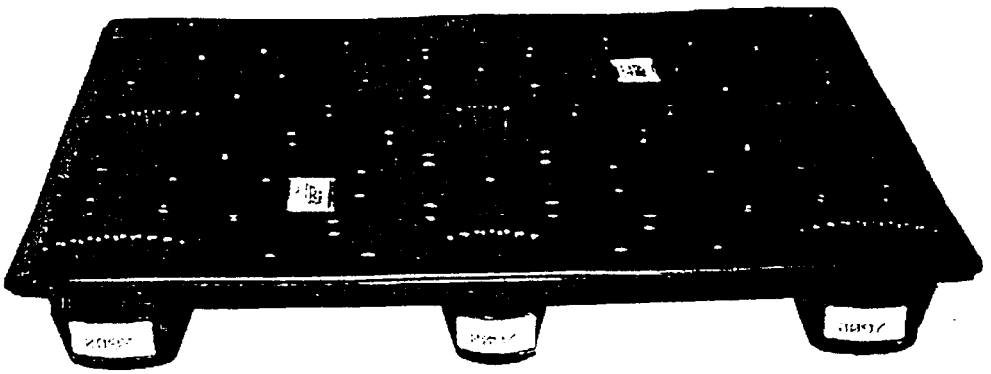
Functional Pallet System / Loadmaster I



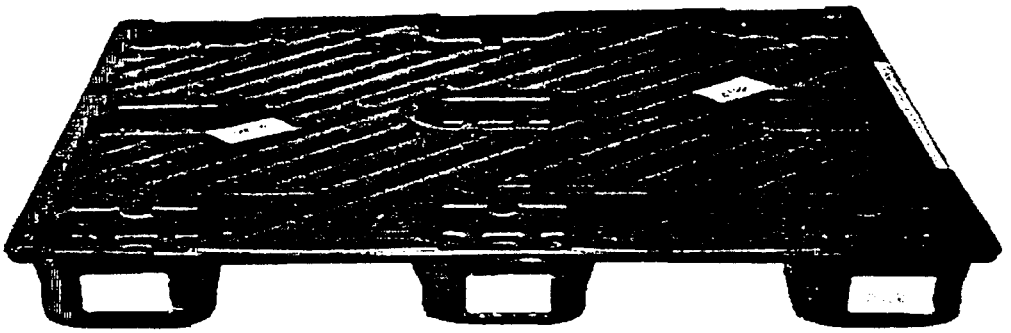
Menasha Corporation / Convoy



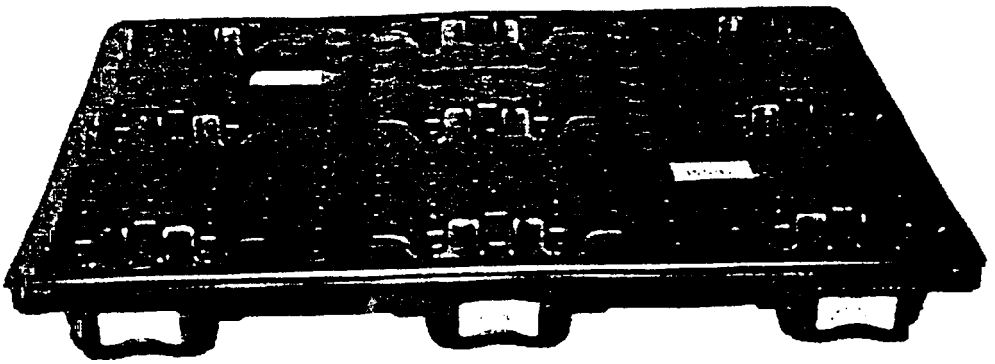
Loudon Plastics. Inc.



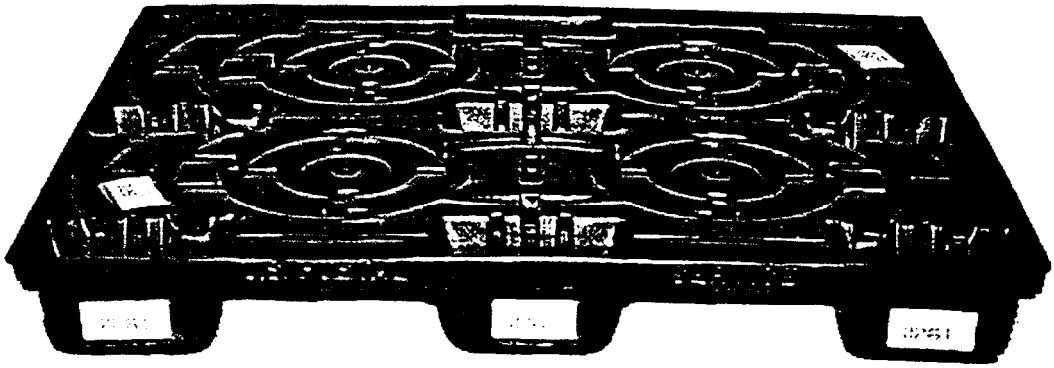
Cadillac Products, Inc. / Retailer



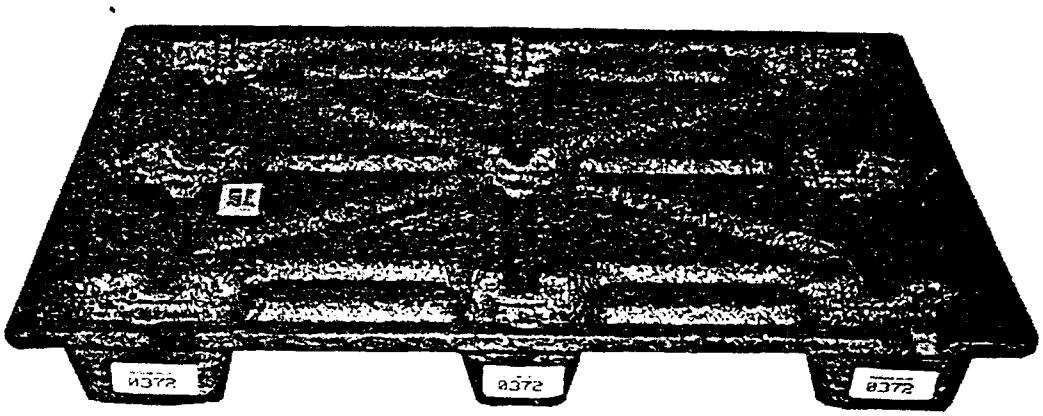
Penda Corporation / Weight Lifter



Shuert Industries / UN40482500042



Cadillac Products, Inc. / USPS Pallet



Litco International, Inc. / Inca (USPS)