CENTER FOR PACKAGING AND UNIT LOAD DESIGN
VIRGINIA TECH.

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VT Unit-Load Material Handling FasTrack

Simulated rough handling of palletized unit loads is recommended to assess structural durability and the economics of use of the pallet. This can be achieved by accelerated rough handling using devices employed in material handling. An example of such a test is found in ASTM D1083.(3) To follow is a protocol developed and used at the Pallet and Container Research Laboratory of Virginia Tech.

This is a modification of a test protocol developed by the Procter and Gamble Company to simulate the use of pallets in the grocery dry goods industries. The test simulates idle pallet storage, palletizing, shipping, transport, receiving, and three types of storage: static rack, flow rack, and block staking.

The handling devices used in the FasTrack include a 3,000-lb. (1363 Kg) capacity counter-balanced forklift and a 4,000- lb. (1818 Kg) capacity electric pallet jack. Fork lift operating speeds are 1mph (1.6 Km/hr) and 3 mph (4.8 Km/hr), depending on the mode of handling. The electric pallet jack operating speed is 2 mph (3.2 Km/hr). A dummy load of 1500 lbs. (682 Kg) is typically used. However, upon request, other load levels are possible.

A minimum of ten (10) replicate tests are recommended.

The FasTrack Handling Modes and Sequence:

Handling Modes:

- Empty pallet storage area: Empty pallets are stacked and stored in this area.
- Staging area: This area is used for sluing and turning pallets so that the forklift can enter the pallet ends and sides. The area is also used to transfer the pallet via pallet jack. The pallet is staged before and after entering the trailer. This staging process simulates shipping and receiving docks.
- Trailer: This is a simulated 102-in. trailer opening with plywood sides. Pallets are moved in and out of one side of the opening to resemble a confined space. Pallets are moved in and out using the pallet sides and ends.
- Transport simulator: Vibrations simulate the moving transport system.
- Static rack storage: This rack simulates warehouse rack storage. The standard free span is 44-in., but can be adjusted.
- Stack storage: This simulates warehouse block stack storage of loaded pallets. The loaded pallet is placed on an irregular surface of bagged fertilizer.
- Flow rack: This is a gravity feed flow rack which supports pallets on two rows of 5/8in. wide rollers set 26.25-in. apart on center. The pallet rolls on an 8-ft. conveyor. Pallet travel is halted when the bottom leading edge deckboard impacts metal stops placed 26 in. apart. Roll speeds are adjusted to 80 feet/minute (1.5 Km/hr).

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Handling Sequence:

The number of handlings a pallet receives during each cycle varies depending on pallet style, (i.e. 2-way, partial 4-way, and 4-way), because pallet style determines how a pallet may be used. A test cycle consists of the following:

1. Pallet is visually inspected;
2. Transfer the load onto the pallet in the staging area;
3. Lift the pallet from the 40-in. end using the forklift and load into the trailer at 3mph (4.8km/hr);
4. Using the forklift, remove from the trailer and return to staging area at 1mph (1.6km/hr); after each placement of the unit load, the forklift or pallet jack exits empty and the forks are raised and lowered before re-entering the pallet for the next handling;
5. Slue, at 1mph partial 4-way and 4-way pallets in the staging area by forklift so that it is picked up from the side and loaded into a trailer at 3mph (4.8km/hr);
6. Using the forklift, unload the unit-load from the trailer and set it down in the receiving staging area at 2mph (1.6km/hr);
7. Lift the unit load by electric jack and re-load into the trailer at 2mph (3.2km/hr);
8. Unload the unit-load from the trailer and set it down in the receiving staging area using the pallet jack. If the pallet is full 4-way entry, step 7 and 8 are repeated using the side entry at 2mph (3.2km/hr);
9. The unit load is pushed 30ft (9.14m) across the concrete floor at 3mph (4.8km/hr) using the fork lift;
10. The unit-load is lifted by the forklift and is set down onto the static rack spanning the length of the pallet. The operator exits the rack without unit load and re-enters;
11. Using the forklift, the unit-load is lifted and set on the top of the stacked bags. The operator exits the stack without unit load and re-enters;
12. The unit-load is lifted by forklift from stacked storage and set into the gravity flow conveyor. The loaded pallet rolls until it impacts the stops at 80ft/min (1.5km/hr) velocity;
13. Using the forklift, the load is removed from the conveyor and set on the floor, and pushed 20ft across the floor;
14. Empty pallets are dropped by pushing off the forks from a 5ft height after every 10 cycles;
15. After every 5 cycles, the pallet operator impacts bottom deck components with the tine tips of the forklift on the floor and entering the pallet at 1mph (1.6kg/hr) velocity;
16. The load is removed from the pallet and inspected for damage at a suitable frequency to monitor pallet durability.