SSCI, IFDI acknowledged at the February 17, 1995 public hearing that the compatibility test was not routinely performed. SSCI also takes the position that the compatibility requirement in 49 CFR 173.24(e) "renders this test moot."

Both ACR and SSCI contend that, because IFDI's leakage spray test (Standard 120) does not require pressure inside the fiber drum, it is not equivalent to DOT's leakproofness test. ACR states that the leakage spray test would not be adequate if the vapor pressure of liquid materials "exceeds that of the previously authorized materials." SSCI asserts that this is a problem also with IFDI's joint integrity test (Standard 110) if liquids have "elevated vapor pressures in the normal range of temperatures experienced during transport."

SSCI describes IFDI's impact test (Standard 150) as a "pale substitute" for DOT's drop test and "substantially inadequate to simulate the full range of transporting experiences." It notes that IFDI's impact test does not require dropping a fiber drum more than two feet, which is some 30% less than the 0.8 meters required for packagings certified for Packing Group III materials. SSCI's comments include a memorandum by a professor in the Virginia Tech Department of Mechanical Engineering, who indicates that "energy that must be dissipated at impact is proportional to the drop height (so that) a drum dropped from a height of 2.7 ft. would have to absorb 2.7 times the energy resulting from an impact from a 1 ft. height." This professor states that steel would 'dissipate about 3.5 times the energy in plastic deformation" as compared to fiberglass epoxy, which he assumes to have similar properties to a fiber drum. He concludes that

a valid drop test for drums of different materials must be performed at the same drop height. Drums that are dropped during handling are going to be dropped from the same height regardless of the material that the drum is made of. Therefore, the height that container industry determines by consensus to be representative of mishandling in the field should apply to all container materials. To request a different height for different materials is to ignore how containers are handled in the field.

Shell Chemical Company believes that IFDI has not demonstrated that fiber drum packaging provides a level of safety equivalent to the HM–181 standards for the transportation of liquid hazardous materials. DuPont also urges DOT not to accept "a standard for the United States that is less than the international standard." III. Other Industry Standards for Nonhazardous Materials

At the February 17, 1995 public hearing, IFDI noted that there are numerous "methods used to evaluate packaging other than the UN performance standards," including the Uniform Freight Classification (UFC), the National Motor Freight Classification (NMFC), and the National Safe Transit Packaging systems. According to IFDI, these systems were developed to evaluate a packaging's ability "to retain its contents so that the packaging will be delivered intact; that there will be no loss of contents." SSCI also stated that the "American performance standards for shipping containers (including the drop, compression, permeability and vibration tests) were first developed by the American Society of Testing and Materials (ASTM) in the 1940's." All of these other systems apply to general freight. Both UFC and NMFC explicitly state that hazardous materials must be tendered in accordance with DOT's regulations, *i.e.*, the HMR. UFC Rule 39; NMFC Item 540. ASTM Standard Practice for Performance Testing of Shipping Containers and Systems (D 4169) states that the "suitability of this practice for use with hazardous materials has not been determined."

As IFDI testified, the UFC and NMFC systems generally use a combination of "both design and performance systems." This is similar to the former DOT 21C specification for fiber drums, which set forth the minimum thickness and strength for the top, bottom, and sidewall of the fiber drum and also included a compression test and a series of four drops from four feet in different orientations (top chime, bottom chime, sidewall and closure). See 49 CFR 178.224 (1990 ed.). The UFC and NMFC standards applicable to fiber drums for liquids set forth several different options. All but one of these options include construction standards, capacities and weight limits as well as the following similar to IFDI's impact test:

Drums filled to net capacity with water must withstand without leakage a tipover fall on concrete on the cover chime followed by a diagonal drop on the bottom chime sufficient to provide at least 500 foot-pounds impact, except that a maximum height of drop shall not exceed two feet and the minimum height of drop not less than one foot.

The last option in the UFC and NMFC systems allows the use of a fiber drum that passes a four-foot drop test from two different orientations, without regard to construction specifications. In this respect, the UFC and NMFC systems resemble the HM–181 performance standards.

The ASTM D 4169 standard provides for a single test sample to be subjected to a series of tests, such as climate hazards, handling, vehicle stacking, and vibration (loose-load and stacked). The specific tests performed and their order are determined by the shipper's intended "distribution cycle" as to how the package will be shipped, the "acceptance criteria" (whether the package is damage-free or merely intact), and the desired "assurance level." The last is "based on the product value, the desired level of anticipated damage that can be tolerated, the number of units to be shipped, knowledge of the shipping environment, or other criteria." Within "handling" is a drop test that also depends on the type and shipping weight of the package. Among the test methods referred to in ASTM D 4169 is the Standard Test Method for Drop Test for Loaded Cylindrical Containers (D 997), applicable to barrels, drums and kegs of all construction materials. The procedure for drop tests states that the height from which the drum is dropped "will depend upon the purpose of the test, but normally will be 4 ft (1.2 m).' Otherwise, ASTM D 4169 generally prescribes lower drop heights for "large and heavy shipping units and unitized loads to withstand mechanical handling hazards," up to one foot; as applied to drums, these standards appear to contemplate that the drums are secured to a pallet for handling.

Procedures of the International Safe Transit Association (formerly the National Safe Transit Association) for testing packaged products weighing over 100 lbs. (Project No. 1) consist of a vibration test followed by an inclineimpact test. For the latter, the package slides down an inclined plane and strikes a vertical surface at a specified velocity. However, this standard appears to be designed only for materials packaged in boxes, and it is not applicable to drums.

IV. Finding on Alternate Standards

Packagings manufactured to IFDI's proposed standards will not meet the drop, leakproofness and hydrostatic tests adopted in HM–181. No pressure is applied in IFDI's leakage spray test. And IFDI's impact test does not measure the ability of a fiber drum to survive a fall on its bottom chime from the minimum 2.6 feet height specified in the HM–181 drop test. The other industry standards discussed above also do not assure that packagings will perform to the same level as packagings that meet the HM–