

understand the extremes of the design intent." NHTSA concurs with this commenter that the ability of a child restraint system to contain an occupant is more effectively evaluated using a smaller dummy than a larger one, and that the structural integrity of a restraint is better evaluated using a larger dummy than a smaller one. This phenomenon, and the fact that the kinematics of a child restraint and its occupant are dependent on the mass and height of a child, and the distribution of mass and height, were illustrated in NHTSA's test program following up the Calspan program, *supra*. In the NHTSA program, nine booster seats were tested with the nine-month-old, three-year-old and six-year-old dummies. The seats performed well with the three-year-old dummy; the performance measures of Standard 213 were satisfied. However, the nine-month-old dummy was ejected from seven of nine seats. The six-year-old dummy experienced excessive head excursion, i.e., exceeding 810 mm (32 inches) with seven of the nine seats. Two of the seats had structural failures with the six-year-old dummy.

NHTSA concludes that the Calspan and VRTC studies show that dummies representing children at or near the extremes of the weight ranges identified by a manufacturer as being suitable for a restraint are needed to evaluate different aspects of the performance of the restraint. The smaller dummy will evaluate the potential for ejection. The heavier dummy will evaluate the structural integrity of the restraint system.

NHTSA further notes that an array will provide for a fuller evaluation of a child restraint's ability to restrain a child when subjected to the inversion test for restraints certified for use on aircraft. In the test, the child restraint and test dummy are spun around a horizontal axis. A smaller dummy is more likely to fall out of the child restraint than a larger one.

UM-CPP, Century and Cosco believed the proposal would result in unnecessary cost increases. They argued that testing a rear-facing seat with the infant dummy, and a forward-facing restraint (other than a booster seat) with the nine-month-old dummy would serve no useful purpose since the commenters believe there is no question that the restraints will pass the Standard 213 performance criteria using the dummies. The agency disagrees that no useful purpose is served by subjecting child restraints to tests with the array of dummies. When child restraints are tested with only one dummy to represent a wide range of children, there is a risk that a restraint could be

designed to perform adequately using the dummy, but could perform inadequately in restraining children at the extremes of the recommended weight ranges. Certainly this was the case for booster seats at the time of the Calspan study. At that time, booster seats, which must not be used with a child having a mass of less than 13.5 kg (weighing 30 lbs), were often recommended for children with a mass as little as 9 kg (20 pounds). As noted at the beginning of this notice, under Standard 213, the booster's performance is evaluated using only the 15 kg three-year-old (33 lb) dummy, and so tested, the restraints met the standard. The performance of the child restraints in protecting children near the extremes of the recommended weight range (e.g., 20 lbs), while suspect, could not be evaluated in a compliance test.²

It should be noted that this rule does not require manufacturers to test with all the specified dummies. A manufacturer may believe that testing with only the largest of a set of specified dummies represents "worst case" testing, and that there is no need to test its restraints with the smaller dummies. That is, a manufacturer may determine that a child restraint meeting Standard 213's performance criteria when tested under worst case conditions will likely meet those criteria when tested under less severe conditions. A manufacturer that tests its child restraint for certification purposes could limit its testing cost by deciding to test only a worst case scenario, i.e., testing under the most austere or unfavorable conditions and circumstances specified in the standard.³ In the event that the agency found an apparent noncompliance, such as an ejection, using one of the smaller dummies, the manufacturer would have to demonstrate that it was reasonable for it to conclude that testing with the large dummy represented the worst case scenario.

² It should be noted that Standard 213 was recently amended to prohibit manufacturers from recommending a booster seat for a child weighing less than 13.5 kg (30 lbs).

³ Relying on worst case testing as a basis for a manufacturer's certification is commonplace among manufacturers. For example, Standard 208, "Occupant Crash Protection," requires injury criteria to be met with the test vehicle traveling forward at any speed "up to and including 30 mph" into a fixed barrier "that is perpendicular to the line of travel of the vehicle, or at any angle up to 30 degrees in either direction from the perpendicular" (S5.1). Manufacturers typically test a vehicle at 30 mph into a perpendicular barrier since that is the worst case test. The manufacturers believe that if the vehicle passes that worst case test, it is reasonable to conclude it will pass less severe tests (e.g., at lower speeds into angled barriers).

Ford believes it is inappropriate to test forward-facing built-in restraints with the 9 kg nine-month-old (20 lb) dummy, because nine-month-old children should be restrained rear-facing in either infant or convertible restraints. NHTSA disagrees with the suggestion to forego use of the nine-month-old as a test instrument for forward-facing restraints. The dummy is representative of a 9 kg (20 lb) child, and is useful in determining child seat performance. The agency notes that Ford recommends its forward-facing built-in restraint systems for children whose mass is from 9 to 27 kg (weighing 20 to 60 lbs). At 9 kg (20 lbs), the nine-month-old dummy is an ideal test instrument for testing the ability of the child restraint to retain a child at the lower extreme of this recommended weight range.

NHTSA has decided that the following dummies will be used to test a child restraint if any portion of the corresponding mass ranges in the table falls within the mass range recommended by the manufacturer of that restraint:

ADOPTED PROVISIONS

Recommended mass of child suitable for the restraint	Dumm(ies) used for compliance test
Birth–5 kg or less (11 lb or less).	Newborn.
More than 5 kg–10 kg (22 lb).	Newborn.
More than 10 kg–18 kg (40 lb).	9-month-old. 9-month-old. ¹
More than 18 kg or 40 lbs.	3-yr-old. 6-yr-old.

¹ This dummy is not to be used to test booster seats.

C. Height ranges. This rule adopts the proposed provision that NHTSA will determine which dummy to use to test a particular child restraint based on the restraint manufacturer's recommendations about the height of the children for whom the restraint is intended. However, rather than basing the provision on sitting height, as proposed, this rule uses standing height. Standard 213 currently requires manufacturers to provide recommendations concerning standing height.

All but Ford and UM-CPP concurred with using height as a criterion for choosing the test dummy with which a child restraint will be tested. IIHS and Advocates believed that recommended height ranges should be considered in choosing a dummy, since that would better ensure that the test dummy