

interval to measure HIC is consistent with the injury threshold used in FMVSS No. 208 for the Hybrid III 50th percentile dummy prior to the incorporation of scaled injury limits and Nij for advanced air bags.

Limiting the duration over which HIC is calculated to a maximum of 36 ms, while limiting HIC to 1000, assures that the acceleration level of the child's head will not exceed 60 g's for any period greater than 36 ms. The 60 g

acceleration limit was set as a reasonable head injury threshold by the originators of the "Wayne State Tolerance Curve", which was used in the development of the HIC calculation.

The change to a 36 millisecond time measurement for HIC will not necessarily result in lower HIC values in compliance testing because of the changeover in this rulemaking to the new dummy family. NHTSA compared the differences between using the HIC₃₆

criterion in testing with the Hybrid III dummy family and using the existing criterion, HIC_{unlimited}, in testing with the Hybrid II family. The following tables outline the results of comparison tests performed on identical child restraints, using the FMVSS No. 213 proposed (Table 8) and existing seat assemblies (Table 9), with both Hybrid III and Hybrid II 3-year-old dummies.

TABLE 8.—COMPARISON TESTS OF 3-YEAR-OLD HYBRID III AND HYBRID II DUMMIES ON PROPOSED SEAT ASSEMBLY
[Hybrid III HIC₃₆ vs Hybrid II HIC_{Unlimited} 3-Year-Old Child Dummy (Tested Using with The NPRM Proposed Seat Assembly)]

	Hybrid III* HIC ₃₆	Hybrid III HIC _{Unlimited}	Trend
Cosco Touriva Convertible, Lap Belt, No Tether	~434	703	Hybrid III HIC ₃₆ <i>Less than</i> Hybrid II HIC _{Unlimited} .
Century Accel Convertible, Lap Belt, No Tether	~344	627	Hybrid III HIC ₃₆ <i>Less than</i> Hybrid II HIC _{Unlimited} .
Century Breverra Hybrid, Lap Belt, No Tether	~521	670	Hybrid III HIC ₃₆ <i>Less than</i> Hybrid II HIC _{Unlimited} .
Cosco HB Booster Hybrid, Lap Belt, No Tether	~684	446	Hybrid III HIC ₃₆ <i>Greater than</i> Hybrid II HIC _{Unlimited} .

*HIC₃₆ were not calculated, the relationship HIC₃₆ = 0.97

*HIC_{Unlimited} was used to approximate HIC₃₆.

TABLE 9.—COMPARISON TESTS OF 3-YEAR-OLD HYBRID III AND HYBRID II DUMMIES ON EXISTING SEAT ASSEMBLY
[Hybrid III HIC₃₆ vs Hybrid II HIC_{Unlimited} 3-Year-Old Child Dummy (Tested Using Existing FMVSS No. 213 Seat Assembly)]

	Hybrid III HIC ₃₆	Hybrid II HIC _{Unlimited}	Trend
FF Convertible, Lap Belt	671	385	Hybrid III HIC ₃₆ <i>Greater than</i> Hybrid II HIC _{Unlimited} .
FF Convertible, Lap Belt	479	
FF Convertible, Lap Belt	424	
Average	671	429	Hybrid III HIC ₃₆ <i>Less than</i> Hybrid II HIC _{Unlimited} .
FF Convertible, Lap and Tether	303	387	
FF Convertible, Lap and Tether	362	396	
Average	333	392	Hybrid III HIC ₃₆ <i>Greater than</i> Hybrid II HIC _{Unlimited} .
FF Convertible, LATCH	292	281	
FF Convertible, LATCH	518	336	
Average	408	309	Hybrid III HIC ₃₆ <i>Greater than</i> Hybrid II HIC _{Unlimited} .
FF Hybrid, Lap and Tether	452	392	
FF Hybrid, Lap and Tether	439	501	
Average	446	447	=

In some of the tests Hybrid III HIC₃₆ results were higher, and in other tests the HII HIC_{Unlimited} results were higher. On the other hand, in a limited number of tests with the 6-year-old dummies, the Hybrid III HIC₃₆ numbers were higher. All in all, the agency determined that the data are inconclusive as to any differences in how the Hybrid II and Hybrid III dummies measure HIC. In any event, the agency's tests of child restraints has not found any difference between HIC_{Unlimited} and HIC₃₆ in terms of compliance passage rates. Thus, the agency has concluded that the impact on child restraint performance relating to the change to HIC₃₆ will be insignificant.

ii. *Chest Injury Criteria.* Some commenters supported while others opposed the proposals to adopt a new chest deflection criterion and to adopt the chest acceleration limits that were

scaled for children and incorporated into FMVSS No. 208. The Alliance supported the proposals. Ms. Bidez supported the proposed chest deflection criteria, stating that "although no significant reports of chest injury in children have yet occurred, prudence and systems engineering dictates [sic] that excessive chest deflection be monitored to prevent the introduction of "new" injury mechanisms in the quest to prevent other injury mechanisms with improved restraint design."

JPMA opposed the proposed chest injury criteria for the reasons explained in the preceding section. TraumaLink also opposed incorporation of the proposed chest deflection and reduced chest acceleration limits, because according to data it has collected in its study, "These types of injuries do not occur in children in [child restraint systems]." TraumaLink further stated:

"We are concerned about the tradeoff between including these more restrictive thoracic criteria and reducing the overall protection of the head through increased head excursions and accelerations." These concerns were echoed by UMTRI, which stated that the relationship between the chest deceleration and deflection limits and field injuries under the type of loading simulated in FMVSS No. 213 are not well established. "Introducing these injury criteria now [including neck injury] could lead to counterproductive child restraint designs because many restraints that perform well in the field, particularly booster seats, are likely to exceed the new injury tolerance measures."

SafetyBeltSafe also opposed the proposed chest injury criteria. It expressed concern that the new seat bench assembly has an added slope to