authority of the following chapters of Title 49 of the United States Code: chapter 301; chapter 323; chapter 325; chapter 327; chapter 329; and chapter 331, and to compromise any civil penalty or monetary settlement in an amount of $25,000 or less resulting from a violation of any of these chapters.

(3) Exercise the powers of the Administrator under 49 U.S.C. 30166 (c), (g), (h), (i), and (k).

(4) Issue subpoenas, after notice to the Administrator, for the attendance of witnesses and production of documents pursuant to chapters 301, 323, 325, 327, 329, and 331 of Title 49 of the United States Code.

(e) *Associate Administrator for Plans and Policy.* The Associate Administrator for Plans and Policy is delegated authority to direct the NHTSA planning and evaluation system in conjunction with Departmental requirement and planning goals; to coordinate the development of the Administrator's plans, policies, budget, and programs, and analyses of their expected impact, and their evaluation in terms of the degree of goal achievement; and to perform independent analyses of proposed Administration regulatory, grant, legislative, and program activities.

(f) *Associate Administrator for Safety Performance Standards.* Except for authority reserved to the Administrator or delegated to the Associate Administrator for Safety Assurance, the Associate Administrator for Safety Performance Standards is delegated authority to exercise the powers and perform the duties of the Administrator with respect to the setting of motor vehicle safety and theft prevention standards, average fuel economy standards, procedural regulations, and the development of consumer information and regulations authorized under 49 U.S.C. chapter 301 (except for sections 30141 through 30147), and authorized under 49 U.S.C. chapters 323, 325, 329, and 331. The Associate Administrator for Safety Performance Standards is also delegated authority to:

(1) Respond to a manufacturer's petition for exemption from 49 U.S.C. chapter 301's notification and remedy requirements in connection with a defect or noncompliance concerning labelling errors;

(2) Extend comment periods (both self-initiated and in response to a petition for extension of time) for noncontroversial rulemakings;

(3) Make technical amendments or corrections to a final rule; and

(4) Extend the effective date of a noncontroversial final rule.

(g) *Associate Administrator for Safety Assurance.* Except for those portions that have been reserved to the Administrator or delegated to the Chief Counsel, the Associate Administrator for Safety Assurance is delegated authority to exercise the powers and perform the duties of the Administrator with respect to:

(1) Administering the NHTSA enforcement program for all laws, standards, and regulations pertinent to vehicle safety, fuel economy, theft prevention, damageability, consumer information and odometer fraud, authorized under 49 U.S.C. chapters 301, 323, 325, 327, 329, and 331.

(2) Issuing regulations relating to the importation of motor vehicles under 49 U.S.C. 30141 through 30147.

(3) Granting and denying petitions for import eligibility determinations submitted to NHTSA by motor vehicle manufacturers and registered importers under 49 U.S.C. 30141.

(h) *Associate Administrator for Traffic Safety Programs.* Except for those portions that have been reserved to the Administrator or delegated to the Associate Administrator for State and Community Services, the Associate Administrator for Traffic Safety Programs is delegated authority to exercise the powers and perform the duties of the Administrator with respect to: 23 U.S.C. chapter 4, as amended; the authority vested by section 210(2) of the Clean Air Act, as amended (42 U.S.C. 7544(2)); the authority vested by 49 U.S.C. 20134(a), with respect to the laws administered by the Administrator pertaining to highway, traffic, and motor vehicle safety; the Act of July 14, 1960, as amended (23 U.S.C. 313 note) and 49 U.S.C. chapter 303; the authority vested by section 141, as it relates to certification of the enforcement of speed limits, and sections 153, 154(a), (b), (d), and (e) and 158 of Title 23 of the United States Code, with the concurrence of the Federal Highway Administrator; and section 209 of the Surface Transportation Assistance Act of 1978 (23 U.S.C. 401 note) as delegated by the Secretary in § 501.2(i).

(i) *Associate Administrator for State and Community Services.* The Associate Administrator for State and Community Services is delegated authority to exercise the powers and perform the duties of the Administrator with respect to State and community highway safety programs under 23 U.S.C. 402, including approval and disapproval of State highway safety plans and final vouchers, in accordance with the procedural requirements of the Administration; to approve the awarding of alcohol incentive grants to the States under 23 U.S.C. 408 and drunk driving prevention grants under 23 U.S.C. 410, for years subsequent to the initial awarding of such grants by the Administrator; as appropriate for activities benefiting states and communities, to implement 23 U.S.C. 403; and to implement the requirements of 23 U.S.C. 153, jointly with the delegate of the Federal Highway Administrator.

(j) *Associate Administrator for Research and Development.* The Associate Administrator for Research and Development is delegated authority to: develop and conduct research and development programs and projects necessary to support the purposes of chapters 301, 323, 325, 327, 329, and 331 of Title 49 U.S.C., and Title 23 U.S.C. chapter 4, as amended, in coordination with the appropriate Associate Administrators, and the Chief Counsel.

(k) *Associate Administrator for Administration.* The Associate Administrator for Administration is delegated authority to:

(1) Exercise procurement authority with respect to NHTSA requirements;

(2) Administer and conduct NHTSA's personnel management activities;

(3) Administer NHTSA financial management programs, including systems of funds control and accounts of all financial transactions; and

(4) Conduct administrative management services in support of NHTSA missions and programs.

(1) *Director, Office of Vehicle Safety Compliance, Enforcement.* The Director, Office of Vehicle Safety Compliance, Enforcement, is delegated authority to exercise the powers and perform the duties of the Administrator with respect to granting and denying petitions for import eligibility decisions submitted to NHTSA by motor vehicle manufacturers and registered importers under 49 U.S.C. 30141(a)(1).

Issued on: August 4, 1995.

Ricardo Martinez,

Administrator.

[FR Doc. 95–19710 Filed 8–17–95; 8:45 am]

BILLING CODE: 4910–59–P

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49 CFR Parts 571, 572, and 589

[Docket No. 92–28; Notice 4]

RIN 2127–AB85

Federal Motor Vehicle Safety Standards; Head Impact Protection

AGENCY: National Highway Traffic Safety Administration (NHTSA), DOT.

ACTION: Final rule.

SUMMARY: This document amends Standard No. 201, *Occupant Protection*

in Interior Impact, to require passenger cars, and trucks, buses and multipurpose passenger vehicles with a gross vehicle weight rating of 10,000 pounds or less, to provide protection when an occupant's head strikes upper interior components, including pillars, side rails, headers, and the roof, during a crash. The amendments add procedures and performance requirements for a new in-vehicle component test. Insofar as this rulemaking applies to passenger cars, it is required by the NHTSA Authorization Act of 1991 (sections 2500–2509 of the Intermodal Surface Transportation Efficiency Act).

DATES: *Effective date:* The amendments made in this rule are effective on September 18, 1995.

Incorporation by reference date: The incorporation by reference of the material listed in this document is approved by the Director of the Federal Register as of September 18, 1995.

Petition date: Any petitions for reconsideration must be received by NHTSA no later than September 18, 1995.

ADDRESSES: Any petitions for reconsideration should refer to the docket and notice number of this notice and be submitted to: Administrator, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590.

FOR FURTHER INFORMATION CONTACT: Bill Fan, Side and Rollover Crash Protection Division, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590 (202–366–4922); or Mary Versailles, Rulemaking Division, Office of Chief Counsel, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590 (202–366–2992).

SUPPLEMENTARY INFORMATION:

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I. Statutory Basis for Rulemaking

This final rule responds to the NHTSA Authorization Act of 1991 (sections 2500–2509 of the Intermodal Surface Transportation Efficiency Act (''ISTEA''), Pub. L. 102–240). ISTEA requires NHTSA to address several vehicle safety matters through rulemaking. One of these matters, set forth in section 2503(5), is improved head impact protection from interior components (i.e., roof rails, pillars, and front headers) of passenger cars.

Section 2502 of ISTEA generally directed NHTSA to initiate rulemaking on improving head impact protection and other matters not later than May 31, 1992. Rulemaking was to be initiated by the publication of either an advance notice of proposed rulemaking (ANPRM) or a notice of proposed rulemaking (NPRM). Section 2502 provided that, if the agency was unable to publish such a notice by May 31, 1992, the agency had to publish, by that date, a notice announcing that the rulemaking will begin by a date that was not later than January 31, 1993. On June 5, 1992, NHTSA published a notice of intent announcing that it would publish an NPRM on improved head impact protection by January 31, 1993. (57 FR 24008) The NPRM was published on February 8, 1993 (58 FR 7506).

Section 2502(b)(2)(B)(iii) of ISTEA generally provides that this rulemaking action, as it applies to passenger cars, must be completed within 24 months of the NPRM. NHTSA may delay the date for completion for not more than six months. Under ISTEA, the rulemaking will be considered completed when the agency promulgates a final rule with standards on improved head injury protection.

II. Safety Problem

Head impacts with the upper interior components of vehicles are the leading cause of head injury for non-ejected occupants killed in a crash. Counting only each fatally injured occupant's most severe injury as the cause of death, NHTSA estimates that 2,430 occupants of passenger cars and trucks, buses, and multipurpose passenger vehicles (LTVs) with a gross vehicle weight rating (GVWR) of 10,000 pounds or less are killed annually when the occupant's head strikes the upper structures in the interior compartment of the vehicle. These head impacts also result in nearly 60,000 occupant injuries, 4,070 of which are serious injuries, rated AIS 3 or greater. (The AIS, or Abbreviated Injury Scale, is used to rank injuries by level of severity. An AIS 1 injury is a minor one, while an AIS 6 injury is one that is currently untreatable and fatal.) Accident data show that occupant head injuries result primarily from head contact with a vehicle's pillars, side rails, headers and other components during a crash.

NHTSA has several Federal motor vehicle safety standards that improve crash protection to the occupant's head in a crash. These include Standard No. 208, *Occupant Crash Protection,* which limits the forces and accelerations that are imposed on the head of a crash dummy in a frontal, 30 mile-per-hour (mph) crash test. Standard No. 208 has been highly effective at reducing actual fatality risk, and, together with the nationwide effort to increase safety belt use, has significantly reduced fatality risk, resulting in thousands of lives saved annually. (''Evaluation of the Effectiveness of Occupant Protection,'' NHTSA Interim Report, June 1992, DOT–HS–807 843.) However, Standard No. 208's effectiveness in reducing the potential for head injury due to impacts with upper interior components is limited. Only rarely does the test dummy in Standard No. 208's crash test strike the windshield header and/or A-pillar of the vehicle. Similarly, NHTSA observed in dynamic side impact tests for passenger cars that high head injury criterion (HIC) readings were not found for the test dummies. Crash test films for 90 degree car-to-car crash tests indicated that the dummy used in the side impact tests typically did not hit its head on areas that cause head injury in real world crashes; i.e., upper interior components.

The main safety standard that directly addresses head impacts is Standard No. 201, *Occupant Protection in Interior Impact.* Standard No. 201 took effect for passenger cars on January 1, 1968 and was extended to LTVs on September 1, 1981. The standard sets requirements for instrument panels, interior compartment doors, seat backs, sun visors, and armrests to lessen injuries to persons thrown against them in crashes. Performance of the instrument panel and seat backs is measured by impacting those components at a speed of 15 mph with a head form. The deceleration of the head form cannot exceed 80g's for more than 3 milliseconds. In a 1988 evaluation report on occupant protection in frontal interior impact, NHTSA found that improvements that manufacturers made to the vehicle interior during 1965–75, particularly to the instrument panel, reduced the risk of fatality and serious injury in frontal crashes by about 25 percent for unrestrained right front passengers of cars. These improvements may be saving 400 to 700 lives per year in frontal crashes. (''An Evaluation of Occupant Protection in Frontal Interior Impact for Unrestrained Front Seat Occupants of Cars and Light Trucks,'' January 1988, DOT HS 807 203.)

While those numbers are significant, a large number of occupant injuries and fatalities result from head impacts with upper interior components not covered by Standard No. 201. In 1970, NHTSA proposed to require force-distributing material (padding) on the door pillars, roof interiors and windshield headers (35 FR 14936). However, the agency terminated the action in 1979, along with a number of other rulemaking actions, citing as a reason the agency's limited resources. (See, NHTSA's five year plan for motor vehicle safety rulemaking, 44 FR 24591; April 26, 1979.) In the mid-1980's, NHTSA initiated a research program to support upgrading Standard No. 201 to provide occupant protection from head injuries in upper interior impacts. The findings of that program provided the basis for the NPRM leading to today's rule.

III. Summary of the NPRM

The NPRM proposed amendments to Standard No. 201 to set specific performance criteria for the pillars, side rails, headers, and roof of passenger cars and LTVs. NHTSA proposed to evaluate the ability of these components to limit occupant head injury by impacting the components with a headform at a specified speed. To measure the magnitude of injury threat resulting from the impact, the proposed headform contains accelerometers that measure head impact responses in a crash. The notice proposed performance criteria for tested components, and a test procedure simulating an occupant's head striking the vehicle interior.

A. Proposed Performance Requirement

The agency tentatively determined that the head injury criterion (HIC) is an appropriate injury criterion for the proposed rule since NHTSA considers the HIC to be the best currently available head injury indicator. This is especially true for injuries produced by contact with an object, such as in a head-to-interior component impact. Many of NHTSA's impact protection standards use the HIC to measure head injury, such as Standard No. 208, Standard No. 213, *Child Restraint Systems*, and Standard No. 222, *School Bus Passenger Seating and Crash Protection*. Each of these standards use a HIC limit of 1000 because research has shown that prohibiting the HIC from exceeding 1000 would prevent or reduce serious injuries in actual crashes.

The NPRM proposed two alternatives for the performance limits. The first was an across-the-board limit of HIC(d) 1000 for all specified components. HIC is calculated using the acceleration readings from an instrumented free motion headform (FMH), and transforming it to a dummy equivalent HIC(d). It represents the HIC that would be experienced by a full dummy or actual vehicle occupant. The second was a two-tiered limit of HIC(d) 1000 for the forward and rearward upper interior components (front and rear headers and A-pillar) and HIC(d) 800 for side upper interior components (side rails and pillars other than the A-pillars) and the upper roof. The agency proposed the lower HIC limit for the side upper interior components because research indicated that the side of the head is more susceptible to injury than the front of the head; i.e., the head injury tolerance threshold is lower in lateral impacts than in frontal impacts.

B. Proposed Test Procedure

1. Headform

Since the proposed test procedure was to simulate the striking of an occupant's head against a vehicle's upper interior, a test device was needed to represent and simulate the responses of a human head in an impact. NHTSA proposed to use a modified Hybrid III dummy head as this test device. The modifications included replacing the Hybrid III skull cap with a steel skullcap plate. The plate would, among other things, allow the headform to be mounted by means of a magnet to the device that propels the headform against the target component. The modified headform lacked the nose of the Hybrid III head, to eliminate interference from the nose during testing. The proposed headform is instrumented with tri-axial accelerometers, positioned to measure the acceleration at the headform's center of gravity. These measurements are used to calculate the magnitude of the potential for injury resulting from the impact; i.e., HIC.

As discussed in the NPRM, the agency tentatively concluded that the headform performed well in terms of its biofidelity, repeatability and reproducibility. Biofidelity is a measure of how well a test device duplicates the responses of a human in an impact. The agency compared the biofidelity of the headform with that of the head of the Hybrid III dummy specified in subpart E of 49 CFR part 572. The Hybrid III dummy is used in Standard No. 208 compliance tests, and the biofidelity of the dummy in frontal impacts is well accepted, particularly for forehead impacts. NHTSA found that the headform duplicated the performance of the Hybrid III dummy very well. Repeatability refers to the repetition of similar impact responses by the same test device, and reproducibility refers to the variation of impact responses among different dummies. NHTSA believed the repeatability and reproducibility of the headform to be within acceptable ranges.

The NPRM proposed amending NHTSA's regulation for anthropomorphic test dummies (49 CFR Part 572) to add specification and qualification provisions for the headform. The proposed specifications consisted of a drawing package containing all of the technical details of the headform parts and assembly. The proposed specifications included a user's manual establishing inspection and assembly procedures and calibration procedures to assure the uniformity of the headform's assembly, and the reliability of its readings.

2. Impact Zones

The purpose of the NPRM was to regulate (i.e., set performance criteria for) those areas of a vehicle's upper interior that are likely to be impacted by an occupant's head in a crash. The proposed areas were the pillar impact zones, front and rear header impact zones, side rail impact zones, and upper roof impact zone. Each of these impact zones was defined in the NPRM. All portions of those zones were subject to testing and had to meet the proposed performance criteria when impacted by the headform in accordance with specified conditions and procedures.

The proposed test procedure was an in-vehicle component test. In real world crashes of all types (frontal, side, rear and rollover), occupants' heads sometimes contact upper interior components. However, in a laboratory simulation of a particular crash mode (e.g., Standard No. 208's frontal crash), the head of a full test dummy often does not contact an upper interior component. Using an in-vehicle component test and only the head of a test dummy, the agency could test different components, all of which may not be contacted by a full test dummy in a particular, simulated crash. In the NPRM, the agency proposed to test any area that the head could contact in a crash, provided that area was within the pillar, header, side rail and upper roof impact zones.

However, certain areas of these regulated zones where head impacts were unlikely in real world crashes were excluded from the performance requirements. For example, NHTSA proposed excluding the portion of the cargo area of vans that is not close to any designated seating position.

3. Conditions and Procedures

The NPRM proposed a compliance test that was intended to replicate the circumstances of actual crashes.

a. Impact Speed. The NPRM proposed that the tested upper interior component be impacted by the headform at a speed of 15 mph. The 15 mph test speed was chosen because it is the current test speed used in Standard No. 201 to test the instrument panel and seat backs of vehicles, and it is the average speed at which the onset of serious injuries occur. The 15 mph speed represents the velocity at which the headform contacts the upper interior component and is lower than the actual speed at which the vehicle is impacted. The agency also tentatively determined that there may be a practicability problem with higher test speeds, since it may not be possible to meet the proposed limit on HIC without using unacceptably thick padding.

b. Free Motion Impact. NHTSA proposed that the flight of the headform be ''free motion'' (as opposed to guided). The advantage of a free motion headform (FMH) over a guided one is that the FMH can simulate the glancing and non-perpendicular impacts experienced in real world crashes. Also, a FMH can be equipped with rotational accelerometers, if desired, although none is currently specified by NHTSA. The NPRM did not propose to specify a specific method for propelling the headform, since the means of propulsion does not affect test results.

c. Impact Parameters. The NPRM stipulated the manner in which the headform impacted the tested vehicle component. For each impact zone, the proposed test procedure defined a range of angles (''approach angles'') at which the free motion headform would strike any point in that zone. The specific point to be impacted by the headform (i.e., any part of a tested zone), would be marked with a solid target circle 0.5 inch in diameter. The headform could be launched from any location inside the vehicle, provided that the specified approach angles and the following restrictions were met. The headform had to travel through the air for a distance of at least one inch before contacting the vehicle interior surface. At the time of initial contact between the headform and the vehicle, a specified portion of the headform's forehead must contact some portion of the target circle, and no portion of the headform may contact any part of the vehicle outside of the specified impact zone. If the headform cannot strike a portion of a specified impact zone without interference from another part of the vehicle (e.g., the windshield or instrument panel), that portion of the zone would be excluded from the performance requirements.

C. Costs and Benefits

The NPRM discussed tentative conclusions about the impacts (e.g., costs and benefits) of a final rule. Based on tests done on current production vehicles, the agency anticipated that some vehicles would be able to meet the proposed criteria for some components, as presently designed. For vehicles that had to be redesigned to meet the proposed criteria, NHTSA determined that added padding would be a feasible and effective countermeasure to improve upper interior head impact protection. NHTSA did not believe that the required amount of increased padding would reduce visibility and/or be unacceptable to consumers, or would increase the risk of neck injury.

The NPRM estimated the average cost of padding needed to meet the two alternatives for the proposed injury criteria (across-the-board HIC 1000 versus HIC 800/1000). NHTSA estimated that, under the first alternative, the total per vehicle average cost, including the average cost and weight of needed padding, lifetime fuel penalty cost and secondary weight cost, was $29 for passenger cars and $45 for all LTVs. Under the second alternative (HIC 800/1000), the estimated total per vehicle average cost was $49 for passenger cars and $68 for LTVs.

The agency used two models (i.e., Lognormal, Prasad/Mertz) to calculate the estimated benefits of the two alternative performance proposals. Under the first alternative (HIC 1000), NHTSA estimated that AIS 2–5 injuries for passenger cars and LTVs would be reduced by 824 under the Lognormal model, and by 683 under the Prasad/Mertz model. Fatalities for passenger cars and LTVs would be reduced by 1,143 under the Lognormal model, and by 1,390 under Prasad/Mertz. Under the second alternative performance proposal (HIC 800/1000), AIS 2–5 injuries for passenger cars and LTVs would be reduced by 841 under the Lognormal model, and by 1,478 under Prasad/Mertz. Fatalities for passenger cars and LTVs would be reduced by 1,365 under the Lognormal model, and by 1,614 under Prasad/Mertz.

D. Leadtime

The agency believed that the earliest possible effective date for the rule would be the first September 1 approximately two years after issuance of a final rule. The agency sought comments on whether a phase-in requirement would be appropriate, starting one to two years after issuance of a final rule.

IV. Summary of the Comments

The agency received over 70 comments in response to the NPRM. Many commenters submitted more than one comment. No commenter disputed that ISTEA mandates NHTSA to promulgate a final rule to improve head impact protection of passenger cars. However, some commenters believed the passenger car proposal inappropriately exceeded the scope of ISTEA. For example, the American Automobile Manufacturers Association (AAMA) believed that, in contrast to the NPRM, ISTEA does not require A-pillars and windshield headers to be included in a rule for increased head impact protection. Volkswagen commented that ISTEA included no mandate to improve the protection of the rear header and roof of passenger cars, or any interior component of LTVs. On the other hand, Advocates for Highway and Auto Safety (Advocates) commented that it does not believe ISTEA provides NHTSA discretion to exclude any rails or pillars from the rule.

Commenters diverged widely in their support of, or opposition to, specific aspects of the proposal. Consumer groups and a coalition of insurance groups generally favored all aspects of the NPRM that would have imposed the most stringent performance requirements (e.g., the two-tiered 800/1000 HIC criteria; setting impact speed at 20 mph) on the greatest portion of the vehicle interior. They supported extending the requirements to as many vehicle types as possible and favored having the requirements become effective in the shortest time possible, opposing a phased-in effective date. The

Insurance Institute for Highway Safety believed the NPRM greatly underestimated the potential benefits of the rule.

In contrast, vehicle manufacturers, suppliers, and associations generally sought to considerably narrow the scope of the rule. They had concerns about the proposed two-tiered HIC criteria of 800/1000, believing that an across-the-board HIC of 1000 is superior to a HIC of 800. They argued that the latter could not be supported by biomechanical or accident data. Many manufacturers had concerns about specific aspects of the proposed test procedure, such as the appropriateness of the headform, the impact speed for the headform, and the feasibility of meeting the proposal that any portion of a target impact zone had to meet the performance criteria of the standard. Since the NPRM placed few limits on the points at which the headform was to contact the tested component and on the approach angles at which the headform was to be launched at the component from inside the vehicle, some manufacturers believed it would be virtually impossible, under the NPRM, for them to locate and certify all of the potential impact locations of a targeted upper interior component. Commenters suggested excluding various interior components, and types of vehicles from the rule. In contrast to the proponents of the NPRM, these commenters believed NHTSA vastly overestimated the safety benefits of the rule and underestimated the costs.

Numerous comments addressed the issue of leadtime. The domestic manufacturers were unanimously opposed to an implementation date earlier than September 1, 1998. These companies stated that, regardless of cost, most companies could not implement the required changes for this rule for any model, even with the phase-in suggested in the NPRM. The reasons given were, first, that the designs to meet the proposed requirements are not bookshelf technologies. Second, the design concepts have to be tested and evaluated for feasibility and implementation readiness. Third, these concepts have to meet the requirements while providing acceptable visibility and interior spaciousness that meet the customer needs, and be manufacturable with tooling that in some cases may have yet to be developed. To meet all these demands, the industry contended that a rule that begins by September 1, 1998 with a phase-in period of four years with the rule becoming 100 percent effective no earlier than September 1, 2002, is essential.

On October 20, 1993, NHTSA published in the **Federal Register** a notice of a public meeting. In that notice, the agency announced that it was reopening the comment period to respond to the NPRM by an additional 30 days (58 FR 54099). On November 15, 1993, a public meeting was held in Washington, D.C., to discuss the various issues raised by the commenters. Representatives from AAMA, General Motors, Ford, Chrysler, Liability Research Group, and Advocates repeated many concerns expressed in earlier comments and submitted supplemental information to support those comments. Additionally, a private citizen gave a presentation concerning FMH impact speed and neck injury risks.

The four main concerns expressed by the commenters in seventeen submissions received during the additional comment period related to; (1) The magnitude of the safety problem, (2) the appropriateness of the proposed test device and test conditions, (3) the anticipated safety benefits from this rulemaking, and (4) the need for an extended leadtime with phase-in and carry-forward provisions. No new issues were brought up in these comments or in the discussions at the public meeting.

V. Summary of the NPRM/Final Rule Differences

The main differences between the provisions of this final rule and those of the NPRM relate to the following matters. The NPRM proposed a test procedure that would have required any portion of the upper interior components (e.g., pillar, side rail or header) to meet specified performance criteria. This rule requires specific targets on those components to meet the criteria and adds procedures for locating those targets. The NPRM proposed two alternatives regarding performance requirements—a single, across-the-board limit of HIC(d) 1000 for all upper interior components or a two-tiered limit of HIC(d) 1000 for the forward and rearward upper interior components and HIC(d) 800 for side upper interior components. This rule adopts a single, across-the-board limit of HIC(d) 1000 for all specified components. The NPRM proposed that the new requirements would become effective on the first September 1 that occurred approximately two years after issuance of the final rule. This rule adopts a five year phase-in period, which will begin September 1, 1998. In addition, this rule allows manufacturers to carry forward credits from previous years during the phase-in period. Each of these changes is fully discussed, together with all other relevant issues, in section VI.

VI. Final Rule

A. Performance Requirements

As explained in section III–A, the agency proposed two alternative versions of the performance requirements. While many commenters agreed that, for impacts of the same severity, there is a higher risk of injury to the side of the head than the forehead, most commenters did not support the two-tiered requirement for HIC(d). The most common rationale cited for disagreeing with the HIC(d) 800 requirement for side components was a lack of sufficient biomechanical data to support that particular level of requirement. In addition to submitting comments on the HIC(d) limit, some commenters suggested other performance measures in addition to, or instead of, HIC(d). Of the alternatives suggested, the most common was a peak acceleration limit to measure the risk of neck injury. One individual questioned the validity of using HIC determined from the accelerations measured from the FMH as the sole measurement of impact severity. He was concerned about the variability in the measurements obtained from the Hybrid III headform. He also raised questions about the effect of FMH rotation on measured impact severity which could be very different from the rotation of a human head constrained by a neck in real world impact conditions. Finally, one manufacturer suggested that a 36 ms time limit be included for HIC calculation.

With respect to a HIC(d) 800 requirement for side components, NHTSA has concluded that, although the proposal is directionally correct, such a requirement should not be adopted at this time. The data to support the HIC(d) 800 requirement was scarce and NHTSA believes it should do testing to acquire additional biomechanical data. In addition, NHTSA is concerned that compliance with such a requirement may not be feasible for side components because of interior space limitations. The agency's research on head injury, including side head impacts, continues. The agency will reexamine the HIC(d) 800 requirement, along with other possible head injury criteria, if research advances to a point that it indicates a revised limit would be sufficiently beneficial, achievable at reasonable cost, and feasible.

With respect to a peak acceleration limit, NHTSA considers such a supplement to the proposed HIC(d) limit unnecessary because the principal effect of any countermeasure on head impacts is effectively to reduce both the peak head acceleration and the HIC. Further, it is not clear how the acceleration limits suggested by commenters were selected, or what the biomechanical bases for those limits are. Since the HIC is considered a better measure than acceleration for evaluating head injury potential, NHTSA believes that adding a peak FMH acceleration limit to the HIC(d) 1000 requirement is redundant. The suggestion that limiting head acceleration would eliminate neck injuries does not take into account the effect of torso motion on neck injury. None of the commenters provided any data to substantiate the claim that addition of acceleration limits to HIC(d) would reduce the potential for neck injuries.

NHTSA has conducted many tests of simulated and production upper interior components of vehicles with the FMH. The free flight of the FMH in all cases is less than six inches and during the period of FMH primary contact, the observed FMH rotation is less than ten degrees in most cases. Therefore, it is the agency's belief that this small amount of rotation has no appreciable effect on the HIC value. It is widely recognized that no biomechanical criteria are available for head rotation. As and when such criteria become available, the agency would certainly consider the addition of other criteria or adoption of another test device to evaluate potential for neck injuries. However, the agency does not see a need to delay adopting HIC as a criterion in the interim to assess head impact protection in interior impacts.

With respect to the 36 ms limit for HIC calculation, agency testing indicates that the FMH acceleration pulse is less than 20 ms in duration. The 36 ms time limit is used in Standard No. 208 frontal crash tests in which the dummy head acceleration pulses are often wide. For that standard, the objective of limiting the time period to 36 ms is to eliminate unrealistic HIC calculations from non-contact head acceleration pulses that are wide. Because a FMH impact test is not valid unless contact occurs, the pulse is generally narrow. In addition, the agency's test data indicate that the rebound pulse during FMH testing is insignificant. However, to allay any concerns and to achieve consistency with other HIC calculations, NHTSA has retained the 36 ms limit it proposed in the NPRM for FMH HIC calculation in the final rule.

B. Headform

The NPRM proposed using the FMH for determining compliance with the new requirements. The FMH is essentially a modified Hybrid III dummy head. The modifications include replacing the Hybrid III skull cap with a steel skullcap plate, which allows the FMH to be mounted to the propulsion unit by means of a magnet. The skullcap plate also serves to hold the headskin in place during testing. In addition, the nose of the Hybrid III head is removed to eliminate interference during testing. The FMH is instrumented with a set of tri-axial accelerometers, positioned to measure the acceleration of the center of gravity, which permit the measurement of HIC. The HIC value is then transformed to an equivalent HIC for the dummy (HIC(d)) using a transfer function.

Ford recommended that the vehicle's upper interior component tests be performed using the Ford hemispherical impactor, because Ford believes that it is simpler and yields more repeatable test results than the FMH. Ford's hemispherical impactor was developed in 1991 specifically for vehicle upper interior impact tests. Other manufacturers and manufacturer associations supported the use of Ford's hemispherical impactor. Volvo recommended that the ''lateral load sensing head'' developed jointly by Volvo and Collision Safety Engineering be incorporated into the FMH impactor for lateral head impact tests. In addition to suggestions for alternative headforms, commenters raised questions regarding whether the headform should be free-motion or guided, its potential to assess neck injury, and the effect of early chin contact on HIC(d).

After reviewing these comments, NHTSA has decided to specify the FMH in this final rule, with one amendment. The amendment relates to the vertical angles to be used in launching the FMH in testing. The angles have been adjusted to reduce the potential for early chin contact with the vehicle's interior during a test.

The agency considers the FMH to be superior to a guided headform impactor, because unlike the guided impactor, which only simulates a single impact, the FMH's movement is more likely to simulate the variety of impacts that occur in real world crashes. In addition, while this rule does not require head rotational acceleration measurements, it is possible that a 9-accelerometer array, which the FMH could accommodate, would allow both the calculation of HIC and the recording of the head rotational accelerations. It is believed that, when biomechanics research on head rotational acceleration has advanced sufficiently to permit establishing suitable criteria, the FMH could be modified and used to measure head rotational acceleration to assess the potential for brain injury.

While neither the FMH nor Ford's hemispherical impactor has a neck component, the FMH has the shape of a human head so that it can simulate forehead impacts against vehicle interior components. Further, because the FMH is essentially a Hybrid III headform, a modified headform could be developed with the addition of a neck in the future, if suitable injury criteria become available. With respect to adopting load sensing technology for lateral head impacts, NHTSA believes that additional research is needed before it could be considered for adoption.

Several manufacturers recommended that Ford's hemispherical impactor be adopted for this rulemaking because of its asserted superior test repeatability. The results of NHTSA's FMH repeatability study were presented in Section 12, Chapter III of the PRIA. The primary findings of this study are that the repeatability of the HIC and peak-g's are excellent (+/−5 percent) for simulated structure tests and very good (+/−10 percent) for vehicle component tests. These results are comparable to the repeatability of Ford's hemispherical impactor. In view of the potential for additional measurements in the future, NHTSA has retained the FMH for this final rule.

In response to concerns about early chin contact, the agency is amending the proposed test procedure by providing that, after the FMH is aimed at a target within the corresponding range of vertical approach angles, the FMH is tilted forward a specified number of degrees. The new test procedure allows for a 5 degree chin offset for targets on the A-pillar and the rearmost pillar and a 10 degree offset for any other pillar. Tilting the head creates a chin offset clearance that will delay chin contact beyond the time of the HIC calculation, which was less than 20 ms in duration in agency testing. The agency is amending the vertical angle ranges proposed in the NPRM to expand the range to accommodate the new chin offsets. For example, for B-pillars the proposed vertical angle range of 0 to 50 degrees has been increased to −10 to 50 degrees.

C. Targets and Angles

In the NPRM, the agency proposed to require that vehicles meet specified HIC(d) limits when any portion of a number of specified upper interior surface areas was impacted by the FMH, at any of a range of specified angles. To achieve this, the agency defined a number of impact zones within the vehicle. Due to the difficulty in clearly differentiating among the various impact zones, the agency proposed to require any area of the interior surface within two or more zones to comply with the requirements for all such zones. For each impact zone, the proposed test procedure defined a range of angles at which the FMH could strike that zone. These angles were referred to as approach angles, and were expressed using a specified orthogonal reference system. The direction of travel by the FMH would have been required to be within the specified ranges.

Manufacturers uniformly criticized this aspect of the NPRM. Almost all the manufacturers and their organizations stated that they would be unable to certify compliance without doing an infinite number of tests. These commenters stated that it was virtually impossible to determine the worst potential combinations of locations and angles, and that therefore, they would be required to test every point at every angle before they could be certain that a vehicle complied. Manufacturers suggested that the agency instead specify a limited number of specific impact locations and a specific approach angle for each such location.

With regard to the infinite testing argument, NHTSA disagrees that it is impossible or even unduly burdensome to determine worst case combinations for testing. NHTSA testing indicates that higher HIC readings are achieved when the underlying vehicle structure (not trim) is stiffer or harder. For example, the joints where more than one component meet had higher HIC readings than mid-points on components, due to the additional stiffness or rigidity at the joint. Manufacturers are in a better position than NHTSA to know exactly where these stiffer/harder areas are as they are often disguised by the trim in production vehicles. Further, at any given point, a higher HIC reading is achieved when the impact is normal to the surface of the underlying structure. Again, manufacturers are in a better position to know this angle because the trim disguises the surface of the underlying structure.

However, in the interest of administrative simplicity and of allaying manufacturer concerns, the agency is specifying target locations throughout the upper interior of the vehicle for all components other than the roof (discussed below). NHTSA believes that specifying these targets will not reduce the safety benefits of this rule. There are several reasons for that belief.

First, the targets were selected on the basis of NHTSA's experience with the location of the hard points in vehicles. While it may be theoretically possible for manufacturers to take the approach of changing their designs and moving the existing hard points out of the designated target locations as a way of meeting the requirements, NHTSA does not believe this can or will be done. For example, a target is specified at the joint between each pillar and the side rail and/or header. This joint could not be easily moved without radical changes in current designs. Other targets are specified in a way that they will be approximately 6 inches from the joints, measured along a component like a pillar or side rail. NHTSA's experience shows that the overlap of the materials of two or more components is, on average, located at this distance. While it may be possible to move the overlap a few inches, NHTSA does not believe it would be economical to do so. Other targets are described in a way that is unaffected by the actual location of the component which the agency seeks to test. For example, whenever there is a seat belt anchorage on a pillar, there is a target on the seat belt anchorage, regardless of where a seat belt anchorage is located on the pillar.

Second, for a number of reasons, NHTSA believes that manufacturers will pad (or install other countermeasures) uniformly on the covered components rather than simply protect the target locations. These reasons include liability concerns, styling, and manufacturing cost. For example, NHTSA believes that it will be cheaper to install one continuous piece of padding on the B-pillar rather than four separate, small, carefully tailored pieces just covering the four targets on that pillar. The upper interior components are sufficiently covered by targets that the cost of the pad to cover the non-target locations should be cheaper than the labor costs in carefully sculpting the padding to just cover the target locations.

Illustrations 1 and 2 show the possible locations of the targets on one side of a passenger car and a minivan.

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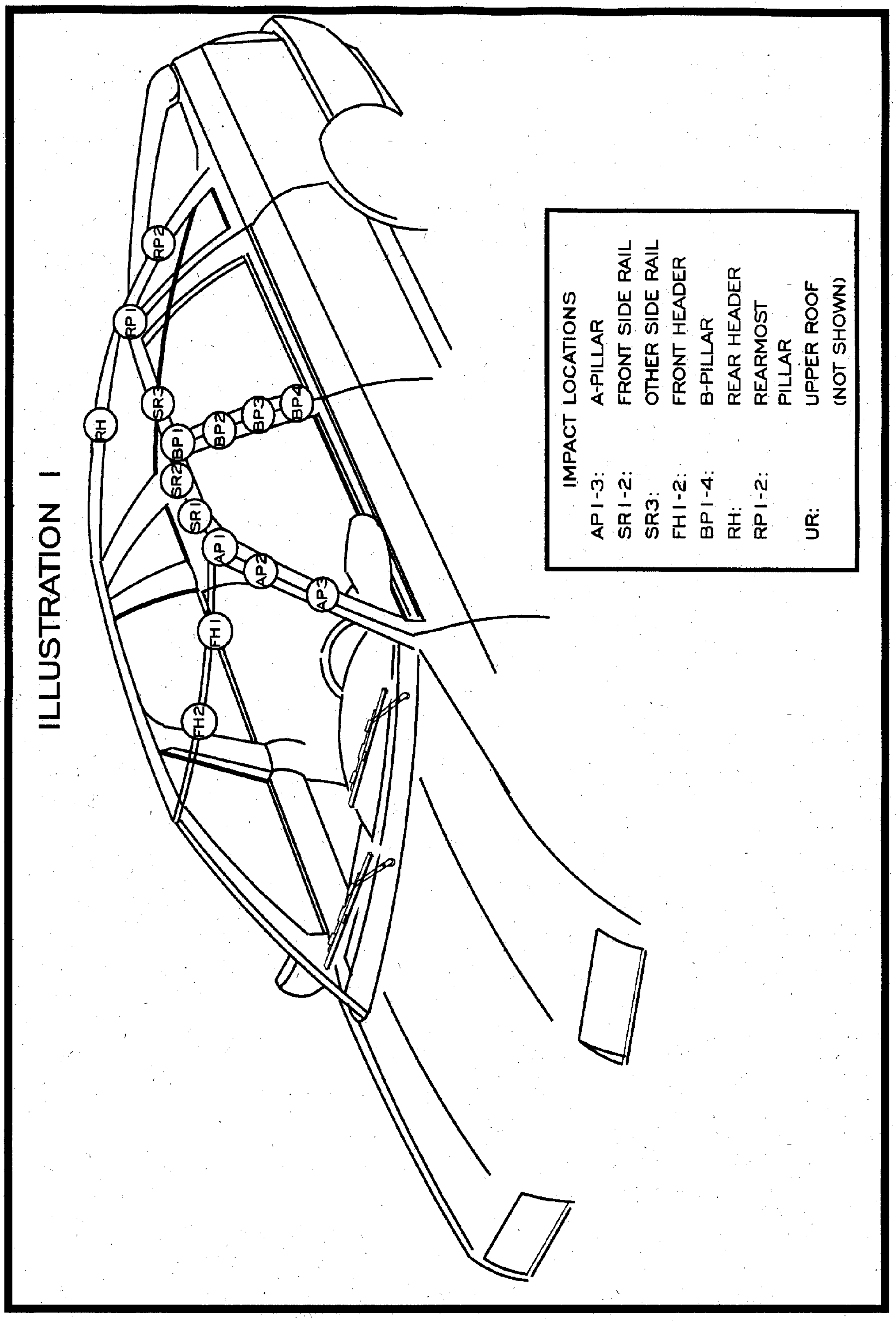
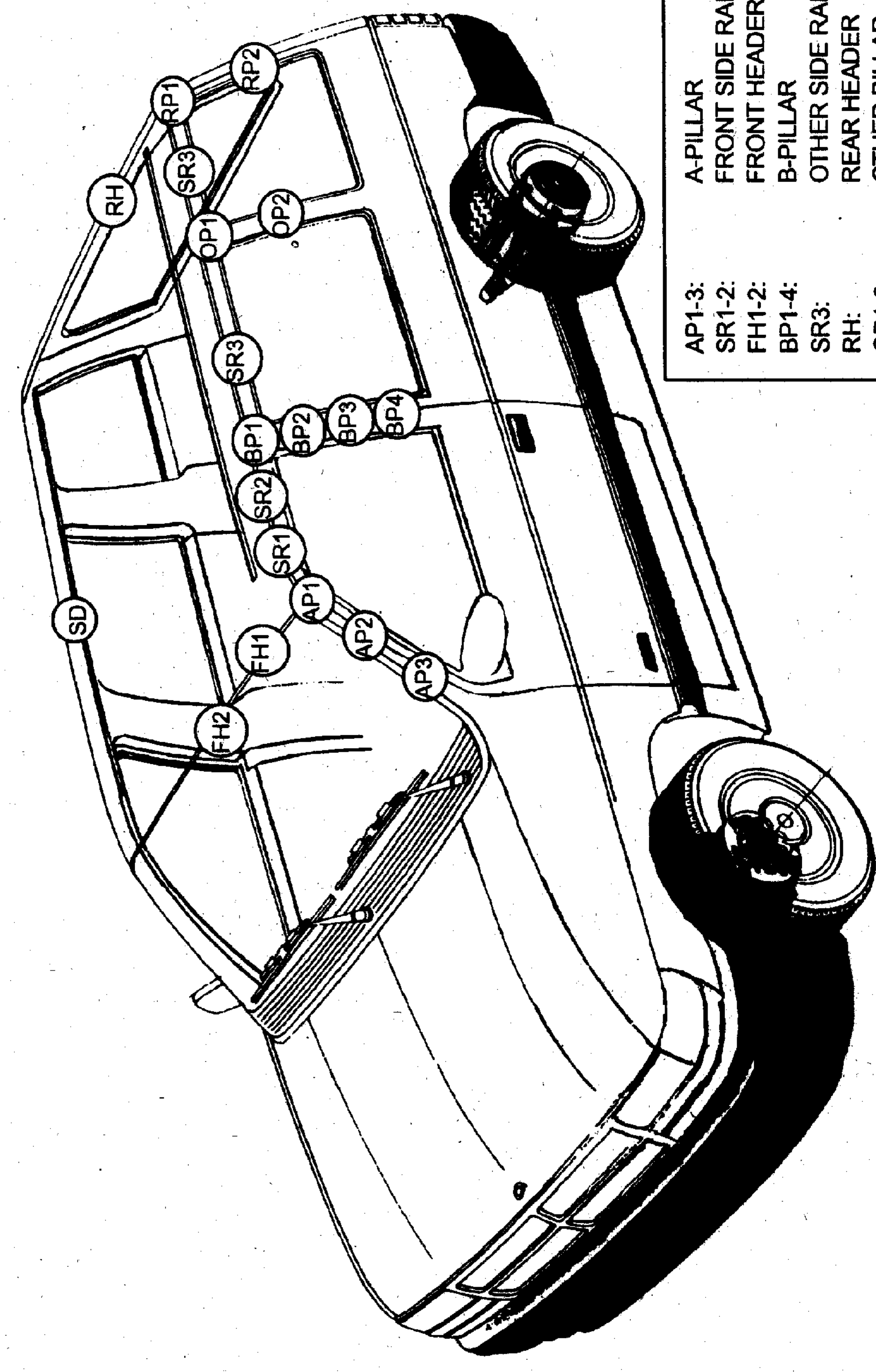


ILLUSTRATION I
RP2
RP1
RH
SR3
BP1
BP2
BP3
BP4
SR2
SR1
AP1
AP2
AP3
FH1
FH2
IMPACT LOCATIONS
AP1-3: A-PILLAR
SR1-2: FRONT SIDE RAIL
SR3: OTHER SIDE RAIL
FH1-2: FRONT HEADER
BP1-4: B-PILLAR
RH: REAR HEADER
RP1-2: REARMOST PILLAR
UR: UPPER ROOF (NOT SHOWN)

ILLUSTRATION 2



AP1-3: A-PILLAR
SR1-2: FRONT SIDE RAIL
FH1-2: FRONT HEADER
BP1-4: B-PILLAR
SR3: OTHER SIDE RAIL
RH: REAR HEADER
OP1-2: OTHER PILLAR
RP1-2: REAR PILLAR
SD: SLIDING DOOR TRACK
UR: UPPER ROOF (NOT SHOWN)

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In addition, NHTSA has decided to include a procedure which may limit the horizontal angles for testing some components. (For a discussion of vertical angles see Section V–A, *Headform*.) If the maximum angle located by the procedure is lower than the maximum angle in the range of possible angles, it becomes the new maximum angle. Similarly, if the minimum angle located by the procedure is greater than the minimum angle in the range of possible angles, it becomes the new minimum angle. NHTSA has concluded that the new specification of horizontal angles would not likely compromise the safety benefits available from any of the interior components or reduce the effectiveness of any countermeasures that are likely to be used by manufacturers. Since the new angle ranges include the most severe impact angles possible and exclude only certain glancing head impacts, they would not affect significantly the safety benefits. However, narrowing the range of angles will help reduce the possibility of excessively padding the pillars, thus preventing the loss of visibility from padding the pillars.

For an A-pillar, the minimum and maximum horizontal angles are determined by extending the shortest line from the pillar to the center of gravity (c.g.) of a 50th percentile male head at the rearmost seat position of the front seat on the same side of the vehicle and the shortest line from the opposite pillar to the c.g. of the head at the forwardmost seat position. These lines would simulate the direct line of travel that a person's head would take in striking the respective A-pillars at maximum severity and therefore, would also simulate the impacts most likely to result in severe head injuries.

The procedure to determine the range of angles for the B-pillar is similar, using angles created by a line extending from the pillar to the c.g. of a 50th percentile male head located in the rear seat adjacent to the pillar and another line extending from the pillar to the c.g. of the head located in the rearwardmost seat position of the seat forward of the pillar on the same side of the vehicle. Illustration 3 shows how the horizontal approach angles for the left A-pillar and the left B-pillar are determined.

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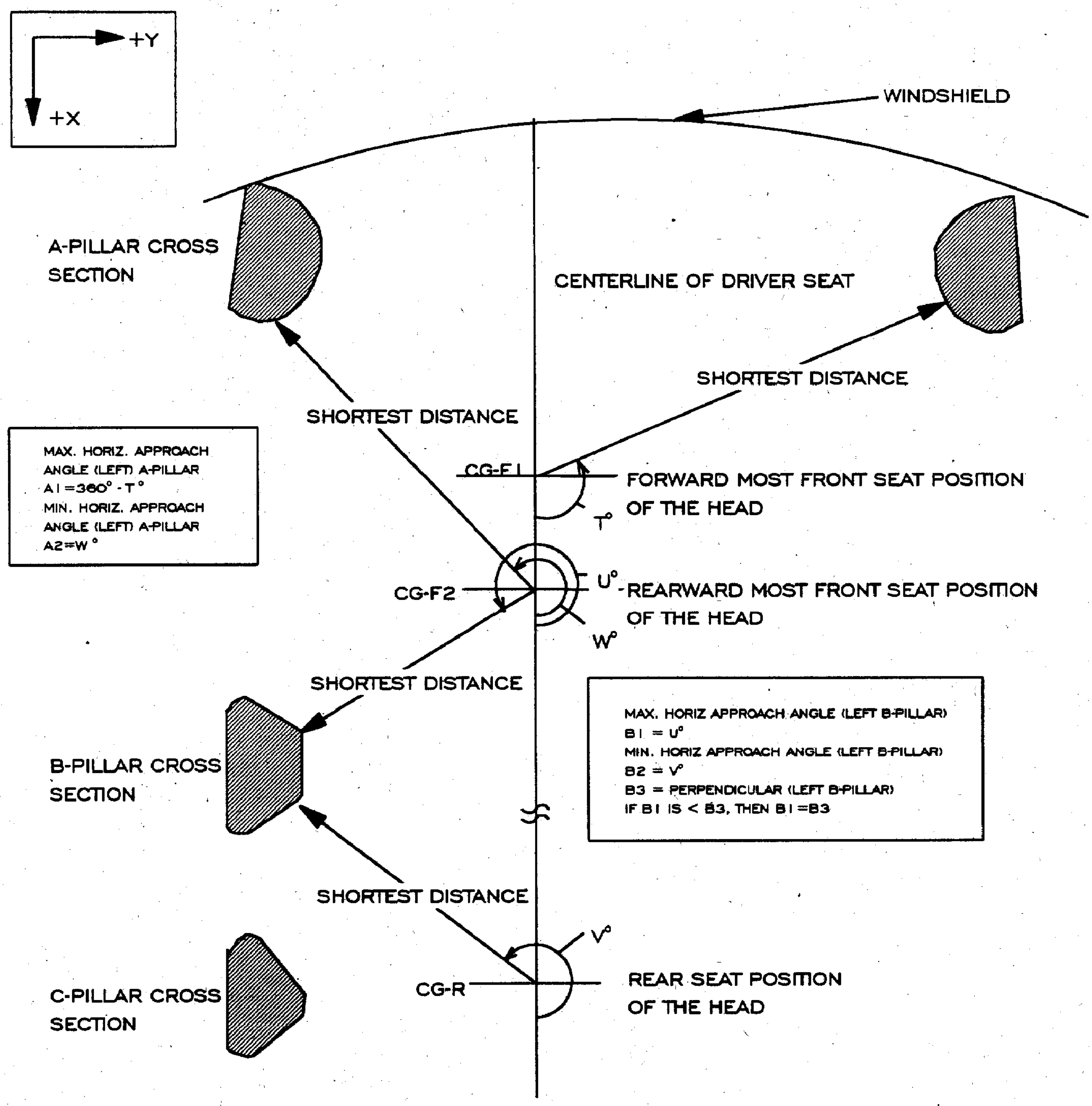

ILLUSTRATION 3

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In addition to generally criticizing the proposal, manufacturers commented that the definition of one zone, the upper roof impact zone was unclear. To define where the other impact zones end and the upper roof impact zone begins, the NPRM defined an upper roof zone plane. All interior surfaces of the vehicle above this plane were included in the upper roof impact zone. The upper roof zone plane was defined as the horizontal plane passing through a point 0.5 inch below the highest point of the vehicle roof interior. The agency requested comments on whether this proposed definition distinguished the other upper interior components from the middle area of the roof and on the practicability of demarcating these regions.

Many vehicle manufacturers stated that the definition should be clarified. For example, commenters noted that some components installed in the roof (e.g., sun roofs) may protrude below the proposed upper roof zone plane and therefore, that it was not clear whether some or all of those components were covered by the rule.

To address concerns about the definition of the upper roof zone, the agency has changed the definition. The new definition delineates four vertical planes (two longitudinal and two transverse) intersecting the interior roof. The upper roof is any area on the upper roof within the area bounded by those four planes. Illustration 4 shows how the upper roof is defined.

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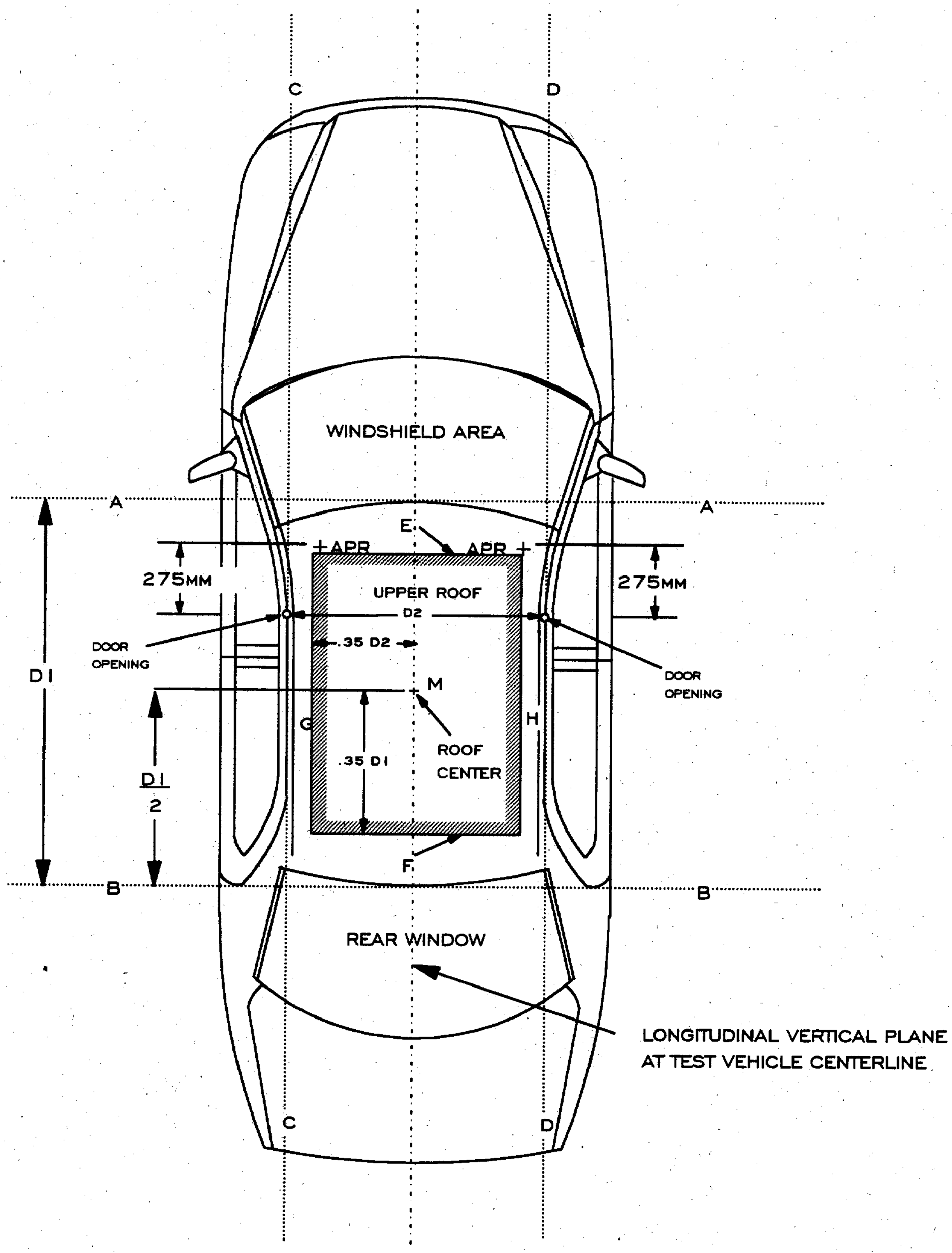

ILLUSTRATION 4

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D. Impact Speed

In the NPRM, the agency proposed that vehicles would have to meet the new requirements when a vehicle's upper interior components were impacted by the FMH at any speed up to and including 15 mph. The 15 mph speed was chosen because agency research indicated that it is approximately the onset speed for an average injury level between AIS 2 and AIS 3, or essentially the threshold at which serious injury can be expected. In addition, 15 mph is the test speed that is generally specified for the existing requirements of Standard No. 201. Finally, the agency's testing indicated that there might be a practicability problem with complying with the injury criterion at higher test speeds, such as 20 mph, since it may not be possible to meet the proposed performance limits at such speeds without using unacceptably thick padding.

Six comments were received on the proposed impact speed. Advocates did not support the 15 mph impact speed for testing of A-pillars and front headers since they do not consider the test speed to be representative of head impact speeds seen in real world accidents. Instead, they suggested a 20 mph impact test for all frontal components without providing any supporting data. Manufacturers suggested lower impact speeds, particularly for frontal components in dual-airbag vehicles. A private individual commented on the possibility of increased risk of ''body induced'' neck injuries when impacting padded components. He contended that current biomechanics research indicates that impacts above 7 mph would tend to increase the potential for neck injuries and therefore, any device used at speeds above that limit should incorporate means to evaluate neck loading.

After reviewing these comments, NHTSA has concluded that the proposed 15 mph FMH impact test is appropriate for all components, regardless of their locations. The agency conducted several accident/crash data analyses to determine the average head impact speed for various components. While the average impact speed is generally higher in frontal impacts than in side impacts, the onset of serious head injury (AIS 2–3) occurs at approximately the same speed (15 mph) for all components. An examination of head/face injury cases in the 1982–1989 NASS data files indicates that the average vehicle delta-v's in accidents vary by injury category. The delta-v's in accidents range from approximately 13 mph for maximum AIS (MAIS) 2 to 27 mph for MAIS 5. An analysis of laboratory crash test data was used to estimate an appropriate head impact speed, given the delta-v derived from accident data. However, the contact velocities for head injuries range from 10 mph to 20 mph for AIS 1 and AIS 5 respectively.

Even though, as raised by one commenter, cadaver drop tests on rigid and padded plates indicate potential for neck injuries above 7 mph, the injury mechanism in such tests is likely to be very different from head impacts against upper interior components in real world crashes. In drop tests, the head comes to rest upon contact, while the remaining mass continues to move, pinching the neck between the head and the rest of the body. In real world head impacts against upper interior components, the kinematics of the torso are different in different crash modes, especially when knee restraints interact with the legs. The pinching action of the neck as seen in cadaver drop tests is unlikely in crashes and therefore, the 7 mph threshold for neck injury based on drop tests is not valid for upper interior head contacts in accidents.

Therefore, NHTSA sees no justification to lower the impact speed for frontal components. Were the agency to adopt a lower impact speed, it would be addressing a much smaller safety problem than that seen in accidents. The agency estimated that the proposed 15 mph test speed is the average speed at which the onset of AIS 2 and AIS 3 injuries are likely to occur. It is also the current test speed for testing other interior components included in the existing standard. In addition, since no commenters have submitted new data to support a 20 mph impact speed, NHTSA finds no justification in adopting such an impact speed for this rule.

E. Visibility

In the NPRM, NHTSA stated that it had tentatively concluded that countermeasures used to meet the new requirements could be selected and designed so that they would not have a significant effect on visibility. The agency invited comment on these tentative conclusions.

Manufacturers who commented on this issue believed that padding would affect visibility, particularly the padding for frontal components. One manufacturer stated that the range of horizontal impact angles for the A-pillar was too large and would lead to the installation of padding in locations where it would affect the driver's forward vision. Safety groups did not believe that visibility was an issue since padding is not the only countermeasure choice that is available to automobile manufacturers.

NHTSA believes that a number of changes in this final rule resolve any concerns about visibility. First, as explained in VI–C, *Targets and Angles,* NHTSA has added a new procedure to limit the range of horizontal impact angles for the pillars, thereby reducing the likely area of the pillar which must be padded. Second, as is discussed later in this notice, NHTSA has extended the leadtime for the new requirements so that manufacturers could make structural modifications to reduce the HIC values in those components. Recently, NHTSA conducted a simple structural analysis of A-pillars of two production vehicles. (Docket No. 92–28–N02–52) The results of the analysis indicate that, with the additional leadtime that is available, alternative A-pillar designs can be developed in some vehicles to accommodate increased padding thickness without significant changes in component weight or forward vision, since the original A-pillar shape was not modified appreciably. NHTSA believes that, with sufficient leadtime, other interior components also can be redesigned to obtain optimal results that would not affect significantly the driver's vision.

F. Requested Exclusions

In the NPRM, the agency proposed excluding from the new requirements certain areas of the upper vehicle interior or certain types of vehicles because of lower likelihood of head injuries in real world crashes. The particular exclusions discussed in the NPRM were:

(1) Components located 36 inches rearward of the vehicle's rearmost designated seating position.

(2) Components along the side walkway of passenger vans.

(3) Components behind a vehicle's front seat area.

(4) Particular types of vehicles, such as walk-in vans.

NHTSA received a number of comments on these exclusions and suggestions for other exclusions. Each type of exclusion raised by commenters is discussed below.

1. Non-passenger Areas

In the NPRM, the agency proposed to exclude the portion of a vehicle that is well to the rear of the rearmost designated seating position. Specifically, the agency proposed that a vehicle need not meet the proposed HIC(d) limits for any part of the vehicle located rearward of a vertical transverse plane 36 inches behind the seating reference point (SgRP) of the vehicle's rearmost designated seating position. The 36 inch value was based on the normal position of the head relative to the SgRP and the extent of possible movement of the head rearward in a crash. The agency requested comment on whether this or another distance would be more appropriate or cost-effective. The agency also requested comment on whether the 36 inch distance would ensure that protection is provided by a vehicle's upper interior areas that an occupant's head is likely to impact, while avoiding requiring padding in areas that are so far behind occupant seating positions that they are very unlikely to be struck by occupants.

Some commenters who addressed this issue, while agreeing that components to the rear of any seating position should be excluded, questioned whether the 36 inch cut-off was justified. Some commenters suggested alternate limits, including 12 inches, and all components rearward of the B-pillar (for vehicles with no rear seats).

After reviewing these comments, NHTSA has decided to exclude any target located more than 24 inches to the rear of the SgRP of the rearmost seating position. NHTSA has reviewed the 36 inch cut-off proposed in the NPRM and decided that it was excessive for planar rear crashes. This conclusion is based on front seat-back angle rotation since the amount of rotation affects the extent of rearward travel of a front seat occupant in a rear crash. Previous research that reviewed front seat-back angle rotation in rear impact compliance testing for Standard No. 301, *Fuel System Integrity,* indicates that over 70 percent of the vehicles had rotation of less than 30 degrees. (See, Summary of Safety Issues Related to FMVSS No. 207, *Seating Systems,* Docket No. 89–02–N03.) These tests were of small cars. Because vehicle accelerations are lower for large cars and LTVs, NHTSA believes that seat-back rotation would be lower. For belted occupants in seats with seat back rotations of 20 degrees and 30 degrees, the amount of rearward head excursion would be 8.5 inches and 12.5 inches, respectively. When a seat back rotates much more than 30 degrees, the occupant's head would not contact the vehicle upper interior components. While the rearward head excursion could be increased by an occupant sliding up the seat (ramping), further review of Standard No. 301 test films showed no indication of ramping of belted occupants in rear impacts. Because the average location of the back of the head relative to the SgRP is 10 inches rearward, this indicates that the back of the head might travel 18.5 inches to 22.5 inches rearward of the SgRP. Therefore, NHTSA has concluded that a 24 inch cut-off is sufficient.

NHTSA disagrees that the B-pillar should be used for the cut-off point. The relationship among the SgRP, the head, and the B-pillar is not consistent between vehicles. The B-pillar may be slightly in front of the head in one vehicle or behind the head in another and therefore, does not ensure that areas that might be impacted by the head are protected. NHTSA also believes a 12 inch cut-off is insufficient. This distance is only two inches behind the typical head location. Consequently, any accident as in an oblique side collision which caused rearward and lateral excursion of the head of more than two inches could result in contact with an unprotected B-pillar. As explained above, most accidents which resulted in rearward excursion would exceed this amount.

2. Aisles

In the NPRM, NHTSA also requested comments on whether components along the side walkway of passenger vans should be excluded from the new requirements, since occupants are not seated directly next to such components.

Two commenters addressed the issue of excluding walkways. One commenter supported such an exclusion, while the other did not support the exclusion.

After reviewing these comments, NHTSA has decided not to exclude targets located along a side walkway. Inclusion of these targets will be beneficial to unbelted passengers in particular. A higher proportion of second and third seat occupants than of front seat occupants are unbelted. One of the targets which would have been excluded is the target on a sliding door track. Because vehicles are often narrower at the roof than at the floor of the walkway, these components are closer to the head and therefore, there is a potential for head contact with this component. In addition, NHTSA agrees with the commenter that contact with side components is possible in some crash scenarios (i.e., side impacts or rollovers) even with a typical 12 inch aisle.

3. Rear Seating Areas

In the NPRM, NHTSA suggested that it might exclude components in a vehicle's rear seating area. The agency noted that, of the approximately 1,143 to 1,389 fatalities that would be prevented by the new requirements, only 28 to 36 would involve rear seat occupants.

While some manufacturers and manufacturer associations supported excluding rear seat areas because of low occupancy rates and a high cost per equivalent life saved, other commenters opposed their exclusion. Opponents of exclusion cited a number of reasons, including: an equal potential for injury when the rear seats are occupied; a high proportion of children among rear seat occupants; and a belief that increased car pooling in the future will increase rear seat occupancy rates.

As explained in the Final Economic Assessment (FEA) prepared for this final rule, the target population used in the current analysis has been adjusted based on more recent accident data, the current (higher) safety belt usage rate, and the phase-in of airbags into the on-road vehicle fleet. The new analysis showed that about 873 to 1,045 fatalities would be prevented by the new requirements, 575 to 711 in passenger cars and 298 to 334 in LTVs. As in the NPRM analysis, the bulk of the benefits in the new analysis would accrue from padding upper interior components in the front seating areas. Based on currently available accident data, the agency estimates about 97 to 122 of the fatalities prevented in passenger cars and about 7 to 8 of the fatalities prevented in LTVs would be in the rear seating areas.

Based on current cost estimates included in the FEA's new analysis, the cost per equivalent life saved in passenger cars is $0.5 to $0.6 million for all seating positions, $0.3 to $0.4 million for front seating positions, and $1.7 to $2.1 million for rear seating positions. The cost per equivalent life saved in LTVs is $1.3 to $1.4 million for all seating positions, $0.7 to $0.8 million for front seating positions, and $24.2 to $26.8 million for rear seating positions.

Although these cost figures appear to disfavor regulating rear seat areas in LTVs, they rest on a current discrepancy between the fatality and injury data for front and rear seating areas. A large discrepancy exists between the number of rear seat fatalities in passenger cars and those in LTVs. NHTSA estimates that about 229 fatalities occurred in the rear seating areas of passenger cars while only 13 fatalities occurred in the rear seating areas of LTVs. This represents about 14 percent of the total fatalities in passenger cars but only 2 percent of the total fatalities in LTVs.

NHTSA believes that basing cost estimates on that current discrepancy leads to a high cost per equivalent life saved for rear seating areas of LTVs but that discrepancy will diminish in the future. The agency anticipates that the proportion of LTVs in the vehicle fleet will increase in the future and thus the proportion of rear seat fatalities involving LTVs occupants will also increase.

The agency's belief about the forthcoming changes in the underlying data is supported by two apparent trends. First, the distribution of rear seat fatalities between these two classes of vehicles is likely to be different by the time 100 percent compliance with this rule is achieved as the proportion of passenger cars and of LTVs in the fleet changes. In recent years, there have been significant changes in the composition of the light vehicle fleet. The percentage of passenger vans and sport utility vehicles in the fleet has increased significantly because of consumer preferences for these vehicles for personal transportation. If this trend continues, the annual benefits estimate for LTVs based on the incidence of fatalities and serious injuries for previous years would change substantially by the time all vehicles in the fleet meet the new standard. Second, the occupancy rate of the rear seating area of all LTVs is also likely to increase because of the increased use of vans and sport utility vehicles for family transportation.

To evaluate the effect of these two trends on the new analysis, NHTSA further revised the new estimate of benefits for passenger cars and LTVs to reflect the mix of those vehicles in the future vehicle fleet. NHTSA anticipated that the proportion of LTVs in the light vehicle fleet would increase from 29 percent to 46 percent. This would result in an increase in the target population of light trucks and a decrease in the target population of passenger cars, and a corresponding change in the benefits for this rule. By contrast, the agency's original cost estimate in the FEA assumed that the current mix of passenger cars and LTVs would not change.

The assumption of mix shifts was considered in the context of two different scenarios including additional assumptions to estimate benefits. In the first scenario, a change in the relative proportion of LTVs and passenger cars was assumed in addition to fleet growth, resulting in a directly proportional change in benefits. However, this scenario does not account for the steady decline in fatality and injury rates over the past twenty years due to improvements in motor vehicles and highway systems.

In the second scenario, it was assumed that the injury and fatality rates would continue to decline, but be offset by increased exposure due to fleet growth, resulting in a constant number of injuries and fatalities for the entire fleet. As in the first scenario, it was assumed that a shift would occur in registration percentages and thus in the percentage of injuries and fatalities in passenger cars and LTVs.

For each of these scenarios, the agency has revised its estimates of fatalities prevented and injuries reduced. NHTSA also revised its estimate of the cost per equivalent life saved in 1993 dollars, using each of the scenarios.

These revisions produced significant, and in some cases dramatic, changes in the estimates of relative benefits and costs per equivalent life saved for passenger cars and LTVs. Based on those revisions, it is estimated that the cost per equivalent life saved in passenger cars may increase to $0.6 to $0.9 million. However, for LTVs, the cost per equivalent life saved is reduced to $0.7 to $0.9 million. The breakdown for front and rear seating areas also shows that the cost per equivalent life saved in passenger cars increased slightly while that in LTVs decreased significantly. The cost per equivalent life saved in the front seating area of passenger cars increased to $0.4 to $0.5 million. For LTVs, the cost per equivalent life saved in the front seating area decreased to $0.4 to $0.5 million. The cost per equivalent life saved in the rear seating areas of passenger cars increased to $2.0 to $2.9 million. The most significant change is in the rear seating areas of LTVs, where the cost decreased substantially to $7.5 to $10.1 million, approximately a two-thirds reduction.

While the costs per equivalent life saved still vary according to seating position, the conclusive factor in determining whether to regulate a particular seating position should not be the existence of such variations, but the reasonableness of the cost for that particular position. Calculating the cost per equivalent life saved by seating position would never yield the same figures for each seating position. For example, while an occupant is always present in the driver's seating position, the same occupancy rate cannot be expected for the right front passenger seating position or any rear seating position. Therefore, cost based on the degree of occupancy in each seating position will almost certainly lead to uneven estimates of cost per equivalent life saved. So long as the cost per equivalent life is reasonable, NHTSA believes that a vehicle should be designed to offer the same level of protection to all occupants, regardless of the occupant's choice of seat.

In addition, the agency believes that the decision whether to regulate rear seating areas must take into consideration any special populations at risk. It is particularly necessary to protect children, who are often seated in the rear and who will be susceptible to head injuries unless the rear seating areas are included in this rule. For all vehicles, 37 percent of injuries and fatalities in rear seating areas are children ranging in age up to 17 years.

4. Vehicles

In the NPRM, the agency also requested comments on whether any particular types of vehicles, such as walk-in vans, should be excluded. NHTSA received a number of comments recommending that various types of vehicles be excluded from the new requirements. Recommendations included: walk-in vans, ambulances, motor homes, vehicles produced in two or more stages, school buses, and vehicles with a gross vehicle weight rating above either 6,000 pounds or 8,500 pounds.

With regard to walk-in vans which have upper interior components located much higher in comparison to other vehicles, head contacts against those components are unlikely for belted occupants and therefore, NHTSA has decided to exclude these vehicles from this rule. NHTSA has excluded these vehicles from other safety standards in the past (i.e., Standard No. 208, *Occupant Crash Protection*) because these vehicles are typically driven at low speeds. Therefore, these vehicles are generally involved in low severity crashes and any impact with the upper interior components would be less severe in these vehicles.

In addition, NHTSA is excluding targets in ambulances and motor homes which are located more than 24 inches rearward of the seating reference point of the driver. These vehicles often have special equipment in these areas which would be difficult to redesign for compliance with these requirements. Definitions of both these vehicles have been added to the regulatory text.

With regard to other requested exclusions, NHTSA is not excluding any other vehicles. None of the comments provided a convincing reason why any of these vehicles would not benefit from being required to offer the same level of protection as other vehicles or why it is not practicable for these vehicles to comply. However, as explained below in section V–I, *Leadtime,* NHTSA is allowing vehicles manufactured in two or more stages to delay compliance until the final year of the phase-in.

5. A-pillars and Front Headers

Manufacturers also requested exclusion of the A-pillar and front header. Manufacturers expressed their belief that there is no safety need justifying inclusion of these components since recent amendments to Standard No. 208 would require air bags in all vehicles affected by these requirements before the effective date of this rule. Further, the manufacturers argued that it is impossible for front seat occupants to contact these components during a crash in a vehicle with air bags.

The agency disagrees that air bags will eliminate or even significantly mitigate all head injuries caused by contacts with A-pillar/front header components and that protecting these components is therefore unnecessary. Air bags and seat belts are safety devices that are primarily effective in frontal impacts. While it is true that they will mitigate head injuries in full frontal and oblique crashes in terms of both the frequency and severity of occurrence, it is also true that secondary contacts in frontal crashes or A-pillar/front header contacts in other crash modes could also cause head injuries that cannot be prevented by air bags.

Before issuing the NPRM, NHTSA analyzed 24 National Accident Sampling System (NASS) airbag cases to assess the impact of air bags on head injury prevention. However, no reliable conclusions could be made because of insufficient airbag data. After issuing the NPRM, NHTSA conducted an additional analysis using the NASS and Air Bag Management Information System (AIRMIS) data files. (Docket No. 92–28–N02–52) Even though the NASS/AIRMIS air bag data are sparse and not statistically representative of real world injury distribution, they show that frontal upper interior components were still being struck, even when belt-air bag restraints were used. For this final rule, NHTSA has re-estimated the target population of injuries and fatalities involving A-pillar and front header impacts. This re-estimation still showed substantial numbers of injuries and fatalities from occupants striking these components, even after the agency adjusted these figures to reflect 100 percent air bag installation (see Chapter IV of the FEA). Therefore, NHTSA is not excluding these components from the final rule.

6. Roof

Many vehicle manufacturers stated that the upper roof zone should not be included in this rulemaking. Manufacturers stated inclusion of the roof will not significantly reduce injuries or fatalities from contact with the roof since the test procedure does not simulate situations in which the roof is being pushed towards the occupant (roof crush) or rollovers in which contact occurs when the roof is reinforced by the ground. Other commenters stated that the test procedure should include placing a rigid surface on the exterior of the roof to simulate the effect of ground contact.

While NHTSA agrees that the test procedure does not simulate the accident scenarios mentioned by the commenters, NHTSA has decided not to exclude the upper roof. For most areas of the upper roof (sheet metal), the HIC(d) requirements are easily met without additional countermeasures. However, including the upper roof will require manufacturers to protect areas (e.g., sun roof frames) that are hard even when the roof is not reinforced by the ground. The inclusion of those areas will be particularly likely to provide some benefits. However, in view of the variety of components in a roof, NHTSA is unable to define a specific target(s) for the upper roof. Therefore, any target on the upper roof may be impacted. NHTSA testing indicates that only components added to the sheet metal or the sheet metal reinforced by such components may not meet the HIC(d) requirements. Therefore, NHTSA does not believe manufacturers will have difficulty in determining and testing worst case scenarios for the upper roof.

7. Convertible Roofs

Both AAMA and the Association of International Automobile Manufacturers (AIAM) stated that convertibles should be excluded from the final rule because of the difficulties associated with padding the movable components of the roof. American Sunroof Company, Automobile Specialty Company, and Aeromotive Systems Company (all convertible top manufacturers), while agreeing that padding movable components would be difficult, stated that only convertible tops and frames, but not other upper interior components (e.g., pillars), needed to be excluded.

After reviewing these comments, NHTSA agrees that countermeasures would not be feasible on convertible roof frames and linkage mechanisms because the presence of a countermeasure such as padding would interfere with their movement. Therefore, NHTSA has decided to exclude from the new requirements any target which would be located on those components. Definitions of the terms ''convertible roof frame'' and ''convertible roof linkage mechanism'' have been added to the final rule. NHTSA is not excluding all targets in convertibles from this final rule as AAMA and AIAM suggested. These commenters did not provide any justification to suggest that it was not practicable to install countermeasures on any components other than the targets in convertibles NHTSA has decided to exclude.

G. Components Currently Subject to Standard No. 201

The NPRM requested comments on the desirability of amending the test procedure for components currently subject to Standard No. 201 to provide for using the FMH in testing those components. These comments were requested not because of any identifiable benefits, but because a uniform test procedure might simplify compliance testing for the industry. The only commenters who addressed this issue were manufacturers or manufacturer associations, all of whom opposed such a change.

NHTSA does not believe that the extension of the FMH test procedures to instrument panels, seat backs, interior compartment doors, sun visors, and armrests would serve a safety purpose because these components are very soft relative to the upper interior components. Thus, it is not likely that any of the components currently tested under Standard No. 201 would exceed the HIC(d)-1000 limit when tested at 15 mph using the FMH. For that reason and because none of the manufacturers believed there was any safety benefit associated with amending the current requirements, NHTSA has not done so.

H. Costs and Benefits

In the NPRM, NHTSA estimated that, for a performance requirement of HIC(d) 1000, the per vehicle cost associated with designing and making the necessary modifications needed to meet the proposed performance requirements would be $29 for passenger cars and $45 for LTVs (in 1991 dollars).

After reviewing the comments and the changes made in this final rule, NHTSA estimates that the per vehicle cost associated with designing and making the modifications needed to meet the new requirements is $33 for passenger cars and $51 for LTVs (in 1993 dollars). In addition, NHTSA estimates that the cost of a new FMH is approximately $3,000 and the cost of a propulsion unit is approximately $35,000. On a per vehicle model basis, NHTSA estimates that total testing costs are $1,870 to $3,740.

A detailed discussion of these estimates can be found in the Final Economic Assessment (FEA) which has been prepared for this final rule. In the FEA, costs have been updated to 1993 economics. Further, more baseline data have now become available for additional analysis. These analyses indicate that a higher percentage of vehicles would require padding.

As to benefits, NHTSA estimated in the NPRM that, for a performance requirement of HIC(d) 1000, the annual reduction of AIS 2–5 head injuries would be 683 to 824, and that the annual reduction in fatalities would be 1,143 to 1,389. Based on more recent accident data, adjustment for current safety belt use (66 percent) and assuming all passenger cars and LTVs would have air bags, additional baseline and padded vehicle test data, and trends indicating future fleet changes, NHTSA has revised these estimates to 675 to 975 AIS 2–5 head injuries reduced and 873 to 1192 fatalities prevented. A study of the 1988–1992 NASS data estimated that about 28 percent of the serious injuries from contacting vehicle interior components, such as pillars, headers, side rails, and the roof occur in rollover accidents. Padding of these interior components should be of substantial benefit in preventing serious injuries and fatalities as well as in reducing minor injuries. If 28 percent of the benefits of this standard are in rollover crashes, it is estimated that, in implementing the Secretary's comprehensive rollover plan, 189–273 AIS 2–5 injuries and 244–334 fatalities would be averted in rollovers as a direct result of this rule. A detailed discussion of these estimates can also be found in the FEA.

I. Leadtime

In the NPRM, NHTSA proposed that the new requirements would become effective on the first September 1 that occurred approximately two years after issuance of the final rule. NHTSA's proposal was based on previous estimates that, for ''padding only'' countermeasures, the normal leadtime to design, tool, and test is approximately 14 to 18 months. In the NPRM the agency recognized that it was possible that a longer leadtime might be necessary for this rulemaking because of the large number of vehicles that would be affected (the previous estimates had not been for a rule applicable to both passenger cars and LTVs) and because of the large number of components in each model which might require changes. Further, countermeasures other than padding might be required and/or desirable. Therefore, the agency requested comments on whether a longer leadtime was necessary and/or whether a phase-in was desirable.

Manufacturers uniformly commented that the agency's leadtime estimates were inadequate. Further, manufacturers almost uniformly believed that a phase-in of the final rule was desirable, with some commenters suggesting that small volume manufacturers be allowed to defer compliance until later in the phase-in schedule. Manufacturer estimates of how much leadtime was necessary prior to the beginning of a phase-in schedule ranged from three to five years. Manufacturers also suggested phase-in schedules of four years (similar to previous phase-in schedules for Standard No. 208 or Standard No. 214, *Side Impact Protection*) or five years (10 percent, 25 percent, 40 percent, 70 percent, and 100 percent). As an alternative, one commenter suggested that the agency require 25 percent of each vehicle to comply within two years, 50 percent of each vehicle within three years, and 100 percent within five years. Manufacturers did not appear to believe that separate phase-in schedules for passenger cars and LTVs would be helpful. However, some commenters suggested that the agency should allow carry-forward or carry-back credits to provide additional flexibility.

The manufacturers provided a number of rationales to support their belief that additional leadtime was necessary. Some manufacturers provided test data that indicated none of the affected vehicles currently comply with the requirements for all the covered components and that many vehicles do not comply with respect to any of the covered components. Manufacturers also indicated that padding may not be sufficient to enable some of the covered components to comply with the standard. Manufacturers also indicated that, even if padding alone were sufficient to comply with the proposed requirements, this would not be the preferred option as padding decreases visibility (a safety concern) and interior roominess (a customer satisfaction concern). Manufacturers indicated that they believed that changes to the vehicle structure (greenhouse) would be necessary (to the extent that a component could not comply with padding alone) or desirable (to compensate for loss in visibility or interior roominess). Manufacturers also explained that such changes had to be made early in a design cycle and that the typical design cycle was four to six years for passenger cars and eight to ten years for LTVs.

In contrast, the safety groups that commented on leadtime believed that the proposed leadtime was sufficient. However, these safety groups did not provide any specific information to support their belief.

After reviewing the comments, NHTSA has determined that the leadtime proposed in the NPRM was not sufficient. NHTSA has found only one vehicle currently in production (tested at only 4 locations) that would comply with all aspects of the new requirements and that, for over 50 percent of the components tested will require changes. NHTSA also agrees with comments that padding alone will not be sufficient for some components in some vehicles. In addition, NHTSA agrees that other countermeasures may be preferable to padding, even if padding alone might be sufficient to meet the new requirements. To the extent that these other countermeasures require additional leadtime, NHTSA is concerned that the leadtime proposed in the NPRM would require manufacturers to use padding alone for some components, and that such padding might have a negative side effect as far as its effect on visibility is concerned. For example, while NHTSA believes many visibility concerns were addressed by the reduction in horizontal approach angles, it still may be possible that the safety benefits resulting from the padded components could be partially offset by an increased accident rate if the padding were added in a way that caused a significant decrease in visibility.

NHTSA also agrees that some countermeasures which would offset some of the problems (e.g., interior roominess) associated with padding alone must be done early in the design process (i.e., increasing the size of the greenhouse or structure of pillars to offset the decrease in visibility or interior roominess). Those countermeasures would, therefore, require much more leadtime to accomplish than simply padding components. NHTSA is also aware that a number of other significant new safety requirements have been issued in recent years (e.g., Standards Nos. 208, 214, etc.), placing a significant cumulative burden on manufacturer's resources.

Finally, NHTSA is convinced that because all vehicles will require some redesign to meet the new requirements, a phase-in is necessary and desirable. Manufacturers will have to design and make the necessary modifications to meet the new requirements for each of their models. However, the same engineering resources and testing facilities may be needed for all of the models and cannot be used simultaneously. Given this, NHTSA has decided that the phase-in period for these new requirements will begin

September 1, 1998. In the first year of the phase-in, 10 percent of each manufacturer's vehicles will be required to comply with the new requirements. In the second year, 25 percent of all vehicles must comply; in the third year, 40 percent; and in the fourth year, 70 percent. All vehicles manufactured on or after September 1, 2002 must comply with the new requirements. NHTSA is aware that this phase-in is one year longer than previous phase-in requirements. However, NHTSA believes that this is justified. Unlike previous phase-ins, available evidence (which amounts to testing of 32 different models) indicates that only one vehicle model as currently manufactured could comply with the new requirements for all covered components. In addition, unlike previous phase-ins, the new requirements are being phased-in for two types of vehicles (passenger cars and LTVs) at the same time.

For manufacturers with few vehicle lines, NHTSA has decided to allow an alternative phase-in. The alternative phase-in allows a manufacturer to delay compliance in the first year of the phase-in. However, manufacturers which take this option must certify all vehicles manufactured on or after September 1, 1999 as complying with the new requirements.

NHTSA also has decided to allow manufacturers of vehicles manufactured in two or more stages to delay compliance until the final year of the phase-in. Since final stage manufacturers and alterers have no control over the year of the phase-in in which a particular vehicle will be certified as complying with the new requirements, NHTSA is allowing these manufacturers until the final year of the phase-in to certify that their vehicles meet the new requirement. NHTSA has taken this approach previously with the phase-ins for Standards Nos. 208. However, NHTSA is not allowing additional leadtime beyond the end of the phase-in, because individual components can be tested outside the vehicle. This will enable a final stage manufacturer or an alterer to verify that the changes it intends to make to a vehicle's compliant interior will not affect the vehicle's compliance.

Finally, NHTSA has decided to allow carry-forward credits. NHTSA believes that this will encourage manufacturers to exceed the requirements in early years, by concentrating initial efforts on either vehicles which present fewer redesign problems or high volume vehicles. This will benefit consumers by accelerating the availability of vehicles which comply with the new requirements and will benefit manufacturers by providing them with flexibility for the later years of the phase-in. NHTSA notes, however, that carry-forward credits can not be used to delay the beginning of 100 percent compliance beyond September 1, 2002.

VII. OVSC Laboratory Test Procedure

A number of manufacturers have asked NHTSA when the Office of Vehicle Safety Compliance's (OVSC) Laboratory Test Procedure for the new requirements in Standard No. 201 would be available. For interested parties, a copy of the OVSC Laboratory Test Procedure has been placed in the docket for this notice. NHTSA would like to emphasize that the OVSC Laboratory Test Procedure is prepared for use by independent laboratories under contract to conduct compliance tests for the agency. The OVSC Laboratory Test Procedures are not intended to change the requirements of the applicable safety standard.

VIII. Correction

NHTSA is amending S3.4.2 of Standard No. 201 to replace the word ''contractable'' with the word ''contactable.'' NHTSA finds for good cause that notice and opportunity to comment are not required. This amendment does not substantively change a requirement, as it merely corrects a typographic error.

IX. Rulemaking Analyses and Notices

A. Executive Order 12866 and Dot Regulatory Policies and Procedures

NHTSA has considered the impact of this rulemaking action under E.O. 12866 and the Department of Transportation's regulatory policies and procedures. This rulemaking document was reviewed under E.O. 12866, ''Regulatory Planning and Review.'' This action has been determined to be ''significant'' under the Department of Transportation's regulatory policies and procedures. NHTSA has prepared a Final Economic Assessment (FEA) for this final rule. As explained in the FEA, NHTSA estimates the consumer costs of this rule to be $641 million annually.

B. Regulatory Flexibility Act

NHTSA has also considered the impacts of this final rule under the Regulatory Flexibility Act. I hereby certify that this rule will not have a significant economic impact on a substantial number of small entities. As explained in the FEA, while there are a substantial number of small businesses that would be affected by this final rule, the agency does not believe there would be a significant economic impact. The agency believes general testing on worst case components can be carried out at low cost and be used as a basis for compliance by using the same thickness of padding on similar components.

C. Paperwork Reduction Act

The reporting requirements associated with this rule have been submitted to the Office of Management and Budget for approval in accordance with 44 U.S.C. chapter 35. *Administration:* National Highway Traffic Safety Administration; *Title:* Head Protection Phase-in Reporting Requirements; *Need for Information:* To report manufacturer's annual production for the first four years of the phase-in period.; *Proposed Use of Information:* To determine compliance with phase-in requirements.; *Frequency:* Annual; *Burden Estimate:* 1260 hours/year; *Respondents:* 35; *Form(s):* Written report; *Average Burden Hours for Respondent:* 36 hours/year.

D. National Environmental Policy Act

NHTSA has also analyzed this final rule under the National Environmental Policy Act and determined that it will not have a significant impact on the human environment.

E. Executive Order 12612 (Federalism)

NHTSA has analyzed this rule in accordance with the principles and criteria contained in E.O. 12612, and has determined that this rule will not have significant federalism implications to warrant the preparation of a Federalism Assessment.

F. Civil Justice Reform

This final rule does not have any retroactive effect. Under 49 U.S.C. 30103, whenever a Federal motor vehicle safety standard is in effect, a State may not adopt or maintain a safety standard applicable to the same aspect of performance which is not identical to the Federal standard, except to the extent that the State requirement imposes a higher level of performance and applies only to vehicles procured for the State's use. 49 U.S.C. 30161 sets forth a procedure for judicial review of final rules establishing, amending or revoking Federal motor vehicle safety standards. That section does not require submission of a petition for reconsideration or other administrative proceedings before parties may file suit in court.

In consideration of the foregoing, 49 CFR Parts 571, 572, and 589 are amended as follows:

List of Subjects

49 CFR Part 571

Imports, Motor vehicle safety, Motor vehicles.

49 CFR Part 572

Incorporation by reference, Motor vehicle safety.

49 CFR Part 589

Reporting and recordkeeping requirements.

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

1. The authority citation for Part 571 of Title 49 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117, and 30166; delegation of authority at 49 CFR 1.50.

§ 571.201 [Amended]

2. Section 571.201 is amended by adding a new S2.1, revising S3 and S3.4.2, and adding new S4 through S8.13, to read as follows:

S2.1 *Definitions.*

A-pillar means any pillar that is, in whole or part, forward of a transverse vertical plane passing through the seating reference point of the driver's seat.

Ambulance means a motor vehicle designed exclusively for the purpose of emergency medical care, as evidenced by the presence of a passenger compartment to accommodate emergency medical personnel, one or more patients on litters or cots, and equipment and supplies for emergency care at a location or during transport.

B-pillar means the forwardmost pillar on each side of the vehicle that is entirely rearward of a transverse vertical plane passing through the seating reference point of the driver's seat, unless there is only one pillar rearward of that plane and it is also a rearmost pillar.

Brace means a fixed diagonal structural member in an open body vehicle that is used to brace the roll-bar and that connects the roll-bar to the main body of the vehicle structure.

Convertible roof frame means the metal frame of a convertible roof.

Convertible roof linkage mechanism means any anchorage, fastener, or device necessary to deploy a convertible roof frame.

Daylight opening means, for openings on the side of the vehicle, other than a door opening, the locus of all points where a horizontal line, perpendicular to the vehicle longitudinal centerline, is tangent to the periphery of the opening. For openings on the front and rear of the vehicle, other than a door opening, *daylight opening* means the locus of all points where a horizontal line, parallel to the vehicle longitudinal centerline, is tangent to the periphery of the opening. If the horizontal line is tangent to the periphery at more than one point at any location, the most inboard point is used to determine the daylight opening.

Door opening means, for door openings on the side of the vehicle, the locus of all points where a horizontal line, perpendicular to the vehicle longitudinal centerline, is tangent to the periphery of the side door opening. For door openings on the back end of the vehicle, *door opening* means the locus of all points where a horizontal line, parallel to the vehicle longitudinal centerline, is tangent to the periphery of the back door opening. If the horizontal line is tangent to the periphery at more than one point at any location, the most inboard point is the door opening.

Forehead impact zone means the part of the free motion headform surface area that is determined in accordance with the procedure set forth in S6.10.

Free motion headform means a test device which conforms to the specifications of Part 572, Subpart L of this Chapter.

Mid-sagittal plane of a dummy means a longitudinal vertical plane passing through the seating reference point of a designated seating position.

Motor home means a motor vehicle with motive power that is designed to provide temporary residential accommodations, as evidenced by the presence of at least four of the following facilities: cooking; refrigeration or ice box; self-contained toilet; heating and/or air conditioning; a potable water supply system including a faucet and a sink; and a separate 110–125 volt electrical power supply and/or an LP gas supply.

Other pillar means any pillar which is not an A-pillar, a B-pillar, or a rearmost pillar.

Pillar means any structure, excluding glazing and the vertical portion of door window frames, but including accompanying moldings, attached components such as safety belt anchorages and coat hooks, which (1) supports either a roof or any other structure (such as a roll-bar) that is above the driver's head, or (2) is located along the side edge of a window.

Roll-bar means a fixed overhead structural member, including its vertical support structure, that extends from the left to the right side of the passenger compartment of any open body vehicles and convertibles. It does not include a header.

Seat belt anchorage means any component involved in transferring seat belt loads to the vehicle structure, including, but not limited to, the attachment hardware, but excluding webbing or straps, seat frames, seat pedestals, and the vehicle structure itself, whose failure causes separation of the belt from the vehicle structure.

Sliding door track means a track structure along the upper edge of a side door opening that secures the door in the closed position and guides the door when moving to and from the open position.

Stiffener means a fixed overhead structural member that connects one roll-bar to another roll-bar or to a header of any open body vehicle or convertible.

Upper roof means the area of the vehicle interior that is determined in accordance with the procedure set forth in S6.15.

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S3 *Requirements for instrument panels, seat backs, interior compartment doors, sun visors, and armrests.* Each vehicle shall comply with the requirements specified in S3.1 through S3.5.2.

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S3.4.2 Each sun visor mounting shall present no rigid material edge radius of less than 0.125 inch that is statically contactable by a spherical 6.5-inch diameter head form.

* * * * *

S4 *Requirements for upper interior components.* Except as provided in S4.1 through S4.3, each vehicle manufactured on or after September 1, 1998, except walk-in van-type vehicles, shall, when tested under the conditions of S6, comply with the requirements specified in S5 at the target locations specified in S8 when impacted by the free motion headform specified in S6.8 at any speed up to and including 24 kilometers per hour. The requirements do not apply to any target that cannot be located using the procedures of S8.

S4.1 *Vehicles manufactured on or after September 1, 1998 and before September 1, 2002.* Except as provided in S4.1.5, vehicles manufactured on or after September 1, 1998 and before September 1, 2002 shall comply with S4.1.1 through S4.1.4.

S4.1.1 *Vehicles manufactured on or after September 1, 1998 and before September 1, 1999.* For vehicles manufactured by a manufacturer on or after September 1, 1998 and before September 1, 1999, the amount of vehicles complying with S5 shall be not less than 10 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1996 and before September 1, 1999, or

(b) The manufacturer's production on or after September 1, 1998 and before September 1, 1999.

S4.1.2 *Vehicles manufactured on or after September 1, 1999 and before September 1, 2000.* Subject to S4.1.6(a), for vehicles manufactured by a manufacturer on or after September 1, 1999 and before September 1, 2000, the amount of vehicles complying with S5 shall be not less than 25 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1997 and before September 1, 2000, or

(b) The manufacturer's production on or after September 1, 1999 and before September 1, 2000.

S4.1.3 *Vehicles manufactured on or after September 1, 2000 and before September 1, 2001.* Subject to S4.1.6(b), for vehicles manufactured by a manufacturer on or after September 1, 2000 and before September 1, 2001, the amount of vehicles complying with S5 shall be not less than 40 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1998 and before September 1, 2001, or

(b) The manufacturer's production on or after September 1, 2000 and before September 1, 2001.

S4.1.4 *Vehicles manufactured on or after September 1, 2001 and before September 1, 2002.* Subject to S4.1.6(c), for vehicles manufactured by a manufacturer on or after September 1, 2001 and before September 1, 2002, the amount of vehicles complying with S5 shall be not less than 70 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1999 and before September 1, 2002, or

(b) The manufacturer's production on or after September 1, 2001 and before September 1, 2002.

S4.1.5 *Alternative phase-in schedules.*

(a) *Alternative phase-in schedule for all manufacturers.* A manufacturer may, at its option, comply with the requirements set forth in S4.1.5(a)(1) and S4.1.5(a)(2) instead of complying with the requirements set forth in S4.1.1 through S4.1.4.

(1) Vehicles manufactured on or after September 1, 1998 and before September 1, 1999 are not required to comply with the requirements specified in S5.

(2) Vehicles manufactured on or after September 1, 1999 shall comply with the requirements specified in S5.

(b) *Alternative phase-in schedule for final stage manufacturers or alterers.* A final stage manufacturer or alterer may, at its option, comply with the requirements set forth in S4.1.5(b)(1) and S4.1.5(b)(2) instead of complying with the requirements set forth in S4.1.1 through S4.1.4.

(1) Vehicles manufactured on or after September 1, 1998 and before September 1, 2002 are not required to comply with the requirements specified in S5.

(2) Vehicles manufactured on or after September 1, 2002 shall comply with the requirements specified in S5.

S4.1.6 *Calculation of complying vehicles.*

(a) For the purposes of complying with S4.1.2, a manufacturer may count a vehicle if it:

(1) Is manufactured on or after September 1, 1998, but before September 1, 2000, and

(2) Is not counted toward compliance with S4.1.1.

(b) For the purposes of complying with S4.1.3, a manufacturer may count a vehicle if it:

(1) Is manufactured on or after September 1, 1998, but before September 1, 2001, and

(2) Is not counted toward compliance with S4.1.1 or S4.1.2.

(c) For the purposes of complying with S4.1.4, a manufacturer may count a vehicle if it:

(1) Is manufactured on or after September 1, 1998, but before September 1, 2002, and

(2) Is not counted toward compliance with S4.1.1, S4.1.2, or S4.1.3.

S4.1.7 *Vehicles produced by more than one manufacturer.*

S4.1.7.1 For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S4.1.1 through S4.1.4, a vehicle produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S4.1.7.2.

(a) A vehicle which is imported shall be attributed to the importer.

(b) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer which markets the vehicle.

S4.1.7.2 A vehicle produced by more than one manufacturer shall be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 589, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S4.1.7.1.

S4.2 *Vehicles manufactured on or after September 1, 2002.* Except as provided in S4.3, vehicles manufactured on or after September 1, 2002 shall comply with the requirements specified in S5.

S4.3 A vehicle need not meet the requirements of S4.1 through S4.2 for:

(a) Any target located on a convertible roof frame or a convertible roof linkage mechanism.

(b) Any target located rearward of a vertical plane 600 mm behind the seating reference point of the rearmost designated seating position.

(c) Any target located rearward of a vertical plane 600 mm behind the seating reference point of the driver's seating position in an ambulance or a motor home.

S5. *Performance Criterion.* The HIC(d) shall not exceed 1000 when calculated in accordance with the following formula:

(a) HIC(d) = 0.75446 (free motion headform HIC) + 166.4.

(b) The free motion headform HIC is calculated in accordance with the following formula:

$$\left[\frac{1}{(t_2 - t_1)}\int_{t_1}^{t_2} a\,dt\right]^{2.5}(t_2 - t_1)$$

Where the term *a* is the resultant acceleration expressed as a multiple of *g* (the acceleration of gravity), and t1 and t2 are any two points in time during the impact which are separated by not more than a 36 millisecond time interval.

S6 *Test conditions.*

S6.1 *Vehicle test attitude.*

(a) The vehicle is supported off its suspension at an attitude determined in accordance with S6.1(b).

(b) Directly above each wheel opening, determine the vertical distance between a level surface and a standard reference point on the test vehicle's body under the conditions of S6.1(b)(1) through S6.1(b)(3).

(1) The vehicle is loaded to its unloaded vehicle weight, plus its rated cargo and luggage capacity or 136 kg, whichever is less, secured in the luggage area. The load placed in the cargo area is centered over the longitudinal centerline of the vehicle.

(2) The vehicle is filled to 100 percent of all fluid capacities.

(3) All tires are inflated to the manufacturer's specifications listed on the vehicle's tire placard.

S6.2 *Windows.* Movable vehicle windows are placed in the fully open position.

S6.3 *Convertible tops.* The top, if any, of convertibles and open-body type vehicles is in the closed passenger compartment configuration.

S6.4 *Doors.*

(a) Except as provided in S6.4(b), doors, including any rear hatchback or tailgate, are fully closed and latched but not locked.

(b) Any side door on the opposite side of the longitudinal centerline of the vehicle from the target to be impacted may be open or removed.

S6.5 *Sun visors.* Each sun visor either is placed in any of the following positions:

(a) Any position where one side of the visor is in contact with the vehicle interior surface (windshield, side rail, front header, roof, etc.), or;

(b) Removed.

S6.6 *Steering wheel and seats.* The steering wheel and seats may be removed from the vehicle.

S6.7 *Seat belt anchorages.*

(a) If a target is on a seat belt anchorage, and if the seat belt anchorage is adjustable, tests are conducted with the anchorage adjusted to a point midway between the two extreme adjustment positions. If the anchorage has distinct adjustment positions, none of which is midway between the two extreme positions, tests are conducted with the anchorage adjusted to the nearest position above the midpoint of the two extreme positions.

(b) If a target is not on a seat belt anchorage, the seat belt anchorage may be removed to test the component on which the anchorage is mounted.

S6.8 *Temperature and humidity.*

(a) The ambient temperature is between 19 degrees C. and 26 degrees C., at any relative humidity between 10 percent and 70 percent.

(b) Tests are not conducted unless the headform specified in S6.9 is exposed to the conditions specified in S6.8(a) for a period not less than four hours.

S6.9 *Headform.* The headform used for testing conforms to the specifications of Part 572, Subpart L of this chapter.

S6.10 *Forehead impact zone.* The forehead impact zone of the headform is determined according to the procedure specified in (a) through (f).

(a) Position the headform so that the baseplate of the skull is horizontal. The midsagittal plane of the headform is designated as Plane S.

(b) From the center of the threaded hole on top of the headform, draw a 69 mm line forward toward the forehead, coincident with Plane S, along the contour of the outer skin of the headform. The front end of the line is designated as Point P. From Point P, draw a 100 mm line forward toward the forehead, coincident with Plane S, along the contour of the outer skin of the headform. The front end of the line is designated as Point O.

(c) Draw a 125 mm line which is coincident with a horizontal plane along the contour of the outer skin of the forehead from left to right through Point O so that the line is bisected at Point O. The end of the line on the left side of the headform is designated as Point a and the end on the right as Point b.

(d) Draw another 125 mm line which is coincident with a vertical plane along the contour of the outer skin of the forehead through Point P so that the line is bisected at Point P. The end of the line on the left side of the headform is designated as Point c and the end on the right as Point d.

(e) Draw a line from Point a to Point c along the contour of the outer skin of the headform using a flexible steel tape. Using the same method, draw a line from Point b to Point d.

(f) The forehead impact zone is the surface area on the FMH forehead bounded by lines a-O-b and c-P-d, and a-c and b-d.

S6.11 *Target circle.* The area of the vehicle to be impacted by the headform is marked with a solid circle 12.7 mm in diameter, centered on the targets specified in S8, using any transferable opaque coloring medium.

S6.12 *Location of head center of gravity.*

(a) *Location of head center of gravity for front outboard designated seating positions (CG–F).*

(1) *Location of rearmost CG–F (CG–F2).* For front outboard designated seating positions, the head center of gravity with the seat in its rearmost adjustment position (CG–F2) is located 160 mm rearward and 660 mm upward from the seating reference point.

(2) *Location of forwardmost CG–F (CG–F1).* For front outboard designated seating positions, the head center of gravity with the seat in its forwardmost adjustment position (CG–F1) is located horizontally forward of CG–F2 by the distance equal to the fore-aft distance of the seat track.

(b) *Location of head center of gravity for rear outboard designated seating positions (CG–R).* For rear outboard designated seating positions, the head center of gravity (CG–R) is located 160 mm rearward and 660 mm upward from the seating reference point.

S6.13 *Impact configuration.*

S6.13.1 The headform is launched from any location inside the vehicle which meets the conditions of S6.13.4. At the time of launch, the midsagittal plane of the headform is vertical and the headform is upright.

S6.13.2 The headform travels freely through the air, along a velocity vector that is perpendicular to the headform's skull cap plate, not less than 25 mm before making any contact with the vehicle.

S6.13.3 At the time of initial contact between the headform and the vehicle interior surface, some portion of the forehead impact zone of the headform contacts some portion of the target circle.

S6.13.4 *Approach Angles.* The headform launching angle is as specified in Table 1. For components for which Table 1 specifies a range of angles, the headform launching angle is within the limits determined using the procedures specified in S6.13.4.1 and 6.13.4.2, and within the range specified in Table I, using the orthogonal reference system specified in S7.

TABLE 1—APPROACH ANGLE LIMITS (IN DEGREES)

Impact zones	Horizontal angle	Vertical angle
Front Header	180	0–50
Rear Header	0 or 360	0–50
Left Side Rail	270	0–50
Right Side Rail	90	0–50
Left A-Pillar	195–255	−5–50
Right A-Pillar	105–165	−5–50
Left B-Pillar	195–345	−10–50
Right B-Pillar	15–165	−10–50
Other Left Pillars	270	−10–50
Other Right Pillars	90	−10–50
Left Rearmost Pillar.	270–345	−10–50
Right Rearmost Pillar.	15–90	−10–50
Upper Roof	Any	0–50
Overhead Rollbar	0 or 180	0–50
Brace or Stiffener	90 or 270	0–50
Seat Belt	Any	0–50

S6.13.4.1 *Horizontal Approach Angles for Headform Impacts.*

(a) *Left A-Pillar Horizontal Approach Angles.*

(1) Locate a line formed by the shortest horizontal distance between CG-F1 for the left seat and the right A-pillar. The maximum horizontal approach angle for the left A-pillar equals 360 degrees minus the angle formed by that line and the X-axis of the vehicle, measured counterclockwise.

(2) Locate a line formed by the shortest horizontal distance between CG-F2 for the left seat and the left A-pillar. The minimum horizontal approach angle for the left A-pillar impact equals the angle formed by that line and the X-axis of the vehicle, measured counterclockwise.

(b) *Right A-Pillar Horizontal Approach Angles.*

(1) Locate a line formed by the shortest horizontal distance between CG-F1 for the right seat and the left A-pillar. The minimum horizontal approach angle for the right A-pillar equals 360 degrees minus the angle

formed by that line and the X-axis of the vehicle, measured counterclockwise.

(2) Locate a line formed by the shortest horizontal distance between CG-F2 for the right seat and the right A-pillar. The maximum horizontal approach angle for the right A-pillar impact equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise.

(c) *Left B-Pillar Horizontal Approach Angles.*

(1) Locate a line formed by the shortest horizontal distance between CG-F2 for the left seat and the left B-pillar. The maximum horizontal approach angle for the left B-pillar equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise, or 270 degrees, whichever is greater.

(2) Locate a line formed by the shortest horizontal distance between CG-R for the left seat and the left B-pillar. The minimum horizontal approach angle for the left B-pillar equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise.

(d) *Right B-Pillar Horizontal Approach Angles.*

(1) Locate a line formed by the shortest horizontal distance between CG-F2 for the right seat and the right B-pillar. The minimum horizontal approach angle for the right B-pillar equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise, or 90 degrees, whichever is less.

(2) Locate a line formed by the shortest horizontal distance between CG-R for the right seat and the right B-pillar. The maximum horizontal approach angle for the right B-pillar equals the angle between that line and the X-axis of the vehicle measured counterclockwise.

S6.13.4.2 *Vertical Approach Angles.*

(a) Position the forehead impact zone in contact with the selected target at the prescribed horizontal approach angle. If a range of horizontal approach angles is prescribed, position the forehead impact zone in contact with the selected target at any horizontal approach angle within the range which may be used for testing.

(b) Keeping the forehead impact zone in contact with the target, rotate the FMH upward until the lip, chin or other part of the FMH contacts the component or other portion of the vehicle interior.

(1) Except as provided in S6.13.4.2(b)(2), keeping the forehead impact zone in contact with the target, rotate the FMH downward by 5 degrees for each target to determine the maximum vertical angle.

(2) For all pillars except A-Pillars, keeping the forehead impact zone in contact with the target, rotate the FMH downward by 10 degrees for each target to determine the maximum vertical angle.

S6.14 *Multiple impacts.*

(a) A vehicle being tested may be impacted multiple times, subject to the limitations in S6.14(b) and (c).

(b) As measured as provided in S6.14(d), impacts within 300 mm of each other may not occur less than 30 minutes apart.

(c) As measured as provided in S6.14(d), no impact may occur within 150 mm of any other impact.

(d) For S6.14(b) and S6.14(c), the distance between impacts is the distance between the centers of the target circle specified in S6.11 for each impact, measured along the vehicle interior.

S6.15 *Upper Roof.* The upper roof of a vehicle is determined according to the procedure specified in S6.15(a) through (h).

(a) Locate the transverse vertical plane A at the forwardmost point where it contacts the interior roof (including trim) at the vehicle centerline.

(b) Locate the transverse vertical plane B at the rearmost point where it contacts the interior roof (including trim) at the vehicle centerline.

(c) Measure the horizontal distance (D1) between Plane A and Plane B.

(d) Locate the vertical longitudinal plane C at the leftmost point at which a vertical transverse plane, located 275 mm rearward of the A-pillar reference point described in S8.1(a), contacts the interior roof (including trim).

(e) Locate the vertical longitudinal plane D at the rightmost point at which a vertical transverse plane, located 275 mm rearward of the A-pillar reference point described in S8.1(a), contacts the interior roof (including trim).

(f) Measure the horizontal distance (D2) between Plane C and Plane D.

(g) Locate a point (Point M) on the roof interior surface, midway between Plane A and Plane B along the vehicle longitudinal centerline.

(h) The upper roof zone is the area of the vehicle upper interior surface bounded by the four planes described in S6.15(h)(1) and S6.15(h)(2):

(1) A transverse vertical plane E located at a distance of (.35 D1) forward of Point M and a transverse vertical plane F located at a distance of (.35 D1) rearward of Point M, measured horizontally.

(2) A longitudinal vertical plane G located at a distance of (.35 D2) to the left of Point M and a longitudinal vertical plane H located at a distance of (.35 D2) to the right of Point M, measured horizontally.

S7. *Orthogonal Reference System.* The approach angles specified in S6.13.4 are determined using the reference system specified in S7.1 through S7.4.

S7.1 An orthogonal reference system consisting of a longitudinal X axis and a transverse Y axis in the same horizontal plane and a vertical Z axis through the intersection of X and Y is used to define the horizontal direction of approach of the headform. The X-Z plane is the vertical longitudinal zero plane and is parallel to the longitudinal centerline of the vehicle. The X-Y plane is the horizontal zero plane parallel to the ground. The Y-Z plane is the vertical transverse zero plane that is perpendicular to the X-Y and Y-Z planes. The X coordinate is negative forward of the Y-Z plane and positive to the rear. The Y coordinate is negative to the left of the X-Z plane and positive to the right. The Z coordinate is negative below the X-Y plane and positive above it. (See Figure 1.)

S7.2 The origin of the reference system is the center of gravity of the headform at the time immediately prior to launch for each test.

S7.3 The horizontal approach angle is the angle between the X axis and the headform impact velocity vector projected onto the horizontal zero plane, measured in the horizontal zero plane in the counter-clockwise direction. A 0 degree horizontal vector and a 360 degree horizontal vector point in the positive X direction; a 90 degree horizontal vector points in the positive Y direction; a 180 degree horizontal vector points in the negative X direction; and a 270 horizontal degree vector points in the negative Y direction. (See Figure 2.)

S7.4 The vertical approach angle is the angle between the horizontal plane and the velocity vector, measured in the midsagittal plane of the headform. A 0 degree vertical vector in Table I coincides with the horizontal plane and a vertical vector of greater than 0 degrees in Table I makes a upward angle of the same number of degrees with that plane.

S8 *Target Locations.*

(a) The target locations specified in S8.1 through S8.12 are located on both sides of the vehicle and, except as specified in S8(b), are determined using the procedures specified in those paragraphs.

(b) Except as specified in S8(c), if there is no combination of horizontal and vertical angles specified in S6.13.4 at which the forehead impact zone of free motion headform can contact one of the targets located using the procedures in S8.1 through S8.12, the center of that target is moved to any location within a circle with a radius of 25 mm, centered on the center of the original target and measured along the vehicle interior, which the forehead impact zone can contact at one or more combination of angles.

(c) If there is no point within the circle specified in S8(b) which the forehead impact zone of the free motion headform can contact at one or more combination of horizontal and vertical angles specified in S6.13.4, the radius of the circle is increased by 25 mm increments until the circle contains at least one point that can be contacted at one or more combination of angles.

S8.1 *A-pillar targets.*

(a) *A-pillar reference point and target AP1.* On the vehicle exterior, locate a transverse vertical plane (Plane 1) which contacts the rearmost point of the windshield trim. The intersection of Plane 1 and the vehicle exterior surface is Line 1. Measuring along the vehicle exterior surface, locate a point (Point 1) on Line 1 that is 125 mm inboard of the intersection of Line 1 and a vertical plane tangent to the vehicle at the outboardmost point on Line 1 with the vehicle side door open. Measuring along the vehicle exterior surface in a longitudinal vertical plane (Plane 2) passing through Point 1, locate a point (Point 2) 50 mm rearward of Point 1. Locate the A-pillar reference point (Point APR) at the intersection of the surface of the vehicle ceiling and a line that is perpendicular to the vehicle exterior surface at Point 2. Target AP1 is located at point APR.

(b) *Target AP2.* Locate the horizontal plane (Plane 3) which intersects point APR. Locate the horizontal plane (Plane 4) which is 88 mm below Plane 3. Target AP2 is the point in Plane 4 and on the A-pillar which is closest to CG–F2 for the nearest seating position.

(c) *Target AP3.* Locate the horizontal plane (Plane 5) containing the highest point at the intersection of the dashboard and the A-pillar. Locate a horizontal plane (Plane 6) half-way between Plane 3 and Plane 5. Target AP3 is the point on Plane 6 and the A-pillar which is closest to CG–F1 for the nearest seating position.

S8.2 *B-pillar targets.*

(a) *B-pillar reference point and target BP1.* Locate the point (Point 3) on the vehicle interior at the intersection of the horizontal plane passing through the highest point of the forwardmost door opening and the centerline of the width of the B-pillar, as viewed laterally. Locate a transverse vertical plane (Plane 7) which passes through Point 3. Locate the point (Point 4) at the intersection of the surface of the vehicle ceiling, Plane 7, and the plane, described in S6.15(h), defining the nearest edge of the upper roof. The B-pillar reference point (Point BPR) is the point located at the middle of the line from Point 3 to Point 4 in Plane 7, measured along the vehicle interior surface. Target BP1 is located at Point BPR.

(b) *Target BP2.* If a seat belt anchorage is located on the B-pillar, Target BP2 is located at any point on the anchorage.

(c) *Target BP3.* Target BP3 is located in accordance with this paragraph. Locate a horizontal plane (Plane 8) which intersects Point BPR. Locate a horizontal plane (Plane 9) which passes through the lowest point of the daylight opening forward of the pillar. Locate a horizontal plane (Plane 10) half-way between Plane 8 and Plane 9. Target BP3 is the point located in Plane 10 and on the interior surface of the B-pillar, which is closest to CG–F(2) for the nearest seating position.

(d) *Target BP4.* Locate a horizontal plane (Plane 11) half-way between Plane 9 and Plane 10. Target BP4 is the point located in Plane 11 and on the interior surface of the B-pillar which is closest to CG–R for the nearest seating position.

S8.3 *Other pillar targets.*

(a) *Target OP1.*

(1) Except as provided in S8.3(a)(2), Target OP1 is located in accordance with this paragraph. Locate the point (Point 5), on the vehicle interior, at the intersection of the horizontal plane through the highest point of the highest adjacent door opening or daylight opening (if no adjacent door opening) and the centerline of the width of the other pillar, as viewed laterally. Locate a transverse vertical plane (Plane 12) passing through Point 5. Locate the point (Point 6) at the intersection of the surface of the vehicle ceiling, Plane 12 and the plane, described in S6.15(h), defining the nearest edge of the upper roof. The other pillar reference point (Point OPR) is the point located at the middle of the line between Point 5 and Point 6 in Plane 12, measured along the vehicle interior surface. Target OP1 is located at Point OPR.

(2) If a seat belt anchorage is located on the pillar, Target OP1 is any point on the anchorage.

(b) *Target OP2.* Locate the horizontal plane (Plane 13) intersecting Point OPR. Locate a horizontal plane (Plane 14) passing through the lowest point of the daylight opening forward of the pillar. Locate a horizontal plane (Plane 15) half-way between Plane 13 and Plane 14. Target OP2 is the point located on the interior surface of the pillar at the intersection of Plane 15 and the centerline of the width of the pillar, as viewed laterally.

S8.4 *Rearmost pillar targets.*

(a) *Rearmost pillar reference point and target RP1.* Locate the point (Point 7) at the corner of the upper roof nearest to the pillar. The distance between Point M, as described in S6.15(g), and Point 7, as measured along the vehicle interior surface, is D. Extend the line from Point M to Point 7 along the vehicle interior surface in the same vertical plane by (3*D/7) beyond Point 7 or until the edge of a daylight opening, whichever comes first, to locate Point 8. The rearmost pillar reference point (Point RPR) is at the midpoint of the line between Point 7 and Point 8, measured along the vehicle interior. Target RP1 is located at Point RPR.

(b) *Target RP2.*

(1) Except as provided in S8.6(b)(2), Target RP2 is located in accordance with this paragraph. Locate the horizontal plane (Plane 16) through Point RPR. Locate the horizontal plane (Plane 17) 150 mm below Plane 16. Target RP2 is located in Plane 17 and on the pillar at the location closest to CG–R for the nearest designated seating position.

(2) If a seat belt anchorage is located on the pillar, Target RP2 is any point on the anchorage.

S8.5 *Front header targets.*

(a) *Target FH1.* Locate the contour line (Line 2) on the vehicle interior trim which passes through the APR and is parallel to the contour line (Line 3) at the upper edge of the windshield on the vehicle interior. Locate the point (Point 9) on Line 2 that is 125 mm inboard of the APR, measured along that line. Locate a longitudinal vertical plane (Plane 18) that passes through Point 9. Target FH1 is located at the intersection of Plane 18 and the upper vehicle interior, halfway between a transverse vertical plane (Plane 19) through Point 9 and a transverse vertical plane (Plane 20) through the intersection of Plane 18 and Line 3.

(b) *Target FH2.*

(1) Except as provided in S8.5(b)(2), target FH2 is located in accordance with this paragraph. Locate a point (Point 10) 275 mm inboard of Point APR, along Line 2. Locate a longitudinal vertical plane (Plane 21) that passes through Point 10. Target FH2 is located at the intersection of Plane 21 and the upper vehicle interior, halfway between a transverse vertical plane (Plane 22) through Point 10 and a transverse vertical plane (Plane 23) through the intersection of Plane 21 and Line 3.

(2) If a sunroof frame is located forward of the front edge of the upper roof and intersects the mid-sagittal

plane of a dummy seated in either front outboard seating position, target FH2 is the nearest point that is forward of a transverse vertical plane (Plane 24) through CG–F(2) and on the intersection of the mid-sagittal plane and the sunroof opening.

S8.6 *Targets on the side rail between the A-pillar and the B-pillar.*

(a) *Target SR1.* Locate a transverse vertical plane (Plane 25) 150 mm rearward of Point APR. Locate the point (Point 11) at the intersection of Plane 25 and the upper edge of the forwardmost door opening. Locate the point (Point 12) at the intersection of the surface of the vehicle ceiling, Plane 25 and the plane, described in S6.15(h), defining the nearest edge of the upper roof. Target SR1 is located at the middle of the line between Point 11 and Point 12 in Plane 25, measured along the vehicle interior.

(b) *Target SR2.* Locate a transverse vertical plane (Plane 26) 275 mm rearward of the APR or 275 mm forward of the BPR. Locate the point (Point 13) at the intersection of Plane 26 and the upper edge of the forwardmost door opening. Locate the point (Point 14) at the intersection of the surface of the vehicle ceiling, Plane 26 and the plane, described in S6.15(h), defining the nearest edge of the upper roof. Target SR2 is located at the middle of the line between Point 13 and Point 14 in Plane 26, measured along the vehicle interior.

S8.7 *Other side rail target (target SR3).*

(a) Except as provided in S8.7(b), target SR3 is located in accordance with this paragraph. Locate a transverse vertical plane (Plane 27) 150 mm rearward of either Point BPR or Point OPR. Locate the point (Point 15) as provided in either S8.7(a)(1) or S8.7(a)(2), as appropriate. Locate the point (Point 16) at the intersection of the interior surface of the vehicle ceiling, Plane 27 and the plane, described in S6.15(h), defining the nearest edge of the upper roof. Target SR3 is located at the middle of the line between Point 15 and Point 16 in Plane 27, measured along the vehicle interior surface.

(1) If Plane 27 intersects a door or daylight opening, the Point 15 is located at the intersection of Plane 27 and the upper edge of the door opening or daylight opening.

(2) If Plane 27 does not intersect a door or daylight opening, the Point 15 is located on the vehicle interior at the intersection of Plane 27 and the horizontal plane through the highest point of the door or daylight opening nearest Plane 27. If the adjacent door(s) or daylight opening(s) are equidistant to Plane 27, Point 15 is located on the vehicle interior at the intersection of Plane 27 and either horizontal plane through the highest point of each door or daylight opening.

(b) Except as provided in S8.7(c), if a grab handle is located on the side rail, target SR3 is located at any point on the anchorage of the grab-handle. Folding grab-handles are in their stowed position for testing.

(c) If a seat belt anchorage is located on the side rail, target SR3 is located at any point on the anchorage.

S8.8 *Rear header target (target RH).* Locate the point (Point 17) at the intersection of the surface of the upper vehicle interior, the mid-sagittal plane (Plane 28) of the outboard rearmost dummy and the plane, described in S6.15(h), defining the rear edge of the upper roof. Locate the point (Point 18) as provided in S8.8(a) or S8.8(b), as appropriate. Except as provided in 8.8(c), Target RH is located at the mid-point of the line that is between Point 17 and Point 18 and is in Plane 28, as measured along the surface of the vehicle interior.

(a) If Plane 28 intersects a rear door opening or daylight opening, then Point 18 is located at the intersection of Plane 28 and the upper edge of the door opening or the daylight opening (if no door opening).

(b) If Plane 28 does not intersect a rear door opening or daylight opening, then Point 18 is located on the vehicle interior at the intersection of Plane 28 and a horizontal plane through the highest point of the door or daylight opening nearest to Plane 28. If the adjacent door(s) or daylight opening(s) are equidistant to Plane 28, Point 18 is located on the vehicle interior at the intersection of Plane 28 and either horizontal plane through the highest point of each door or daylight opening.

(c) If Target RH is more than 112 mm from Point 18 on the line that is between Point 17 and Point 18 and is in Plane 28, as measured along the surface of the vehicle interior, then Target RH is the point on that line which is 112 mm from Point 18.

S8.9 *Upper roof target (target UR).* Target UR is any point on the upper roof.

S8.10 *Sliding door track target (target SD).* Locate the transverse vertical plane (Plane 29) passing through the middle of the widest opening of the sliding door, measured horizontally and parallel to the vehicle longitudinal centerline. Locate the point (Point 19) at the intersection of the surface of the upper vehicle interior, Plane 29 and the plane, described in S6.15(h), defining the nearest edge of the upper roof. Locate the point (Point 20) at the intersection of Plane 29 and the upper edge of the sliding door opening. Target SD is located at the middle of the line between Point 19 and Point 20 in Plane 29, measured along the vehicle interior.

S8.11 *Roll-bar targets.*

(a) *Target RB1.* Locate a longitudinal vertical plane (Plane 30) at the mid-sagittal plane of a dummy seated in any outboard designated seating position. Target RB1 is located on the roll-bar and in Plane 30 at the location closest to either CG–F2 or CG–R, as appropriate, for the same dummy.

(b) *Target RB2.* If a seat belt anchorage is located on the roll-bar, Target RB2 is any point on the anchorage.

S8.12 *Stiffener targets.*

(a) *Target ST1.* Locate a transverse vertical plane (Plane 31) containing either CG–F2 or CG–R, as appropriate, for any outboard designated seating position. Target ST1 is located on the stiffener and in Plane 31 at the location closest to either CG–F2 or CG–R, as appropriate.

(b) *Target ST2.* If a seat belt anchorage is located on the stiffener, Target ST2 is any point on the anchorage.

S8.13 *Brace target (target BT).* Target BT is any point on the width of the brace as viewed laterally from inside the passenger compartment.

§ 571.201 [Amended]

3. Section 571.201 is amended by adding new Figure 1 and Figure 2 at the end of the section as follows:

BILLING CODE 4910–59–P

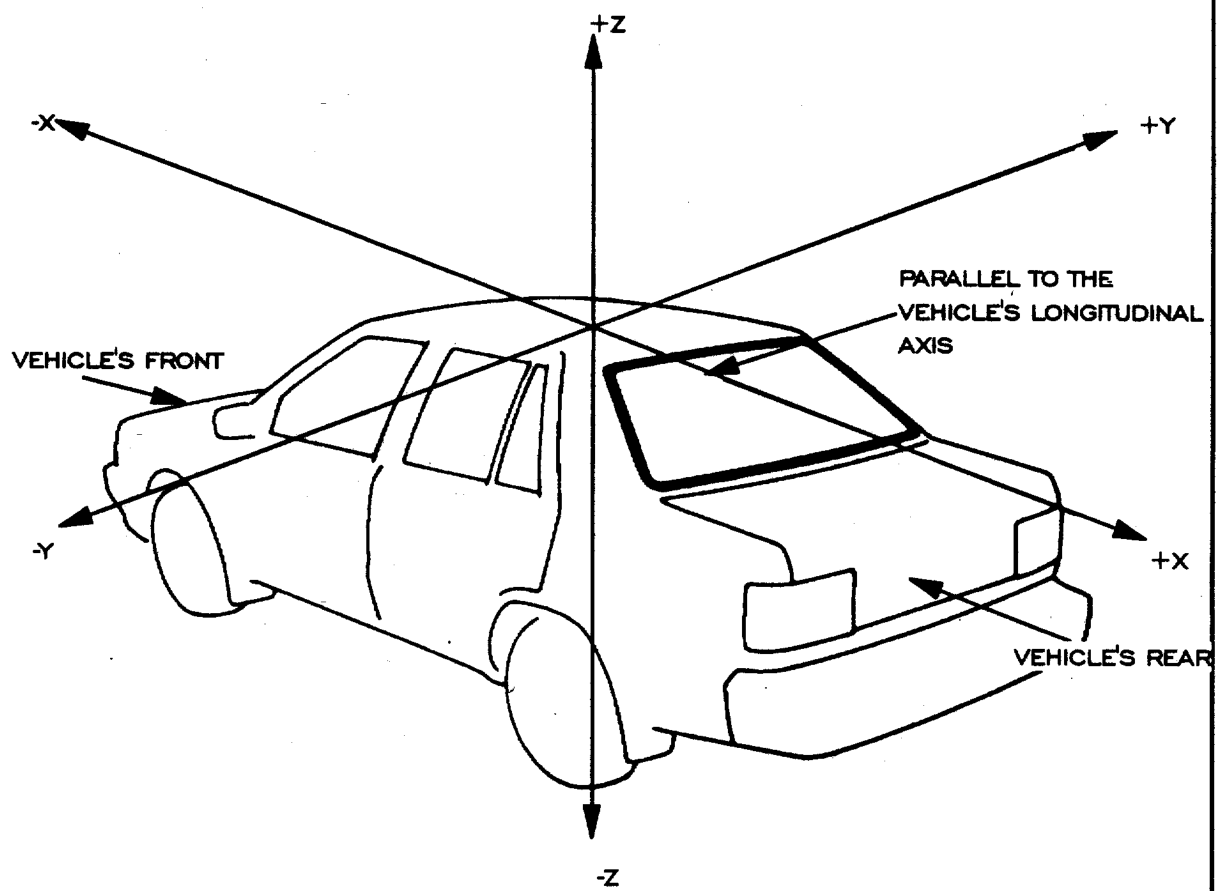
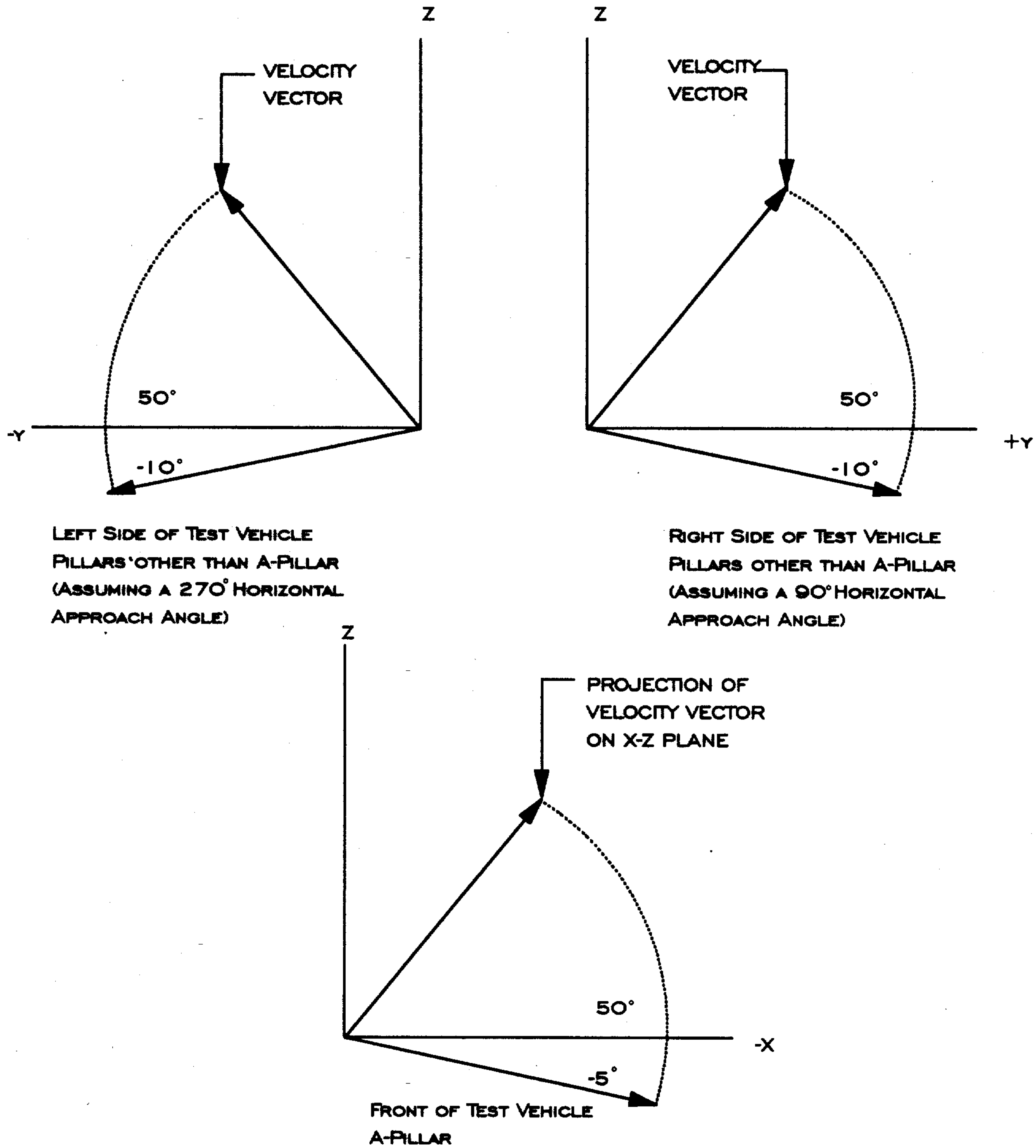


FIGURE I - ORTHOGONAL REFERENCE SYSTEM



VERTICAL AND HORIZONTAL APPROACH ANGLE PLANE

FIGURE 2

BILLING CODE 4910–59–C

PART 572—ANTHROPOMORPHIC TEST DEVICES

1. The authority citation for Part 572 of Title 49 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117, and 30166; delegation of authority at 49 CFR 1.50.

PART 572—[REVISED]

3. The title of Part 572 is revised to read as set forth above.

4. Section 572.1 is revised to read as follows:

§ 572.1 Scope.

This part describes the anthropomorphic test devices that are to be used for compliance testing of motor vehicles and motor vehicle equipment with motor vehicle safety standards.

5. Part 572 is amended by adding a new subpart L, consisting of §§ 572.100 through 572.103, to read as follows:

Subpart L—Free motion headform

Sec.
572.100 Incorporation by Reference.
572.101 General description.
572.102 Drop test.
572.103 Test conditions and instrumentation.

Subpart L—Free motion headform

§ 572.100 Incorporation by Reference.

(a) The drawings and specifications referred to in § 572.101 are hereby incorporated in subpart L by reference. These materials are thereby made part of this regulation. The Director of the **Federal Register** approved the materials incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of the materials may be inspected at NHTSA's Docket Section, 400 Seventh Street, S.W., room 5109, Washington, DC, or at the Office of the **Federal Register**, 800 North Capitol Street, N.W., Washington, DC.

(b) The incorporated material is available as follows:

(1) Drawing number 92041–001, ''Head Form Assembly,'' (November 30, 1992); drawing number 92041–002, ''Skull Assembly,'' (November 30, 1992); drawing number 92041–003, ''Skull Cap Plate Assembly,'' (November 30, 1992); drawing number 92041–004, ''Skull Cap Plate,'' (November 30, 1992); drawing number 92041–005, ''Threaded Pin,'' (November 30, 1992); drawing number 92041–006, ''Hex Nut,'' (November 30, 1992); drawing number 92041–008, ''Head Skin without Nose,'' (November 30, 1992, as amended March 6, 1995); drawing number 92041–009, ''Six-Axis Load Cell Simulator Assembly,'' (November 30, 1992); drawing number 92041–011, ''Head Ballast Weight,'' (November 30, 1992); drawing number 92041–018, ''Head Form Bill of Materials,'' (November 30, 1992); drawing number 78051–148, ''Skull-Head (cast) Hybrid III,'' (May 20, 1978, as amended August 17, 1978); drawing number 78051–228/78051–229, ''Skin- Hybrid III,'' (May 20, 1978, as amended through September 24, 1979); drawing number 78051–339, ''Pivot Pin-Neck Transducer,'' (May 20, 1978, as amended May 14, 1986); drawing number 78051–372, ''Vinyl Skin Formulation Hybrid III,'' (May 20, 1978); and drawing number C–1797, ''Neck Blank, (August 1, 1989); drawing number SA572–S4, ''Accelerometer Specification,'' (November 30, 1992), are available from Reprographic Technologies, 1111 14th Street, N.W., Washington, DC 20005.

(2) A user's manual entitled ''Free-Motion Headform User's Manual,'' version 2, March 1995, is available from NHTSA's Docket Section at the address in paragraph (a) of this section.

(3) SAE Recommended Practice J211, OCT 1988, ''Instrumentation for Impact Tests,'' Class 1000, is available from The Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

§ 572.101 General description.

(a) The free motion headform consists of the component assembly which is shown in drawings 92041–001 (incorporated by reference; see § 572.100), 92041–002 (incorporated by reference; see § 572.100), 92041–003 (incorporated by reference; see § 572.100), 92041–004 (incorporated by reference; see § 572.100), 92041–005 (incorporated by reference; see § 572.100), 92041–006 (incorporated by reference; see § 572.100), 92041–008 (incorporated by reference; see § 572.100), 92041–009 (incorporated by reference; see § 572.100), 92041–011 (incorporated by reference; see § 572.100), 78051–148 (incorporated by reference; see § 572.100), 78051–228/78051–229 (incorporated by reference; see § 572.100), 78051–339 (incorporated by reference; see § 572.100), 78051–372 (incorporated by reference; see § 572.100), C–1797 (incorporated by reference; see § 572.100), and SA572–S4 (incorporated by reference; see § 572.100).

(b) Disassembly, inspection, and assembly procedures, and sign convention for the signal outputs of the free motion headform accelerometers, are set forth in the Free-Motion Headform User's Manual (incorporated by reference; see § 572.100).

(c) The structural properties of the headform are such that it conforms to this part in every respect both before and after being used in the test specified in Standard No. 201 of this chapter (§ 571.201).

(d) The outputs of accelerometers installed in the headform are recorded in individual data channels that conform to the requirements of SAE Recommended Practice J211, OCT 1988, ''Instrumentation for Impact Tests,'' Class 1000 (incorporated by reference; see § 572.100).

§ 572.102 Drop test.

(a) When the headform is dropped from a height of 14.8 inches in accordance with paragraph (b) of this section, the peak resultant accelerations at the location of the accelerometers mounted in the headform as shown in drawing 92041–001 (incorporated by reference; see § 572.100) shall not be less than 225g, and not more than 275g. The acceleration/time curve for the test shall be unimodal to the extent that oscillations occurring after the main acceleration pulse are less than ten percent (zero to peak) of the main pulse. The lateral acceleration vector shall not exceed 15g (zero to peak).

(b) *Test procedure.*

(1) Soak the headform in a test environment at any temperature between 19 degrees C. to 26 degrees C. and at a relative humidity from 10 percent to 70 percent for a period of at least four hours prior to its use in a test.

(2) Clean the headform's skin surface and the surface of the impact plate with 1,1,1 Trichloroethane or equivalent.

(3) Suspend the headform, as shown in Figure 50. Position the forehead below the chin such that the skull cap plate is at an angle of 28.5 ± 0.5 degrees with the impact surface when the midsagittal plane is vertical.

(4) Drop the headform from the specified height by means that ensure instant release onto a rigidly supported flat horizontal steel plate, which is 2 inches thick and 2 feet square. The plate shall have a clean, dry surface and any microfinish of not less than 8 microinches 203.2×10^{-6} mm (rms) and not more than 80 microinches 2032×10^{-6} mm (rms).

(5) Allow at least 3 hours between successive tests on the same headform.

§ 572.103 Test conditions and instrumentation.

(a) Headform accelerometers shall have dimensions, response characteristics, and sensitive mass locations specified in drawing SA572–S4 (incorporated by reference; see § 572.100) and be mounted in the headform as shown in drawing 92041–001 (incorporated by reference; see § 572.100).

(b) The outputs of accelerometers installed in the headform are recorded in individual data channels that conform to the requirements of SAE Recommended Practice J211, OCT 1988, ''Instrumentation for Impact Tests,'' Class 1000 (incorporated by reference; see § 572.100).

(c) Coordinate signs for instrumentation polarity conform to the sign convention shown in the Free-Motion Headform User's Manual (incorporated by reference; see § 572.100).

(d) The mountings for accelerometers shall have no resonant frequency within a range of 3 times the frequency range of the applicable channel class.

6. Part 572 is amended by adding a new Figure 50 at the end of subpart L as follows:

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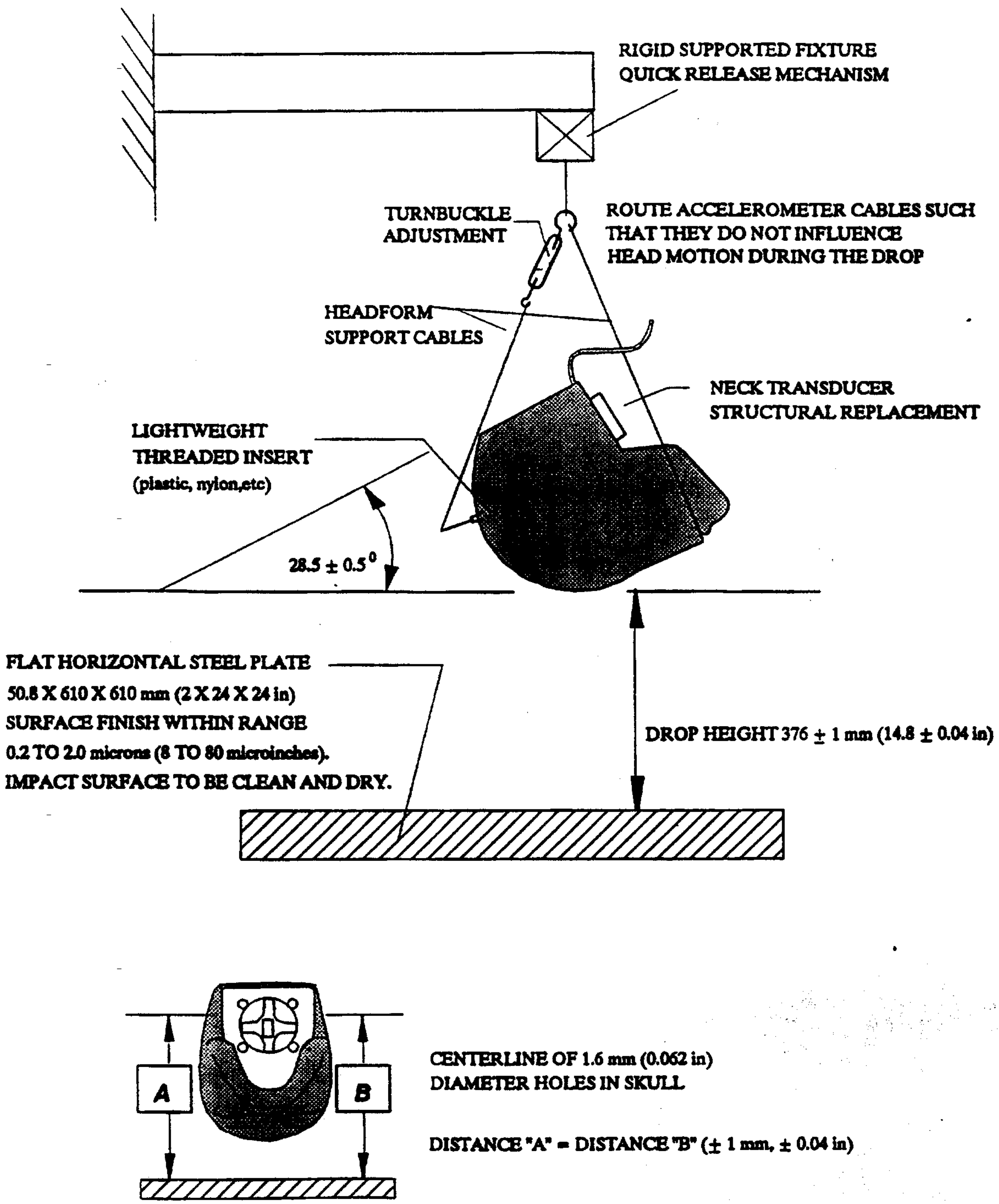
Figure 50

HEADFORM DROP TEST
Set-Up Specifications



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PART 589—UPPER INTERIOR COMPONENT HEAD IMPACT PROTECTION PHASE-IN REPORTING REQUIREMENTS

1. Part 589 is added to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117, and 30166; delegation of authority at 49 CFR 1.50.

§ 589.1 Scope.

This part establishes requirements for manufacturers of passenger cars and trucks, buses and multipurpose passenger vehicles with a gross vehicle weight rating of 10,000 pounds or less to respond to NHTSA inquiries, to submit a report, and maintain records related to the report, concerning the number of such vehicles that meet the upper interior component head impact protection requirements of Standard No. 201, *Occupant protection in interior impact* (49 CFR 571.201).

§ 589.2 Purpose.

The purpose of these reporting requirements is to aid the National Highway Traffic Safety Administration in determining whether a manufacturer of passenger cars and trucks, buses and multipurpose passenger vehicles with a gross vehicle weight rating of 10,000 pounds or less has complied with the upper interior component head impact protection requirements of Standard No. 201.

§ 589.3 Applicability.

This part applies to manufacturers of passenger cars and trucks, buses and multipurpose passenger vehicles with a gross vehicle weight rating of 10,000 pounds or less. However, this part does not apply to any manufacturers whose production consists exclusively of walk-in vans, vehicles manufactured in two or more stages, and vehicles that are altered after previously having been certified in accordance with part 567 of this chapter.

§ 589.4 Definitions.

(a) All terms defined in 49 U.S.C. 30102 are used in their statutory meaning.

(b) Bus, gross vehicle weight rating or GVWR, multipurpose passenger vehicle, passenger car, and truck are used as defined in § 571.3 of this chapter.

(c) *Production year* means the 12-month period between September 1 of one year and August 31 of the following year, inclusive.

§ 589.5 Response to Inquiries.

During the production years ending August 31, 1999, August 31, 2000, August 31, 2001, and August 31, 2002, each manufacturer shall, upon request from the Office of Vehicle Safety Compliance, provide information regarding which vehicle make/models are certified as complying with the requirements of S4 of Standard No. 201.

§ 589.6 Reporting requirements.

(a) *General reporting requirements.* Within 60 days after the end of the production years ending August 31, 1999, August 31, 2000, August 31, 2001, and August 31, 2002, each manufacturer shall submit a report to the National Highway Traffic Safety Administration concerning its compliance with the upper interior component head impact protection requirements of Standard No. 201 for its passenger cars, trucks, buses and multipurpose passenger vehicles produced in that year. Each report shall—

(1) Identify the manufacturer;

(2) State the full name, title, and address of the official responsible for preparing the report;

(3) Identify the production year being reported on;

(4) Contain a statement regarding whether or not the manufacturer complied with the upper interior component head impact protection requirements of the amended Standard No. 201 for the period covered by the report and the basis for that statement;

(5) Provide the information specified in § 589.5(b);

(6) Be written in the English language; and

(7) Be submitted to: Administrator, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, DC 20590.

(b) *Report content*—(1) *Basis for phase-in production goals.* Each manufacturer shall provide the number of passenger cars and trucks, buses and multipurpose passenger vehicles with a GVWR of 10,000 pounds or less manufactured for sale in the United States for each of the three previous production years, or, at the manufacturer's option, for the current production year. A new manufacturer that has not previously manufactured passenger cars and trucks, buses and multipurpose passenger vehicles with a GVWR of 10,000 pounds or less for sale in the United States must report the number of such vehicles manufactured during the current production year. However, manufacturers are not required to report any information with respect to those vehicles that are walk-in van type vehicles, vehicles manufactured in two or more stages, and/or vehicles that are altered after previously having been certified in accordance with part 567 of this chapter.

(2) *Production.* Each manufacturer shall report for the production year for which the report is filed the number of passenger cars and multipurpose passenger vehicles, trucks and buses with a GVWR of 10,000 pounds or less that meet the upper interior component head impact protection requirements (S4) of Standard No. 201.

(3) *Vehicles produced by more than one manufacturer.* Each manufacturer whose reporting of information is affected by one or more of the express written contracts permitted by S4.1.7.2 of Standard No. 201 shall:

(i) Report the existence of each contract, including the names of all parties to the contract, and explain how the contract affects the report being submitted.

(ii) Report the actual number of vehicles covered by each contract.

§ 589.7 Records.

Each manufacturer shall maintain records of the Vehicle Identification Number for each passenger car, multipurpose passenger vehicle, truck and bus for which information is reported under § 589.5(b)(2) until December 31, 2003.

§ 589.8 Petition to extend period to file report.

A petition for extension of the time to submit a report must be received not later than 15 days before expiration of the time stated in § 589.5(a). The petition must be submitted to: Administrator, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590. The filing of a petition does not automatically extend the time for filing a report. A petition will be granted only if the petitioner shows good cause for the extension and if the extension is consistent with the public interest.

Issued on August 14, 1995.

Ricardo Martinez,

Administrator.

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