

In a test in which the test vehicle is striking its right side, the dummy is to be configured and instrumented to strike its right side, in accordance with subpart M of part 572.

S8.27.2 The part 572, subpart M, test dummy specified is clothed in form fitting cotton stretch garments with short sleeves and midcalf length pants. Each foot of the test dummy is equipped with a size 11EEE shoe, which meets the configuration size, sole, and heel thickness specifications of MIL-S-13192 (1976) and weighs  $0.57 \pm 0.09$  kilograms ( $1.25 \pm 0.2$  pounds).

S8.27.3 Limb joints shall be set at between 1 and 2 g's. Leg joints are adjusted with the torso in the supine position.

S8.27.4 The stabilized temperature of the test dummy at the time of the side impact test shall be at any temperature between 20.6 degrees C. and 22.2 degrees C., and at any relative humidity between 10 percent and 70 percent.

S8.27.5 The acceleration data from the accelerometers installed inside the skull cavity of the test dummy are processed according to the practices set forth in SAE Recommended Practice J211, March 1995, "Instrumentation for Impact Tests," Class 1000.

S8.28 *Positioning procedure for the Part 572 Subpart M Test Dummy—vehicle to pole test.* The part 572, subpart M, test dummy shall be initially positioned in the front outboard seating position on the struck side of the vehicle in accordance with the provisions of S7 of Standard 214, 49 CFR 571.214, and the vehicle seat shall be positioned as specified in S6.3 and S6.4 of that standard. The position of the dummy shall then be measured as follows. Locate the horizontal plane passing through the dummy head center of gravity. Identify the rearmost point on the dummy head in that plane. Construct a line in the plane that contains the rearward point of the front door daylight opening and is perpendicular to the longitudinal vehicle centerline. Measure the longitudinal distance between the rearmost point on the dummy head and this line. If this distance is less than 50 mm (2 inches) or the point is not forward of the line, then the seat and/or dummy positions shall be adjusted as follows. First, the seat back angle is adjusted, a maximum of 5 degrees, until a 50 mm (2 inches) distance is achieved. If this is not sufficient to produce the 50 mm (2 inches) distance, the seat is moved forward until the 50 mm (2 inches) distance is achieved or until the knees of the dummy contact the dashboard or knee bolster, whichever comes first. If the required distance

cannot be achieved through movement of the seat, the seat back angle shall be adjusted even further forward until the 50mm (2 inches) distance is obtained or until the seat back is in its full upright locking position.

\* \* \* \* \*

Issued on July 29, 1998.

**Ricardo Martinez,**

*Administrator.*

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## DEPARTMENT OF TRANSPORTATION

### National Highway Traffic Safety Administration

#### 49 CFR Part 572

[Docket No. NHTSA-97-3144]

RIN 2127-AG74

#### Side Impact Anthropomorphic Test Dummy

AGENCY: NHTSA, DOT.

ACTION: Final rule.

**SUMMARY:** This notice establishes specifications and qualification requirements for a newly developed anthropomorphic test dummy. The dummy will be used in compliance testing under amendments made to Standard 201 "Occupant Protection in Interior Impact" in a separate final rule being published today. The upper interior impact protection requirements of Standard 201 are being amended to facilitate the introduction of dynamically deployed interior head protection systems. Vehicles equipped with those dynamic systems will be permitted to comply with alternative reduced requirements. As a condition of being permitted to do so, however, the vehicle must also meet a new dynamic crash test that assesses the protection offered by the dynamic systems. The new dummy is used in conducting that test.

**DATES:** The amendments are effective September 1, 1998.

The incorporation by reference of the material listed in this document is approved by the Director of the Federal Register as of September 1, 1998.

**Petitions:** Petitions for reconsideration must be received by September 18, 1998.

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

**FOR FURTHER INFORMATION CONTACT:** The following persons at the National Highway Traffic Safety Administration, 400 Seventh Street, SW, Washington, DC 20590:

For non-legal issues:

Stan Backaitis, Office of Crashworthiness Standards, NPS-11, telephone (202) 366-4912, facsimile (202) 366-4329, electronic mail "sbackaitis@nhtsa.dot.gov".

For legal issues:

Otto Matheke, Office of the Chief Counsel, NCC-20, telephone (202) 366-5253, facsimile (202) 366-3820, electronic mail "omatheke@nhtsa.dot.gov".

#### SUPPLEMENTARY INFORMATION:

##### A. Background

This final rule is issued in conjunction with a final rule amending Federal Motor Vehicle Safety Standard (FMVSS) No. 201, Head Impact Protection. The amendments to Standard 201 facilitate the introduction of dynamically deploying interior head protection systems by permitting vehicle manufacturers to comply with alternative performance requirements. To demonstrate compliance with those requirements, those amendments specify a dynamic crash test. Before the test, an anthropomorphic test dummy is placed in the outboard front seat on the struck side of the test vehicle. The vehicle is then propelled sideways at a speed of 29 km/h (18 mph) into a 254 mm (10 inch) rigid pole. This final rule establishes the specifications and calibration requirements for that test dummy.

The dummy specified in this notice is based on two existing dummies, the Part 572, Subpart F anthropomorphic test device (Side Impact Dummy or SID) that is used in testing under FMVSS 214, Side Impact Protection, and the Part 572, Subpart E anthropomorphic test device (Hybrid III or HIII) that is used in testing under FMVSS 208, Occupant Crash Protection. The new dummy combines the head and neck of the Hybrid III (HIII) with the torso and extremities of the Side Impact Dummy (SID) through the use of a redesigned neck bracket. The agency has concluded that the resulting SID/HIII dummy is appropriate for use in the new test.

##### B. Notice of Proposed Rulemaking

In a Notice of Proposed Rulemaking (NPRM) published in the **Federal Register** on December 6, 1997 (62 FR 64546), NHTSA outlined the specifications for the proposed side impact dummy. The NPRM contained, or incorporated references to, (1) a

drawing package containing all of the technical details of the new neck bracket used for mating the SID torso with the HIII head and neck assembly, (2) a parts list, and (3) a SID/HIII user manual containing instructions for inspection, assembly, disassembly, use, and adjustments of dummy components. These drawings and specifications were offered to ensure that the dummies would be uniform in construction. Performance calibration tests proposed in the NPRM served to assure that the SID/HIII responses would be within established biomechanical corridors and further assure the uniformity of dummy assembly, structural integrity, and adequacy of instrumentation. The agency tentatively concluded that these measures would ensure the repeatability of the dummy's performance in dynamic testing.

The proposal indicated that the dummy would be instrumented with an accelerometer array for measurement of accelerations in the head during impacts. The proposal also specified the manner and location of installation of sensors to reduce variability in their measurements that might otherwise result from differences in location and mounting.

Drawings and specifications for the SID/HIII were made available for examination in the NHTSA Docket Section. Copies of those materials and the user manual were also available from Reprographic Technologies, 9000 Virginia Manor Road, Beltsville, Md. 20705, tel. (301) 210-5600. In addition, an engineering drawing for the new neck bracket and sample neck brackets were available on a short term loan basis from the NHTSA Vehicle Research and Test Center, East Liberty, Ohio, 43319, tel. (937) 666-4511.

The dummy NPRM indicated that the free motion headform (FMH) test procedure is not suitable for use in Standard 201 testing the potential for pole impact-induced head injuries in side impacts, particularly in vehicles equipped with deploying head protection devices. Since the Hybrid III head and neck both have good biofidelity, NHTSA proposed that they be used with the existing SID dummy for this test. The Hybrid III head and neck, in the agency's view, provided the best means for evaluating head injury in this test while the use of the SID torso afforded an opportunity to collect meaningful data relating to thoracic injuries.

The agency proposed that the SID (Part 572; Subpart F) body and lower extremities would be combined with the Hybrid III (Part 572; Subpart E) head

and neck assembly to form a new dummy test device called SID/HIII (Part 572; Subpart M). The proposed SID/HIII, at 170 lbs, was approximately 1.2 lbs heavier than the SID, due to the incremental weight increase of the Hybrid III neck component and the new neck bracket. NHTSA tentatively concluded that the weight of the SID/HIII dummy would be within the limits of the existing SID and Hybrid III dummies. The NPRM also indicated that new neck bracket was designed so that the seating height of the SID and the SID/HIII would be nearly identical. To accommodate the new neck bracket, the design of the existing upper and middle shoulder foam pads was revised from one piece to two piece right and left mirror image designs without altering either the padding's peripheral shape and its thickness or its attachment to the torso. Relative to the SID, the head center of gravity (head CG) of the proposed SID/HIII was, however, 0.75 inch higher and 0.25 inch more forward when the Hybrid III head/neck assembly is mounted to the SID torso using the new neck bracket. This change, in NHTSA's view, more correctly reflected the head and neck orientation of a seated occupant.

### C. Comments in Response to the NPRM

NHTSA received seven comments in response to the NPRM. Comments were submitted by four vehicle manufacturers, BMW, Volvo, Volkswagen, Toyota. Comments were also submitted by the American Automobile Manufacturers Association (AAMA), the Insurance Institute for Highway Safety (IIHS), and a manufacturer of test dummies, First Technology Safety Systems (FTSS).

Of the six dummy users, three (BMW, IIHS and Volvo) recommended the adoption of the SID/HIII without any conditions, two supported its adoption but suggested its use for a limited time duration (AAMA and VW), and one (Toyota) opposed its use, favoring instead the use of the BioSID and EuroSID-1. FTSS, a manufacturer of dummies, provided comments relative to mechanical improvements to assure better performance. AAMA's comments addressed the side impact pole test proposal of Standard 201 as well as the proposed SID/HIII dummy. AAMA argued that the proposed dummy should not be used for the side impact pole test as it has marginal biofidelity. AAMA considers the SID/HIII to have insufficient biofidelity and suggested that the current version of the BioSID test dummy be used for the side impact pole test. In the event that NHTSA decides to proceed with the use of the

SID/HIII, the organization indicated that it would not oppose temporary use of the dummy until September 1, 2001, at which time the upgraded EuroSID-1 would become available for the Standard 201 pole test.

BMW indicated its support of the proposed Standard 201 pole test and the use of the SID/HIII in that test. While supportive of the use of the SID/HIII, BMW also indicated that it believed that the BioSID head and neck would be more appropriate for calibration purposes.

FTSS, a manufacturer of test dummies, supported the proposed use of the SID/HIII dummy, but noted that the NPRM justified the use of the HIII head and neck on the assumption that this head and neck are identical in performance to that of the BioSID. However, according to FTSS, the BioSID head and neck are the same design as the Hybrid-III, but employ different vinyl and rubber formulations for better repeatability and consistency of calibration response. The company also observed that the BioSID head skin uses a softer vinyl formulation which allows more skin deformation and reduces the peak g level. The company urged NHTSA to specify the use of talcum powder in the interface between skin and skull in the HIII head to bring the HIII head performance to equal that of the BioSID. FTSS expressed reservations about the SID/HIII neck, observing that very few HIII necks can pass the prescribed calibration corridors for the SID/HIII. FTSS therefore believes that the agency should modify the SID/HIII proposal by substituting the BioSID neck for the HIII neck. The company also advocated changes to the SID torso employed in the proposed SID/HIII, contending that two of the 12 specified shoulder foam retaining washers should be of a smaller diameter.

IIHS submitted comments supporting the proposed rulemaking. The organization indicated its belief that the SID/HIII is adequate for assessing the performance and benefits of dynamic head protection devices in side-into-pole crash tests. In support of this position, IIHS submitted test data from side impact pole tests it performed using the BioSID and SID/HIII dummies. While supporting the use of the SID/HIII, IIHS also indicated that NHTSA should consider the option of allowing the use of the SID/HIII or EuroSID-1 for the pole tests. IIHS also supported the use of the SID torso and the HIII head and neck without the new neck bracket incorporated in the proposed SID/HIII. According to IIHS, the resulting height of the SID/HIII combination without the

new neck bracket is a more appropriate test device for the side impact pole test.

Toyota did not support the use of the SID/HIII and urged the agency to use EuroSID-1 torso and the HIII head and neck rather than SID/HIII for full scale pole tests proposed to be incorporated into Standard 201. Toyota noted that the ISO draft test procedure for a side impact pole test (ISO/TC22/SC10/WG3) proposed using EuroSID-1 and the BioSID, over other existing dummies, because the SID is not so biofidelic as these test devices. The company also argued that the proposed use of the SID/HIII is contrary to international harmonization as it is extremely unlikely that the SID/HIII would be adopted for the ISO side impact pole test.

VW supported the use of the SID/HIII as an interim measure and urged NHTSA not to delay rulemaking while waiting for the optimum dummy. The company indicated that while it supported use of the proposed SID/HIII dummy, it also indicated that the agency should consider allowing the additional option of using the EuroSID-1 until August 31, 2002. VW stated that the agency should continue to study the issue of which test dummy would be most effective for the side impact pole test and mandate the optimum test device by September 1, 2002.

Volvo strongly supported the proposed adoption of the SID/HIII. In Volvo's view, the SID/HIII is sufficiently biofidelic and is otherwise acceptable for evaluating the risk of injury to the head in the side impact pole test. The company indicated that it believed that the SID/HIII is the best currently available test dummy for the proposed Standard 201 side impact pole test. Volvo indicated that the HIII head and neck, in conjunction with the SID torso, are well suited for neck injury assessment in the presence of advanced restraint systems.

### **I. Final Rule**

NHTSA has decided to adopt the design and specifications for the SID/HIII as proposed in the NPRM without any changes. The agency has concluded that the SID/HIII is the best test device currently available for the side impact pole test. Comments submitted in response to the NPRM indicate that all of responding vehicle manufacturers, except for Toyota and AAMA, believe the SID/HIII dummy is sufficient and adequate for the proposed Standard 201 side impact pole test. IIHS, having performed the side impact pole test, noted that the ribcage-shoulder structure of the SID/HIII collapses upon impact by the intruding structures. As a

result, the head translates laterally by the amount of the ribcage collapse and impacts the intruding structure. In a similar test using the BioSID dummy, IIHS observed that the BioSID head did not contact any vehicle or pole surfaces. In that test, the dummy's left arm and the rib-shoulder structure limited the torso collapse and translation of the head towards intruding structures. The agency believes that the IIHS tests indicate that the SID/HIII is a more appropriate test device for the side impact pole tests than the BioSID. The agency also notes that BMW and Volvo also fully supported use of the proposed SID/HIII, while VW and AAMA indicated support for using the SID/HIII on an interim basis until final selection of an appropriate dummy is made. Toyota's arguments that the EuroSID-1 is a more adequate dummy do not, in NHTSA's view, adequately consider the excessive stiffness of the EuroSID shoulder and the impact that this has on representative testing in the side impact pole test.

#### **A. Alternative Test Dummies**

A number of commenters indicated that dummies other than the proposed SID/HIII should be used for the Standard 201 side impact pole test, either in conjunction with, or as an alternative to, the SID/HIII. AAMA contended that the SID/HIII was not so biofidelic as other available dummies and suggested that the BioSID or the EuroSID-1, when the latter is available, be specified in its place. Toyota recommended replacement of the SID/HIII by the EuroSID-1. VW suggested that use of either the EuroSID-1 or SID/HIII, be allowed as a test option. IIHS urged the agency to study use of the EuroSID-1 for the pole tests. BMW and FTSS suggested specifying the SID/HIII with the Hybrid-III based BioSID head and neck. They stated that BioSID components are more appropriate for calibration purposes because they have better response consistency and are better centered within the calibration corridor in the lateral direction. FTSS observed that the BioSID head and neck are of the same design as the HIII, but their vinyl and rubber formulations are different. FTSS suggested that the head response of the standard HIII design can be made to approximate that of the BioSID through application of talcum powder in the interface between the vinyl skin and skull. FTSS also noted that very few HIII necks can pass the prescribed calibration corridors. Accordingly, FTSS urged NHTSA to specify the BioSID neck and use smaller diameter washers for shoulder foam retention.

NHTSA concludes that the SID/HIII is the appropriate test device for the side impact pole test. The agency recognizes that the current ISO rating scheme ranks the BioSID as having the highest biofidelity of all five existing side impact dummies. (new ratings from the ISO working group are: BioSID=5.9, EuroSID-1 = 4.2, SID/HIII = 3.8, EuroSID = 3.2, and SID = 2.3). However, in comparative IIHS pole impact tests of a BMW using the BioSID and SID/HIII dummies, the BioSID was not capable of assessing the severity of impact with the intruding pole because the BioSID shoulder structure, when contacted by the intruding vehicle side structure, failed to collapse and thus kept the head away from contact impact with the intruding pole. In contrast, the SID/HIII dummy, because of its collapsing shoulder structure, allows the head to move toward and impact the intruding pole as a human head would. This more human-like response is obviously very important for the assessment of dynamic head protection systems. The shortcomings of the BioSID shoulder, in NHTSA's view, imply that the ISO biofidelity rating scheme may not be applicable to dummies used in side impact pole tests. For this particular application, the IIHS test results demonstrate that the SID/HIII dummy may have been underrated by the ISO working group.

NHTSA has similar reservations regarding use of the EuroSID-1. The agency has used the EuroSID-1 in a limited number of lateral barrier impacts. Similar tests were also performed by AAMA. These tests indicate that the EuroSID-1 thorax deflection response may not be representative of human subjects. Observations of the EuroSID-1 in crash testing show that movement of the torso may be controlled and limited by either a mechanical lock-up within the ribcage structure or by characteristics of the shoulder structure, whose initiation to motion and degree of rotation appears to be highly dependent on the direction of initial impact. NHTSA believes that the unpredictable motion of the EuroSID-1 shoulder, as well as the uncertainties created by the mechanical lock-up of the torso, would be difficult to control. These phenomena would, in the agency's view, have a serious impact on the lateral movement of the head and neck in a side impact pole test. The agency observes that in another context, AAMA recommended that the EuroSID-1 be accepted for side impact tests only after it was modified and upon verification of the dummy's proper performance in full scale tests. The

foregoing indicates that EuroSID-1 has not yet been accepted as a valid test dummy. While minor modifications of the EuroSID-1 are expected to be completed by the end of 1998, other changes are being undertaken over a longer term. NHTSA has no present assurance that the modifications, when completed, will make the dummy any more suitable than it is today. In view of this, the agency can not seriously consider the EuroSID-1 dummy until data from complete evaluation of the dummy, including 90 degree pole tests, become available for analysis.

BMW and FTSS suggest specifying the use of the BioSID head and neck on SID/HIII because it is extremely difficult to find standard Hybrid III heads and necks that meet the BioSID calibration criteria. According to these commenters, the BioSID neck, which uses different components, is more likely to meet the requirements of the SAE Task Group specified calibration corridor.

According to FTSS, the design of the BioSID head and neck are the same as the HIII, except that the BioSID vinyl and rubber formulations have been modified to meet the requirements of the BioSID calibration corridors. FTSS also suggests that the head response of the standard HIII design can be made to approximate that of the BioSID through application of talcum powder in the interface between the vinyl skin and skull as used for EuroSID-1.

Accordingly, FTSS urged NHTSA to specify the BioSID neck and to amend the specifications for the HIII head so that talcum powder can be used between the skin and the skull.

The agency notes that not all HIII neck/head combinations will meet the specifications of the calibration corridor. However, agency experience shows that it is not unduly burdensome to find, through testing, HIII heads and necks that meet the calibration corridor specifications. NHTSA has concluded that the selected combination of the HIII head and neck is an appropriate test device for the side impact pole test. The agency does not have test experience with the suggested combination of SID/BioSID components, and it cannot say with assurance that SID/HIII and the SID with BioSID head and neck advocated by BMW and FTSS would perform identically. NHTSA has concluded that since the SID/HIII functions well with the specified HIII components, there is no present need to pursue the BioSID head and neck option advocated by BMW and FTSS.

The FTSS recommendation to use talcum powder as a lubricant between the head skin and the skull has not been evaluated by agency testing. However,

the agency has not encountered serious problems finding standard Hybrid-III heads that meet the specified calibration requirements without talcum powder lubrication. Considering the fact that little is known about the consistency of the head response with talcum powder lubricated interfaces, and that currently available heads can meet the requirements without the FTSS suggested lubrication, talcum powder lubrication of the skull will not be specified.

NHTSA is not taking any action regarding the FTSS recommendation that specifications for two of the twelve shoulder foam retaining washers be changed to a smaller diameter. The agency notes that the design already specifies shoulder washers with the diameter desired by FTSS. Therefore, there is no need for any change in specification.

Based upon recognition by the majority of the responding parties that the SID/HIII test device is acceptable and currently available for the side impact pole test, NHTSA has concluded that the dummy be specified in the final rule as originally proposed in the NPRM. The agency is not accepting the AAMA's and VW's suggestion to specify the EuroSID-1 as an optional test device for use in the pole side impact test. As NHTSA has determined that there is an urgent need to issue a final rule, it must now specify a dummy that is suitable for evaluating dynamically deployed interior head protection systems in the side impact pole test—the SID/HIII.

#### *B. Effective Date*

IIHS, VW, and Volvo urged NHTSA to implement the proposed rule as soon as possible. BMW specifically asked that the agency issue the final rule by March 1998. AAMA, while not commenting on the effective date of the proposal, indicated that it would not oppose temporary use of the SID/HIII until the upgraded EuroSID-1 became available.

IIHS, VW, and Volvo urge that the final rule become effective immediately or as soon as possible. NHTSA has determined that the SID/HIII dummy should be incorporated into Part 572 within thirty days of the date of publication of this final rule to allow compliance testing pursuant to the dynamically deployed interior head protection system requirements of Standard 201, which have effective date of September 1, 1998.

## **II. Rulemaking Analyses and Notices**

### *A. Executive Order 12866 and DOT Regulatory Policies and Procedures*

This notice was not reviewed pursuant to E.O. 12866, "Regulatory Planning and Review." NHTSA has considered the impacts of this final rule and determined that it is not significant within the meaning of the Department of Transportation's regulatory policies and procedures.

The final rule does not require any vehicle design changes, but only specifies the construction of a new neck bracket to join existing components to create the test dummies used to evaluate a vehicle's compliance with Standard 201 under one of two test options. The agency believes that the cost of the new neck bracket is approximately \$200 to \$300. The neck bracket is the only new hardware that would be needed for those manufacturers and other parties already employing the SID and HIII dummies for compliance testing to standards other than Standard 201. Costs associated with the use of the proposed SID/HIII in the optional side impact test proposed in the August 26, 1997 NPRM are estimated to be \$1,750 for calibration tests for the head, neck, lumbar spine, thorax and pelvis. Therefore, the impacts of the final rule is so minimal that a full regulatory evaluation is not required.

The agency has prepared a Final Regulatory Evaluation describing the economic and other effects of the companion final rule amending Standard 201 and specifying the use of this proposed test dummy. Summary discussions of many of those effects are provided above. For persons wishing to examine the full analysis, a copy is being placed in the docket.

### *B. Regulatory Flexibility Act*

The Regulatory Flexibility Act of 1980 (Public Law 96-354) requires each agency to evaluate the potential effects of a proposed rule on small businesses. I hereby certify that this final rule will not have a significant economic impact on a substantial number of small entities. This rule establishes specifications for a new dummy test device which will be used by manufacturers in the event that they install dynamically deployed head impact protection systems and employ a new optional test procedure for such systems under Standard 201. The costs associated with the assembly and testing of the dummy itself are minimal. Furthermore, this rule primarily affects passenger car and light truck manufacturers which are not small entities under 5 U.S.C. 605(b). The

Small Business Administration's regulations at 13 CFR Part 121 define a small business, in part, as a business entity "which operates primarily within the United States." (13 CFR 121.105(a)). The agency estimates that there are at most five small manufacturers of passenger cars in the U.S. and no small manufacturers of light trucks, producing a combined total of at most 500 cars each year.

The primary effect of the final rule will be on single stage manufacturers of passenger cars and LTVs. If incomplete vehicle manufacturers build LTV's with dynamically deployed interior head protection systems in the future, final stage manufacturers, which are generally small businesses, may have to certify compliance in some circumstances. If these small businesses need to employ the optional test procedure contained in Standard 201 which uses the SID/HIII dummy, they would incur additional costs if they conduct the testing themselves. However, it is unlikely that these manufacturers would conduct such testing themselves and may otherwise avail themselves of opportunities to avoid incurring excessive costs. Manufacturer associations could sponsor generic tests using the dummy to reduce certification costs and final stage manufacturers could avoid costs by relying on the certification provided by the manufacturer of the incomplete vehicle.

Other entities which qualify as small businesses, small organizations and governmental units will be affected by this rule to the extent that they purchase passenger cars and LTVs. They will not be significantly affected since the potential cost increases associated with this action should only slightly affect the purchase price of new motor vehicles.

For these reasons, NHTSA believes that this final rule does not have a significant impact on any small business.

#### C. Paperwork Reduction Act

In accordance with the Paperwork Reduction Act of 1980 (P.L. 96-511), there are no requirements for information collection associated with this proposed rule.

#### D. National Environmental Policy Act

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

#### E. Executive Order 12612 (Federalism) and Unfunded Mandates Act

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

In issuing this final rule for specifications to create a new test dummy by joining components of two existing dummies with a new neck bracket, the agency notes, for the purposes of the Unfunded Mandates Act, that it is pursuing the least cost alternative. Also, as noted above, this test device will be used only if a manufacturer chooses one of two options to test for compliance with Standard 201. As the selection of that option is not required by this rule or by the companion rule amending Standard 201, and as this rule does not require use of this new test dummy, this rule does not impose new costs. While manufacturers choosing to test for compliance under the optional tests requiring use of the test dummy will incur additional costs, the costs associate with the new dummy will be negligible.

#### F. Civil Justice Reform

This final rule does not have any retroactive effect.

#### List of Subjects in 49 CFR Part 572

Motor vehicle safety, Incorporation by reference.

In consideration of the foregoing, 49 CFR Part 572 is amended as follows:

#### PART 572—[AMENDED]

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.

2. A new Subpart M, consisting of sections 572.110 through 572.116 is added to read as follows:

#### Subpart M—Side Impact Hybrid Dummy 50th Percentile Male.

Sec.

572.110 Materials incorporated by reference.

572.111 General description.

572.112 Head assembly.

572.113 Neck assembly.

572.114 Thorax.

572.115 Lumbar spine and pelvis.

572.116 Instrumentation and test conditions.

#### Subpart M—Side Impact Hybrid Dummy 50th Percentile Male

##### § 572.110 Materials incorporated by reference.

(a) The following materials are hereby incorporated by reference in Subpart M:

(1) The Anthropomorphic Test Dummy Parts List, SID/Hybrid III part 572, subpart M, dated May 10, 1997.

(2) The SID/Hybrid III Part 572 Subpart M User's Manual, dated May 1997.

(3) Drawing number 96-SIDH3-001, titled, "Head-Neck Bracket," dated August 30, 1996.

(4) Drawing number 96-SIDH3-006, titled, "Upper and Middle Shoulder Foam," dated May 10, 1997.

(5) Drawing number SA-SIDH3-M001, titled, "Complete Assembly SIDH3," dated April 19, 1997.

(6) Drawing number 78051-61X, Revision C, titled "Head Assembly—complete," dated March 28, 1997.

(7) Drawing number 78051-90, Revision A, titled "Neck Assembly—complete," dated May 20, 1978.

(8) Dummy assembly drawing number SA-SID-M030, Revision A, titled "Thorax Assembly—complete," dated May 18, 1994.

(9) Dummy assembly drawing SA-SID-M050, revision A, titled "Lumbar Spine Assembly," dated May 18, 1994.

(10) Dummy assembly drawing SA-150 M060, revision A, titled "Pelvis and Abdomen Assembly," dated May 18, 1994.

(11) Dummy assembly drawing SA-SID-053, revision A, titled "Lumbar Spine Assembly," dated May 18, 1994.

(12) Dummy assembly drawing SA-SID-M080, titled "Leg Assembly, Right," dated August 13, 1987.

(13) Dummy assembly drawing SA-SID-M081, titled "Leg Assembly, Left," dated August 13, 1987.

(14) Drawing number 78051-383X, Revision P, titled "Neck Transducer Structural Replacement," dated November 1, 1995.

(15) The Society of Automotive Engineers (SAE) J1733 Information Report, titled "Sign Convention for Vehicle Crash Testing," dated December 1994.

(16) SAE Recommended Practice J211, "Instrumentation for Impact Tests," Parts 1 and 2, dated March 1995.

(b) The incorporated materials are available as follows:

(1) The Director of the Federal Register approved those 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., Suite 700, Washington, DC.

(2) The parts lists, user's manual and drawings referred to in paragraphs (a)(1) through (a)(14) of this section are available from Reprographic Technologies, 9000 Virginia Manor Road, Beltsville, MD 20705 (301) 419-5070.

(3) The SAE materials referred to in paragraphs (a)(15) and (a)(16) of this section are available from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

#### § 572.111 General description.

(a) The dummy consists of component parts and component assemblies defined in drawing SA-SIDH3-M001, dated April 19, 1997, which are described in approximately 200 drawings and specifications that are set forth in §§ 572.32, 572.33 and 572.41(a)(3),(4),(5) and (6) of this part, and in the drawing of the Adaptor Bracket 96-SIDH3-001.

(1) The head assembly consists of the assembly specified in subpart E (§ 572.32) and conforms to each of the drawings subtended under drawing 78051-61X rev. C.

(2) The neck assembly consists of the assembly specified in subpart E (§ 572.33) and conforms to each of the drawings subtended under drawing 78051-90 rev. A.

(3) The thorax assembly consists of the assembly shown as number SID 053 and conforms to each applicable drawing subtended by number SA-SID M030 rev. A.

(4) The lumbar spine consists of the assembly specified in subpart B (§ 572.9(a)) and conforms to drawing SA

150 M050 and drawings subtended by SA-SID M050 rev. A.

(5) The abdomen and pelvis consist of the assembly and conform to the drawings subtended by SA 150 M060, the drawings subtended by SA 150 M060 rev. A and the drawings subtended by SA-SID-087 sheet 1 rev. H, and SA-SID-87 sheet 2 rev. H.

(6) The lower limbs consist of the assemblies specified in Subpart B (§ 572.10) shown as SA 150 M080 and SA 150 M081 in Figure 1 and SA-SID-M080 and SA-SID-M081 and conform to the drawings subtended by those numbers.

(7) The neck mounting adaptor bracket conforms to drawing 96-SIDH3-001.

(8) Upper and middle shoulder foams conform to drawing 96-SIDH3-006.

(b) The structural properties of the dummy are such that the dummy conforms to the specifications of this subpart in every respect before being used in vehicle tests specified in Standard 201.

(c) Disassembly, inspection and assembly procedures, external dimensions, weight and drawing list are set forth in the SIDH3 User's Manual, dated May 1997.

(d) Sign convention for signal outputs is given in the reference document SAE J1733 of 1994-12, "Sign Convention for Vehicle Crash Testing."

#### § 572.112 Head assembly.

The head assembly consists of the head (drawing 78051-61X, rev. C) with the neck transducer structural replacement (drawing 78051-383X, rev. P) and three (3) accelerometers that are mounted in conformance to § 572.36 (c).

(a) Test procedure. (1) Soak the head assembly in a test environment at any

temperature between 18.9 and 25.6 degrees C. (66 to 78 degrees F.) and at a relative humidity between 10 percent and 70 percent for a period of at least four (4) hours prior to its application in a test.

(2) Clean the impact surface of the head skin and impact plate surface, described in paragraph (a)(4) of this section, with 1,1,1 trichloroethane or equivalent prior to the test.

(3) Suspend the head, as shown in Figure 51, so that the midsagittal plane makes an angle of  $35 \pm 1$  degrees with the impact surface and its anterior-posterior axis is horizontal  $\pm 1$  degree.

(4) Drop the head from a height of  $200 \pm 0.25$  mm ( $7.87 \pm 0.01$  inches), measured from the lowest point on the head, by a means that ensures a smooth, clean release into a rigidly supported flat horizontal steel plate, which is  $51 \pm 2$  mm ( $2.0 \pm 0.01$  in.) thick and  $610 \pm 10$  mm ( $24.0 \pm 0.4$  in) square. The plate shall have a dry surface and shall have a microfinish of 0.2 microns (8 microinches) to 2.0 microns (80 microinches).

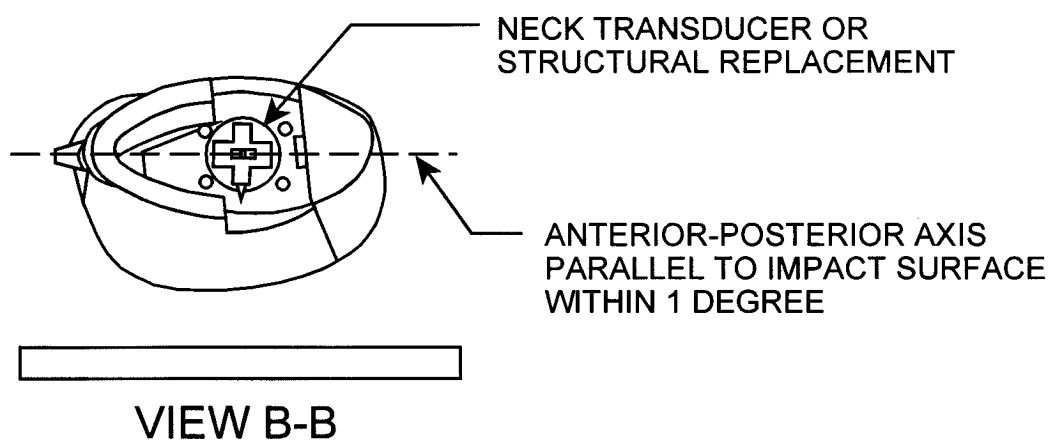
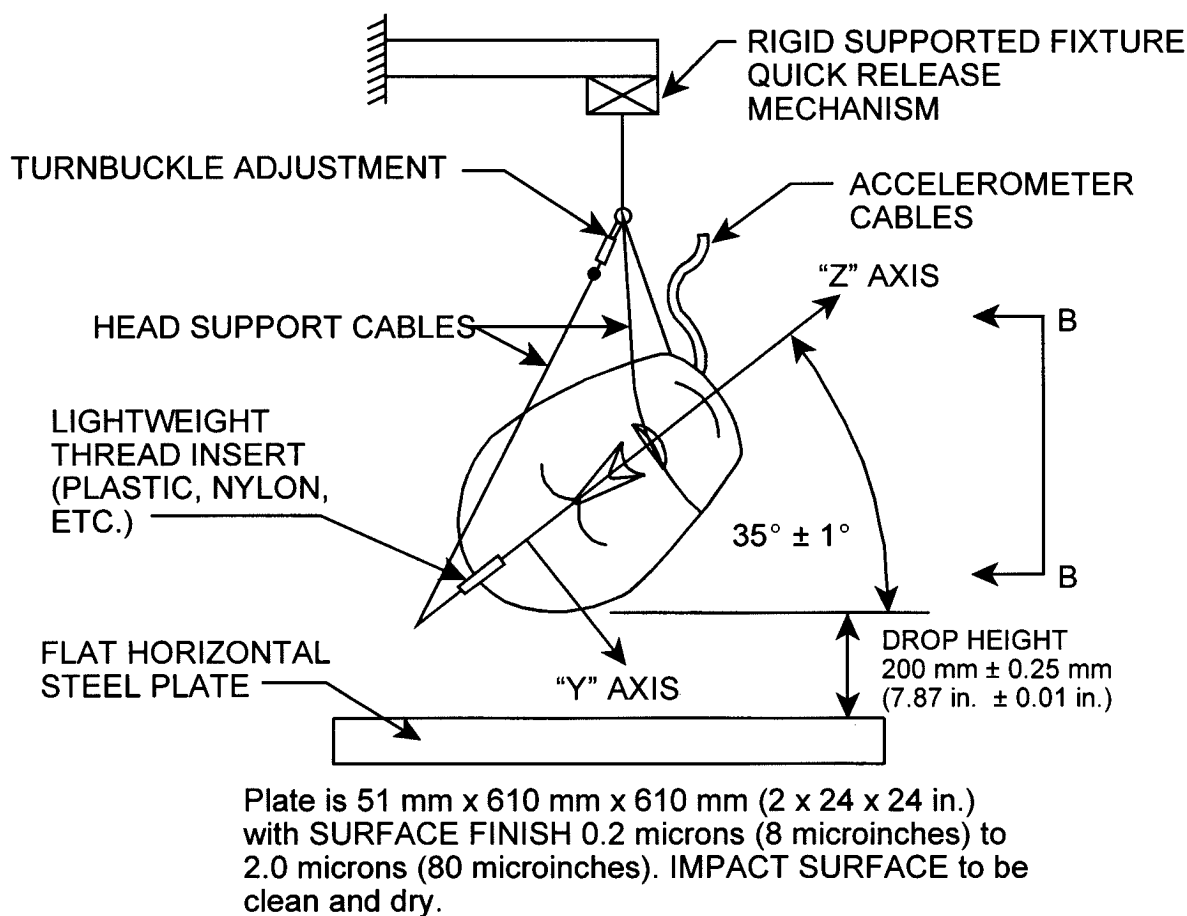
(5) Allow at least two (2) hours between successive tests on the same head.

(b) Performance criteria. (1) When the head assembly is dropped in accordance with § 572.112(a), the measured peak resultant acceleration shall be between 120 and 150 G's.

(2) The resultant acceleration-time curve shall be unimodal to the extent that oscillations occurring after the main acceleration pulse shall not exceed 15 percent (zero to peak) of the main pulse. The longitudinal acceleration vector shall not exceed 15 G's.

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Figure 51

**HEAD DROP TEST**

**§ 572.113 Neck assembly.**

The head/neck assembly consists of the parts 78051-61X, rev. C; -84; -90, rev. A; -94; -98; -104, revision F; -303, rev. E; -305; -306; -307, rev. X and has a six axis neck transducer (drawing C-1709, revision D) installed in conformance with § 572.36(d).

(a) Test procedure. (1) Soak the head and neck assembly in a test environment at any temperature between 20.6 and 22.2 degrees C. (69 to 72 degrees F.) and at any relative humidity between 10 percent and 70 percent for a period of at least four (4) hours prior to its application in a test.

(2) Torque the jamnut (78051-64) on the neck cable (78051-301, rev. E) to  $1.35 \pm 0.27$  Nm ( $1.0 \pm 0.2$  ft-lb) before each test.

(3) Using neck brackets 78051-303 and -307, mount the head/neck assembly to the part 572 pendulum test fixture (see § 572.33, Figure 22,) so that the midsagittal plane of the head is vertical and perpendicular to the plane of motion of the pendulum's longitudinal centerline (see § 572.33, Figure 20, except that the direction of the head/neck assembly is rotated around the superior-inferior axis by an angle of 90 degrees). Install suitable transducers or other devices necessary for measuring the "D" plane (horizontal surface at the base of the skull) rotation with respect to the pendulum's longitudinal centerline. The rotation can be measured by placing a transducer at

the occipital condyles and another at the intersection of the centerline of the neck and the line extending from the base of the neck as shown in figure 52.

(4) Release the pendulum and allow it to fall freely from a height to achieve an impact velocity of 6.89 to 7.13 m/s (22.6 to 23.4 ft/sec) measured at the center of the pendulum accelerometer.

(5) Allow the neck to flex without the head or neck contacting any object during the test.

(6) Time zero is defined as the time of initial contact between the striker plate and the pendulum deceleration medium.

(7) Allow a period of at least thirty (30) minutes between successive tests on the same neck assembly.

(b) Performance criteria. (1) The pendulum deceleration pulse is to be characterized in terms of decrease in velocity as obtained by integrating the pendulum acceleration output.

Time (ms)	Pendulum Delta-V (m/s)
10 .....	1.96 to 2.55.
20 .....	4.12 to 5.10.
30 .....	5.73 to 7.01.
40 to 70 .....	6.27 to 7.64.

(2) The maximum rotation of the midsagittal plane of the head shall be 64 to 78 degrees with respect to the pendulum's longitudinal centerline. The decaying head rotation vs. time curve

shall cross the zero angle between 50 to 70 ms after reaching its peak value.

(3) The moment about the x-axis which coincides with the midsagittal plane of the head at the level of the occipital condyles shall have a maximum value between 88 and 108 Nm. The decaying moment vs. time curve shall first cross zero moment between 40 and 60 ms after reaching its peak value. The following formula is to be used to calculate the moment about the occipital condyles when using the six-axis neck transducer:

$$M = M_x + 0.01778 F_y$$

Where  $M_x$  and  $F_y$  are the moment and force measured by the transducer and expressed in terms of Nm and N, respectively.

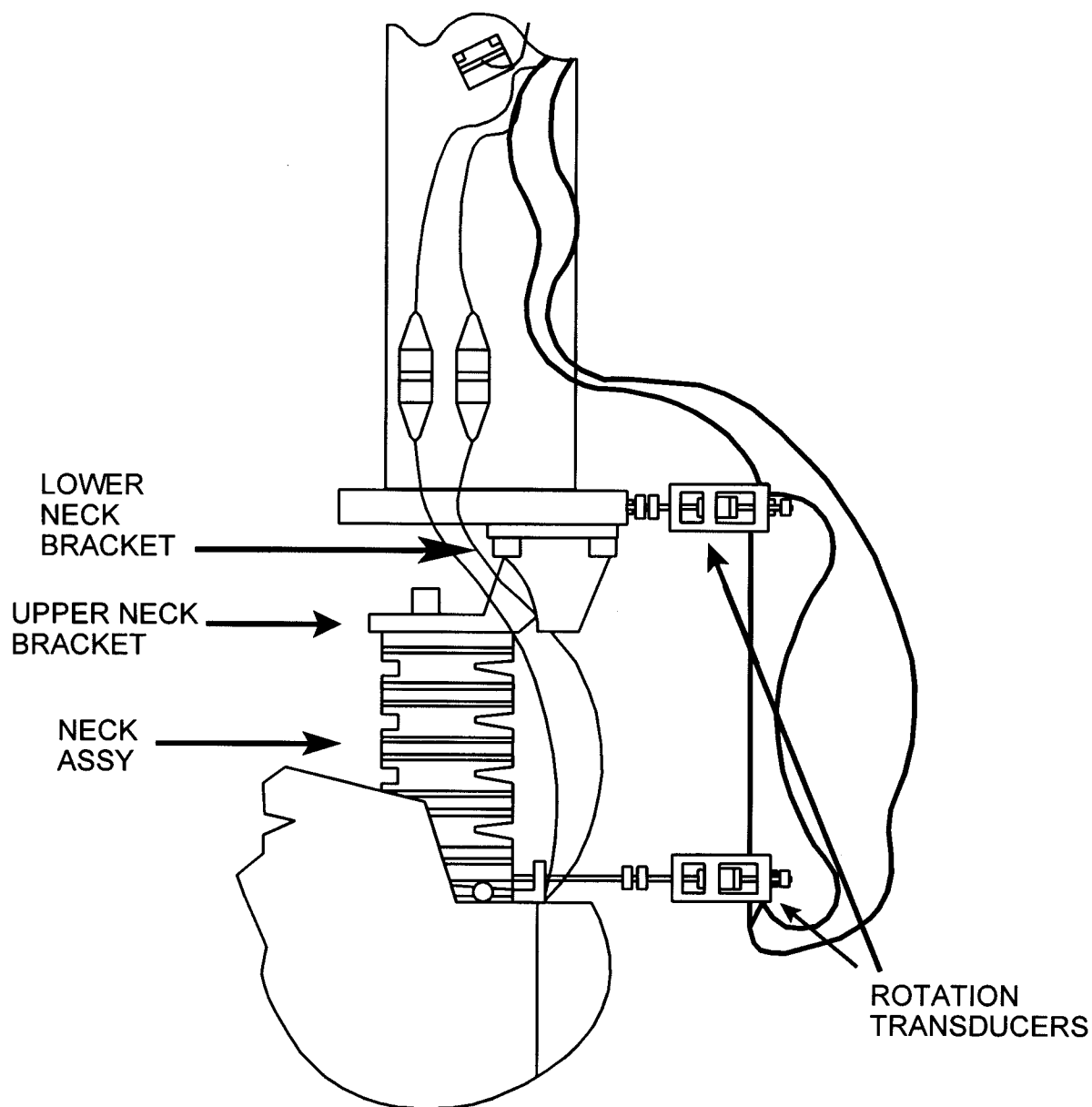
(4) The maximum rotation of the head with respect to the pendulum's longitudinal centerline shall occur between 0 and 20 ms after peak moment.

**§ 572.114 Thorax.**

The specifications and test procedure for the thorax for the SID/HIII dummy are identical to those applicable to the SID dummy as set forth in § 572.42 except that the reference to the SID device found in § 572.42(a), (SA-SID-M001A revision A, dated May 18, 1994) does not apply and the reference to the SID/HIII (SA-SIDH3-M001, dated April 19, 1997) is applied in its place.

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Figure 52  
**NECK PENDULUM TEST**



**§ 572.115 Lumbar spine and pelvis.**

The specifications and test procedure for the lumbar spine and pelvis are identical to those for the SID dummy as set forth in § 572.42 except that the reference to the SID device found in § 572.42(a), (SA-SID-M001A revision A, dated May 18, 1994) does not apply and the reference to the SID/HIII (SA-SIDH3-M001, dated April 19, 1997) is applied in its place.

**§ 572.116 Instrumentation and test conditions.**

(a) The test probe for lateral thoracic and pelvis impact tests are the same as those specified in § 572.44(a).

(b) Accelerometer mounting in the thorax is the same as specified in § 572.44(b).

(c) Accelerometer mounting in the pelvis is the same as specified in § 572.44(c).

(d) Head accelerometer mounting is the same as specified in § 572.36(c).

(e) Neck transducer mounting is the same as specified in § 572.36(d).

(f) Instrumentation and sensors used must conform to SAE Recommended Practice J211, March 1995, "Instrumentation for Impact Tests."

(g) The mountings for the spine, rib and pelvis accelerometers shall have no resonance frequency within a range of 3 times the frequency range of the applicable channel class.

(h) Limb joints of the test dummy shall be set at the force between 1 to 2 g's, which just supports the limb's weight when the limbs are extended horizontally forward. The force required

to move a limb segment does not exceed 2 g's throughout the range of the limb motion.

(i) Performance tests must be conducted at a temperature between 20.6 and 22.2 degrees C. (69 to 72 degrees F.) and at a relative humidity between 10 percent and 70 percent after exposure of the dummy to those conditions for a period of at least four (4) hours.

(j) For the performance of tests specified in § 572.114 and § 572.115, the dummy is positioned the same as specified in § 572.44(h).

Issued on July 29, 1998.

**Ricardo Martinez,**

*Administrator.*

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