

(b) The overhead percentage cited below shall be considered to include all indirect costs including, but not limited to, field and office supervisors and assistants, incidental

job burdens, small tools, and general overhead allocations. "Commission" is defined as profit on work performed by others. The percentages for overhead, profit,

and commission are negotiable according to the nature, extent, and complexity of the work involved, but in no case shall they exceed the following ceilings:

	Overhead (percent)	Profit (percent)	Commission (percent)
To Contractor on work performed by other than its own forces	10
To first tier subcontractor on work performed by its subcontractors	10
To Contractor and/or subcontractors on work performed with their own forces	10	10

(c) Not more than four percentages for overhead, profit, and commission shall be allowed regardless of the number of subcontractor tiers.

(d) The Contractor or subcontractor shall not be allowed overhead or commission on the overhead, profit, and/or commission received by its subcontractors.

(e) Equitable adjustments for deleted work shall include credits, limited to the same percentages for overhead, profit, and commission in paragraph (b) of this clause.

(f) On proposals covering both increases and decreases in the amount of the contract, the application of the overhead, profit, and commission shall be on the net change in direct costs for the Contractor or the subcontractor performing the work.

(g) After receipt of the Contractor's proposal, the contracting officer shall act within a reasonable period, provided that when the necessity to proceed with a change does not permit time to properly check the proposal, or in the event of a failure to reach an agreement on a proposal, the contracting officer may order the Contractor to proceed on the basis of the price being determined at the earliest practicable date. In such a case, the price shall not be more than the increase or less than the decrease proposed.

(End of clause)

[FR Doc. 97-31935 Filed 12-5-97; 8:45 am]

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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

ACTION: Notice of proposed rulemaking.

SUMMARY: This notice proposes specifications and qualification requirements for a newly-developed anthropomorphic test dummy. The dummy would be used in compliance testing under an earlier companion proposal to amend the standard on head impact protection. The earlier proposal would facilitate the introduction of

dynamic side impact protection devices by permitting vehicle manufacturers to comply with alternative performance requirements. To demonstrate compliance with those requirements, that proposal specifies a dynamic crash test which uses the new dummy.

DATES: Comment closing date:

Comments on this notice must be received by NHTSA no later than January 22 1998.

ADDRESSES: Any comments should refer to the docket and notice number of this notice and be submitted (preferably in 10 copies) to: U.S. Department of Transportation, Docket Management Room PL-401, 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:

I. Background

This proposal supplements an earlier proposal previously published in the **Federal Register** that would amend Federal Motor Vehicle Safety Standard (FMVSS) No. 201, Head Impact Protection. [62 FR 45202] The earlier companion proposal would facilitate the introduction of dynamic side impact protection devices by permitting vehicle manufacturers to comply with alternative performance requirements. To demonstrate compliance with those requirements, that proposal specifies a dynamic crash test. In the test, a vehicle would be propelled sideways at a speed of 29 km/h (18 mph) into a 254 mm (10 inch) rigid pole. An anthropomorphic test dummy would be in the outboard front seat on the struck side of the

vehicle. This notice proposes the specifications and calibration requirements for that test dummy.

The dummy proposed 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 proposed dummy would combine 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 tentatively concludes that the resulting SID/HIII dummy would be operational and adequate for use in the proposed rule.

II. Agency Proposal

The specifications for the proposed side impact dummy would consist of (1) a drawing package containing all of the technical details of the 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 would ensure that the dummies would be the same in their construction. The performance calibration tests proposed in this NPRM would serve to assure that the SID/HIII responses are within the established biomechanical corridors and further assure the uniformity of dummy assembly, structural integrity, and adequacy of instrumentation. As a result, the repeatability of the dummy's performance in dynamic testing would be ensured.

The dummy would be instrumented with an accelerometer array for measurement of accelerations in the head during impacts. The rule would specify 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 are available for examination in the NHTSA Docket Section. Copies of those materials and the user manual may also be obtained from Reprographic Technologies, 9000 Virginia Manor Road, Beltsville, Md. 20705, tel. (301) 210-5600. In addition, an engineering drawing for the neck bracket and the neck brackets themselves are available on a short term loan basis from the NHTSA Vehicle Research and Test Center, East Liberty, Ohio 43319, tel. (937) 666-4511.

A. Description

On August 26, 1997, NHTSA published a notice of proposed rulemaking [62 FR 45202] containing amendments to Standard No. 201. The proposed amendments, offered in an effort to provide maximum flexibility to manufacturers in developing dynamic head protection systems, include an optional test procedure incorporating a full scale side impact test with a 29 km/h (18 mph) side impact into a 254 mm (10 inch) rigid pole. In this test, the subject vehicle would be propelled into the pole so that the pole would impact at the center of gravity of the head of a seated dummy positioned on the designated front outboard seating position of the struck side.

Since the free motion headform (FMH) used in Standard 201 testing cannot be used for evaluating HIC in such an impact and the Hybrid III head and neck assembly appears to be the most biofidelic test device currently available for evaluating head injury in side impacts, the agency is proposing that the Hybrid III head and neck be used with the existing SID dummy for this test. The Hybrid III head and neck currently provides the best means for evaluating head injury in this test while the use of the SID torso affords an opportunity to collect meaningful data relating to thoracic injuries.

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 SID/HIII at 170 lbs is 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. However, the SID/HIII is approximately 2.0 lbs lighter than the Hybrid III 50th percentile dummy (172 lbs +/- 2.4 lbs). Therefore, the weight of the SID/HIII dummy would be within the limits of the existing SID and Hybrid III dummies. The new neck bracket is 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 were 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 SID/HIII is, 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 also more correctly reflects the head and neck orientation of a seated occupant. As discussed in the Preliminary Regulatory Evaluation (PRE) for the earlier companion proposal to amend Standard 201, agency test data established that this minor discrepancy of the head CG location would not have any significant effect on the HIC, TTI and Pelvis-G responses. Detailed descriptions of the SID/HIII dummy test device are given in the proposed part 572, subpart M, S572.110 through S572.116.

B. Biofidelity of the SID/HIII Dummy in Lateral Impact

The agency has tentatively concluded that the Hybrid III head and neck is the most biofidelic configuration now available for assessing injuries to the head and neck in side impacts. That conclusion was based on testing of the three side impact dummies; BioSid,¹ EuroSid and SID. The testing was performed in 1990 by two GM researchers (Mertz and Irwin) using the latest biofidelity test conditions and requirements agreed to by Working Group 5 of ISO/T22/SC12 at that time. A total of 4 sets of tests were performed. Because BioSid uses the Hybrid III head and neck assembly, the test data generated to verify the lateral impact response characteristics of the BioSid head/neck system are believed by NHTSA to be useful in predicting the performance of the SID/HIII dummy.

The agency's review of these tests, which is discussed in greater detail in the PRE prepared for the August 26, 1997 NPRM proposing changes to Standard 201, indicates that the Hybrid III head-neck assembly has sufficient biofidelity for assessing side impact protection. Using the ISO/SC12/WG5 methodology and biofidelity rating system for the assessment of the various

body segments, NHTSA rates the SID/HIII dummy "Fair" for side impact application purposes. In comparison, the BioSid received a "Fair" rating while the SID and the EuroSid were both deemed to be "Marginal." None of the dummies evaluated received a rating greater than "Fair"—which exceeds the ISO/SC12/WG5 recommended acceptable level for a dummy test device. Although a better side impact dummy may be developed in the future, based on the above analysis, NHTSA tentatively concludes that, for the immediate future, the SID/HIII is a sufficient and an acceptable test device to evaluate the risk of injury to the head in case of a side impact.

C. Test Results of the SID/HIII Dummy

(1) Repeatability and Reproducibility Tests

In 1990, NHTSA issued a final rule amending FMVSS No. 214 to require full scale side crash tests to evaluate side impact protection of passenger vehicles. The rule specified the use of the SID dummy as a human surrogate to assess the risk of injury in side crashes. Two alternative dummy development efforts, the EuroSid-1 and the BioSid, were in progress at that time. The BioSid uses the Hybrid III head/neck system. NHTSA evaluated the BioSid in 1988 and compared its performance to the SID. A series of lateral impact calibration tests were performed in 1990 using two BioSid dummies. It was concluded that the calibration responses of the BioSid are both repeatable and reproducible to within the response boundaries generally accepted for anthropomorphic test dummies. The results of the lateral head drop tests and lateral neck pendulum tests of those two BioSid dummies are listed in Table IV-8 of the PRE prepared for the August 26, 1997 NPRM proposing amendments to Standard 201. The agency also conducted two additional lateral head drop tests and five neck pendulum tests using the head/neck components of a third dummy. The test results also are listed in Table IV-8 of the PRE.

Based on those test data, the repeatability of the dummy head/neck certification response was found to be exceptionally good. The coefficient of variation for each dummy component is extremely small, ranging from 0.97 percent to 2.6 percent. The reproducibility of the head/neck system response of the two BioSid dummies that were manufactured by one manufacturer at the same period of time is also excellent because the coefficient of variation is within the 5 percent norm. When the test data of the third dummy is added for the reproducibility

¹The BioSid dummy was developed in response to concerns regarding the SID and EuroSid dummies. It was developed by a Side Impact Dummy Task Force created under the sponsorship of the Society of Automotive Engineers Human Biomechanics and Simulation Standards Committee (SAE-HBSSC).

evaluation, the coefficient of variation of the neck rotation angle in lateral bending motion increases to approximately 5.5 percent which is just slightly outside the range of the "excellent" reproducibility rating. It is within the "good" reproducibility rating that is generally defined by a coefficient of variation ranging between 5 percent and 10 percent. Although as a result of the additional dummy test the deviations of the head acceleration and the neck moment responses also increase, they are still within the "excellent" reproducibility rating range.

(2) Durability Tests

BMW recently conducted a series of side-to-pole impact tests to assess the effectiveness of its inflatable tubular structure (ITS) system in side impact protection. On April 19, 1996, BMW submitted its confidential test data to NHTSA as part of the BMW comments on the ANPRM announcing the proposed amendments to Standard 201. [61 FR 9136] The dummy test device used in the BMW ITS evaluation tests is a SID dummy with the Hybrid III head/neck system whose seated height is approximately 0.75 inches higher than that of the SID. However, it was also noted that the head CG of the BMW dummy was about 1.5 inches higher than that of the SID dummy.

It is possible that a taller seated dummy, particularly whose head CG is substantially higher, may exhibit modified head/neck kinematics and/or dynamic responses in a lateral impact, which could lead to the design of different head protection systems. The agency tentatively concludes that it is reasonable to modify the existing neck bracket in order to maintain the dummy's seated height within the range of heights of 50th percentile male dummies. For this reason, the NHTSA modified neck bracket provides a means to approximate the original SID seated height and the head/neck posture while minimizing the increase in the height of the head CG of the SID/HIII dummy by approximately 0.75 inch. Inasmuch as the above changes minimize the dimensional and mass distribution deviations from the currently specified SID, the new neck bracket is included in the construction of the SID/HIII dummy.

A total of nine sled lateral impact tests were conducted by NHTSA to assess the durability of the new neck bracket and its potential effects on dummy responses. The sled buck consisted of a bench seat with low friction surfaces and two rigid loading plates on the impacted side at the lateral end of the seat. The lower plate was up

to the dummy's shoulder height and was covered with 4 inch thick cushion (Ethafom LC 220). The non-padded upper plate was at the head height level.

In each test, the SID/HIII was seated on the bench with the torso in an upright position. The sled buck was oriented at a right angle to the direction of sled travel and accelerated to a speed of 18 mph. The direction of motion of the dummy was horizontal, parallel to the seating surface and perpendicular to and toward the loading plates. The test matrix consisted of three tests each for the Part 572 Subpart F SID dummy, the SID with the Hybrid III head/neck using the Subpart F neck bracket, and the SID/HIII dummy with the new neck bracket.

The test results, contained in Table IV-10 of the PRE prepared for the August 26, 1997 NPRM proposing amendments to Standard 201, indicate that the proposed new neck bracket is structurally sufficient and durable for the intended purpose. There was no sign of bracket damage in head impacts producing a HIC value as high as approximately 5,000. This impact severity is beyond the norm of the head-to-upper interior impact test responses. Most important, the new neck bracket would bring the head height down to the normal range of the 50th percentile male seated dummy and does not have significant effects on the HIC, TTI and pelvis-g responses.

D. Proposed Calibration Tests

The agency proposes that the following calibration test specifications and procedures, which make use of the existing dummy test fixtures and equipment, be adopted for the SID/HIII:

1. Head Drop Test Specifications

The head is dropped from 200 mm onto a flat, steel plate such that its midsagittal plane makes a 35 degree angle with respect to the impact surface and its anterior-posterior axis is horizontal. When the dummy head is dropped in accordance with the above test procedure, the following specifications are to be met:

- a. The resultant acceleration of the center of gravity of the head shall be between 120 and 150 G.
- b. The resultant acceleration-time curve shall be unimodal such that no oscillation after the main acceleration peak shall exceed 15 percent of the peak resultant head acceleration.
- c. The longitudinal acceleration component shall not exceed 15 G.

2. Neck Pendulum Test Specifications

The proposed test procedure is similar to the Hybrid III neck test, except the entire head/neck assembly is

rotated 90 degrees when attached to the neck pendulum. The pendulum is identical to that used in the Hybrid III neck calibration tests and the impact velocity is between 6.89 and 7.13 m/s. When the neck is tested in accordance with the proposed test procedure, the following specifications are to be met:

- a. The pendulum deceleration pulse is to be characterized in terms of its change (decrease) in velocity as obtained by integrating the pendulum accelerometer 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.

- b. The maximum rotation of the midsagittal plane of the head shall be 64 to 78 degrees with respect to the pendulum. The decaying head rotation vs. time curve shall cross the zero angle between 50 to 70 ms after reaching its peak value.

- c. The moment about the x-axis which lies in 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.

- d. The maximum rotation of the head with respect to the pendulum shall occur between 0 and 20 ms after peak moment.

3. Temperature Sensitivity and Time Between Tests

The calibration test specifications for the Hybrid III head and neck components apply. The lateral head drop tests would be conducted at 18.9-25.6 degrees C at a relative humidity from 10-70 percent. The lateral neck pendulum tests would be conducted at 20.6-22.2 degrees C at a relative humidity from 10-70 percent.

The head and neck components would be soaked at these conditions for at least four hours before testing. A waiting period of two hours would be required between two consecutive tests using the same head component. A waiting period of at least thirty (30)

minutes would be required between successive tests on the same neck.

III. Rulemaking Analyses and Notices

A. Executive Order 12291 (Federal Regulation) 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 rulemaking action and determined that it is not significant within the meaning of the Department of Transportation's regulatory policies and procedures.

The proposed amendments would not require any vehicle design changes but would instead only specify 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 No. 201 under one of three 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 required for those 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 proposed amendments would be so minimal that a full regulatory evaluation is not required.

The agency has prepared a Preliminary Regulatory Evaluation describing the economic and other effects of the rulemaking action proposing amendments to Standard No. 201 requiring 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. Modifications to dummy designs affect motor vehicle manufacturers, few of which are small entities. The Small Business Administration (SBA) has set size standards for determining if a business within a specific industrial classification is a small business. The Standard Industrial Classification code used by the SBA for Motor Vehicles and Passenger Car Bodies (3711) defines a

small manufacturer as one having 1,000 employees or less.

Very few single stage manufacturers of motor vehicles within the United States have 1,000 or fewer employees. Those that do are not likely to perform testing that would require use of the SID/HIII test device and would be much more likely to contract with a larger manufacturer or a test facility to perform such testing. For this reason, NHTSA believes that this proposal would not have a significant impact on any small business.

C. Paperwork Reduction Act

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

D. National Environmental Policy Act

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

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

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

In issuing this proposal 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 if a manufacturer chooses one of three options to test for compliance with Standard 201. As the selection of that option would not be required by this proposal or by the earlier companion proposal, and as this rulemaking does not require use of this new test dummy, this rulemaking does not impose new costs. While manufacturers choosing to test for compliance under the optional tests requiring use of the proposed test dummy would incur additional costs, these costs would be negligible.

F. Civil Justice Reform

This proposed rule would 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.

Submission of Comments

Interested persons are invited to submit comments on the proposal. It is requested but not required that 10 copies be submitted.

All comments must not exceed 15 pages in length. (49 CFR 553.21). Necessary attachments may be appended to these submissions without regard to the 15-page limit. This limitation is intended to encourage commenters to detail their primary arguments in a concise fashion.

If a commenter wishes to submit certain information under a claim of confidentiality, three copies of the complete submission, including purportedly confidential business information, should be submitted to the Chief Counsel, NHTSA, at the street address given above, and seven copies from which the purportedly confidential information has been deleted should be submitted to the Docket Section. A request for confidentiality should be accompanied by a cover letter setting forth the information specified in the agency's confidential business information regulation. 49 CFR part 512.

All comments received before the close of business on the comment closing date indicated above for the proposal will be considered, and will be available for examination in the docket at the above address both before and after that date. To the extent possible, comments filed after the closing date will also be considered. Comments received too late for consideration in regard to the final rule will be considered as suggestions for further rulemaking action. Comments on the proposal will be available for inspection in the docket. NHTSA will continue to file relevant information as it becomes available in the docket after the closing date, and it is recommended that interested persons continue to examine the docket for new material.

Those persons desiring to be notified upon receipt of their comments in the rules docket should enclose a self-addressed, stamped postcard in the envelope with their comments. Upon

receiving the comments, the docket supervisor will return the postcard by mail.

List of Subjects in 49 CFR Part 572

Motor vehicle safety, Incorporation by reference.

In consideration of the foregoing, it is proposed that 49 CFR part 572 be amended as follows:

PART 572—[AMENDED]

1. The authority citation for Part 572 of Title 49 would continue 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 would be added to read as follows:

Subpart M—Side Impact Hybrid Dummy 50th Percentile Male

Sec.

572.110 Incorporated materials.

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 Incorporated materials.

(a) The drawings, specifications, and manual referred to in this subpart that are not set forth in full are hereby incorporated in this part by reference. These materials are thereby made part of this subpart.

(b) The materials incorporated in this part by reference are available for examination in the general reference section of Docket No. 88-07, Docket Section, National Highway Traffic Safety Administration, Room 5109, 400 Seventh Street, SW, Washington, DC.

§ 572.111 General description.

(a) The dummy consists of component parts and component assemblies defined in drawing SA-SIDH3-M001, dated 4/19/1997, 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), 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 specified in subpart B (§ 572.9) 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 both before and after being used in vehicle tests specified in Standard No. 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", SAE, Warrendale, Pa.

§ 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 S572.36(c).

(a) *Test Procedure.* (1) Soak the head assembly in a test environment at any temperature between 18.9 to 25.6 degrees C. (66 to 78 degrees F.) and at a relative humidity from 10 percent to 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 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 +/- 1 degrees with the impact surface and its anterior-posterior axis is horizontal +/- 1 degree.

(4) Drop the head from a height of 200 +/- 0.25 mm (7.87 +/- 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 50 +/- 2 mm thick and 610 +/- 10 mm square. The plate shall have a clear, dry surface and has any microfinish of 8 to 80 microinch/inch rms.

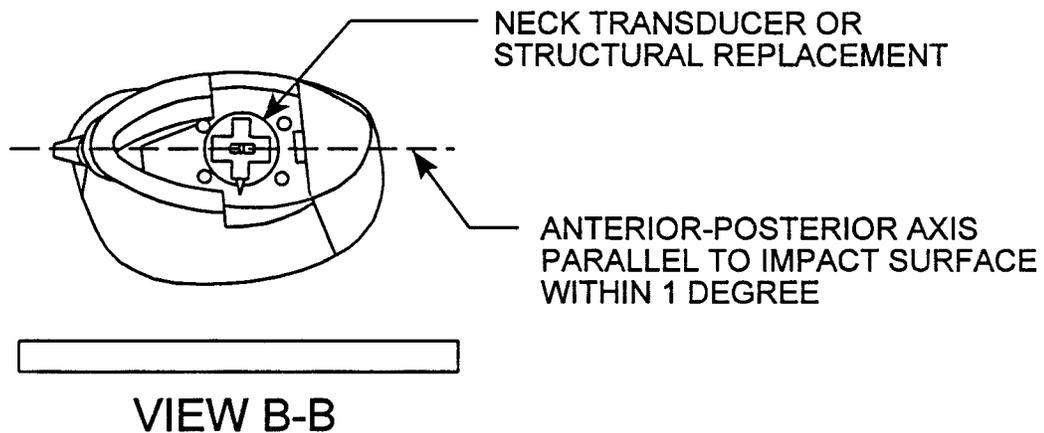
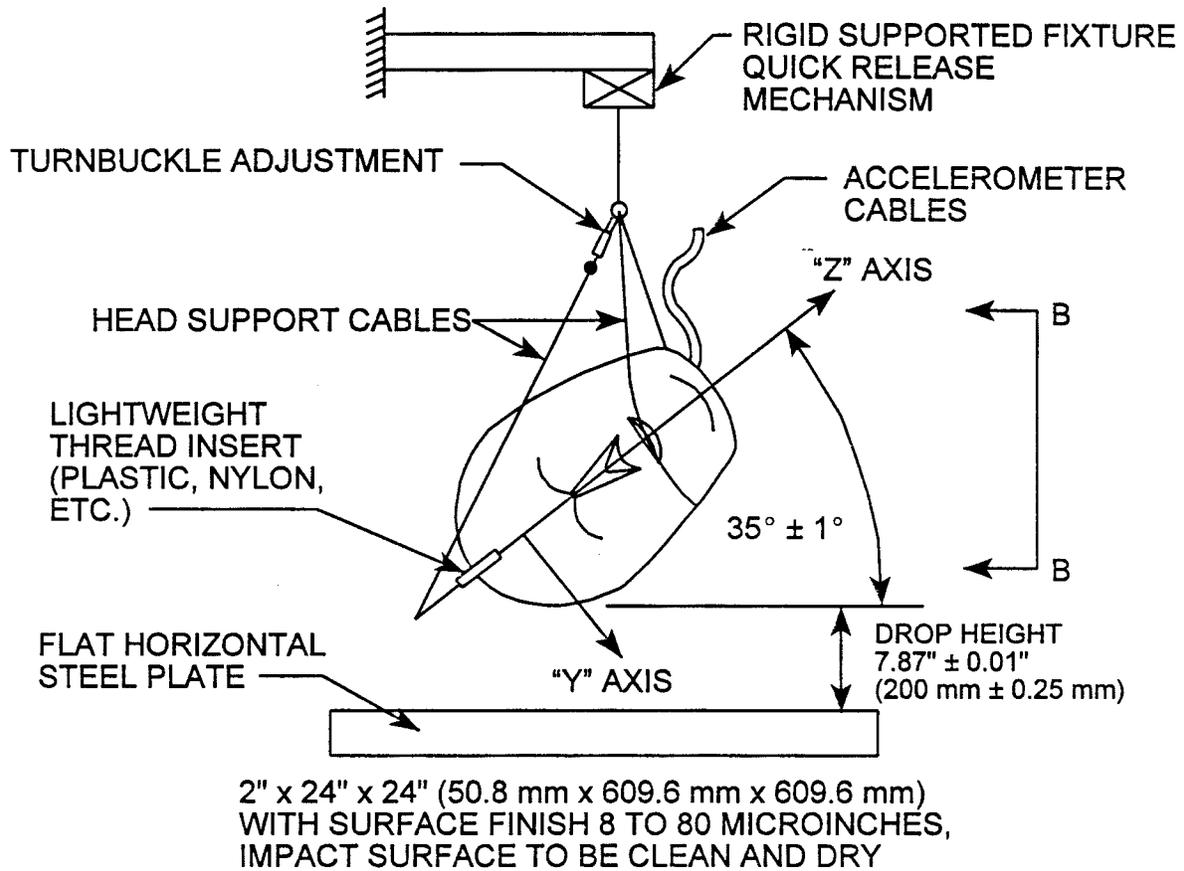
(5) Allow at least two (2) hours between successive tests on the same head.

(b) *Performance Criteria.* (1) When the head assembly is dropped in accordance with S572.112(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 (consisting of the parts 78051-61X, rev. C; -84; -90, rev. A; -94; -98; -104, revision F; -303, rev. E; -305; -306; -307, rev. X) which has a six axis neck transducer (drawing C-1709, revision D) installed in conformance with S572.36(d).

(a) *Test Procedure.* (1) Soak the head and neck assembly in a test environment at any temperature between 20.6 to 22.2 degrees C. (69 to 72 degrees F.) and at a relative humidity from 10 percent to 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+/-0.27 Nm (1.0 +/-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 S572.33, 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 S572.33, 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) Allow the neck to flex without the head or neck contacting any object.

(5) 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.

(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:

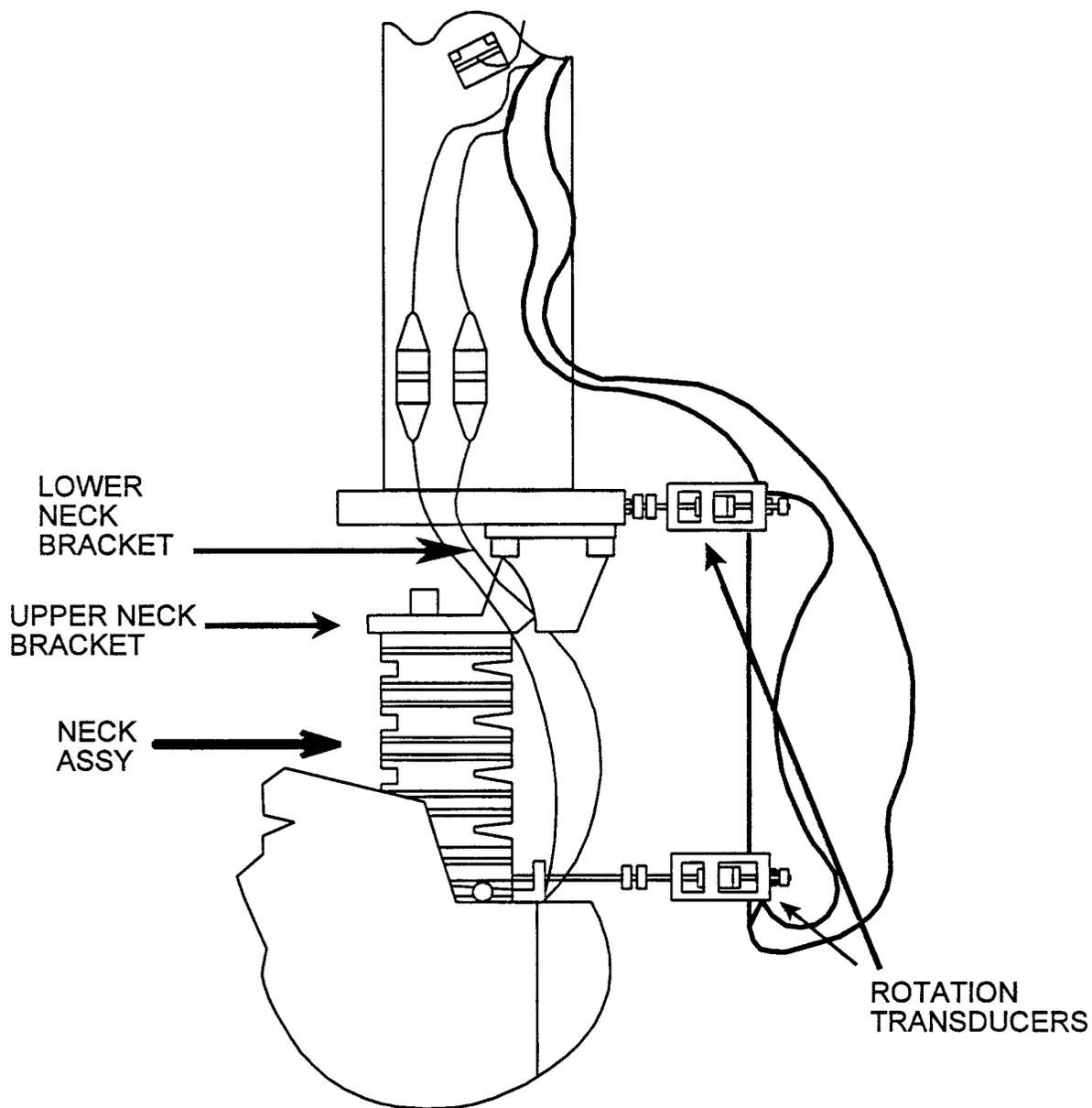
$$M = M_x + 0.01778 F_y$$

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.

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Figure 52
NECK PENDULUM TEST



§ 572.114 Thorax.

The specifications and test procedure for the thorax are identical to those set forth in § 572.42.

§ 572.115 Lumbar spine and pelvis.

The specifications and test procedure for the lumbar spine and pelvis are identical to those set forth in § 572.43.

§ 572.116 Instrumentation and test conditions.

(a) The test probe for lateral thoracic and pelvis impact tests are the same as those specified in S572.44(a).

(b) Accelerometer mounting in thorax is the same as specified in S572.44(b).

(c) Accelerometer mounting in pelvis is the same as specified in S572.44(c).

(d) Head Accelerometer mounting is the same as specified in S572.36(c).

(e) Neck transducer mounting is the same as specified in S752.36(d).

(f) Instrumentation and sensors used must conform to the Recommended Practice SAE J-211 (Mar 1995)—Instrumentation for Impact Test.

(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 are 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 are conducted at any temperature from 20.6 to 22.2 degrees C. (69 to 72 degrees F.) and at any relative humidity from 10 percent to 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 S572.42 and S572.43, the dummy is positioned the same as specified in S572.44(h).

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